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UNIVERSITY OF THE WITWATERSRAND

GRADUATE SCHOOL OF
PUBLIC AND DEVELOPMENT MANAGEMENT

RESEARCH REPORT

The regulation of interconnection in Rwanda

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Research report submitted to the Graduate School of Public and Development Management,
University of the Witwatersrand, Johannesburg
in partial fulfilment of the requirements for the degree of
Master of Management in ICT Policy and Regulation

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DECLARATION

I hereby declare that this research report titled "The regulation of interconnection in Rwanda" is my own unaided work. It is submitted in partial fulfilment for the degree of Master of Management in ICT Policy and Regulation at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination at any other university.

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Alex NKURUNZIZA

4 May 2012

ABSTRACT

The aim of this research is to explore the regulation of interconnection in Rwanda by investigating whether the current interconnection regime has ensured fair and reasonable interconnection rates that can enhance efficiency and effective competition. A qualitative research approach was used and the data were collected using semi-structured interviews and documentary analysis. The findings reveal that although RURA adopted a cost-based interconnection approach to ensure a fair and reasonable interconnection rate, its poor implementation resulted in an inefficient level of fixed and mobile interconnection rates. The study found an inconsistent application of the regime by incumbents, lack of sufficient regulatory capacity and lack of clear and comprehensive policy instruments. More recently, RURA is making efforts towards adopting a new regime to address the current interconnection rate issues in Rwanda. This study demonstrates that the current interconnection rate regime requires extensive rethinking about appropriate costing models and regulatory capacity, in order to enhance market efficiency and promote effective competition.

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Finally I thank everyone who, in one way or another, has contributed to the completion of this report. May almighty God bless all of you.

DEDICATION

This work is dedicated to my parents, **Apollinaire NGANIMANA** and **Charlotte MWANAMWANA,** and my sister **Jackie WIBABARA.**

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LIST OF ABBREVIATIONS

ACCC: Australian Competition and Consumer Commission
ARICEA: Association of Regulators and Information and Communication for Eastern and
COMESA: Common Market of Eastern and Southern Africa
COSITU: ITU model for the Calculation of Costs, Tariffs and Rates for Telephone Services
EAC: East African Countries
FAC: Fully Allocated Cost
FDC: Fully Distributed Cost
GPRS: General Packet Radio Service
GSM: Global System for Mobile Communication
ICT: Information Communications and Technology
ICEA: Ingenieurs Conseil Et Economistes Associes Southern Africa (ARICEA)
ICX: Interconnection
IMS: Information Management System
IPTV: Internet Protocol Television
ISDN: Integrated Services Digital Networks
ISP: Internet Service Provider
LRIC: Long Run Increment Cost
MSAN: Multi-Service Access Node
MTN: Mobile Telephony Network
NGN: Next Generation Network
NICI: National Information and Communication Infrastructure
NISR: National Institute of Statistics of Rwanda.
OECD: Organisation for Economic Co-operation and Development
RDB: Rwanda Development board
RICP: Rwanda Investment Climate Project
RRA: Rwanda Revenue Authority
RURA: Rwanda Utilities Regulatory Agency
TELRIC: Total Element Long Run Increment Cost
VoIP: Voice over Internet Protocol
WiMAX: Worldwide Interoperability for Microwave Access
WTO: World Trade Organization

CHAPTER ONE: THE INTERCONNECTION REGIME IN RWANDA

1.1 INTRODUCTION

Interconnection determines the winners and the losers in a competitive environment. Jamison (1998) said that competition and efficiency in the telecommunication sector hinge on interconnection pricing regulation. However, Armstrong (2002) highlights that the main issue is to ensure that new entrants can access the incumbent's network at appropriate prices, terms and conditions. In countries where operators buy inputs from each others' network, the incumbent always has incentives to use high interconnection charges as a tool to drive small operators out of the market. Too high interconnection rates deter competition. On the other hand, too low interconnection charges discourage investment and delays facility-based competition. The main challenge to regulatory institutions is to determine fair and reasonable interconnection rates that can enhance efficiency and effective competition in the telecoms market.

In an attempt to determine an appropriate level of interconnection rate that can enhance efficiency and effective level of competition, Rwandan interconnection policy advocates a cost-based pricing principle. Proponents (Jamison, 1998 and Noumba et al.2004) of cost-based pricing principles state that it never turns out to be impropriate in the light of actual costs and market conditions. They further say that it establishes the level playing field for a favorable environment that encourages greater participation by the private sector.

Despite the commitments from Rwanda Utilities Regulatory Agency (RURA) to grant new entrants access to incumbent's network at appropriate prices, terms and conditions, Magonyozi (2008) argued that efficiency and competition are still far away from being effective in Rwanda. Salinger (1998:28) argues that "the use of LRIC is theoretically sound, but its implementation in practice is rather complex and could undermine the profitability of the incumbent's investment if poorly executed".

It is this assertion that forms the basis of the present study which investigates the interconnection regulation in Rwanda. The main critical question of this study is: How has interconnection pricing regulation impacted the Rwandan telecommunication sector? Cave and Volsgang (2003) state that regulators can stop incumbents from delaying to invest if an appropriate backward or forward-looking cost-based approach is adopted. This raises a few critical questions: What is the existing interconnection pricing regime in Rwanda? How has

the existing interconnection pricing regime affected the Rwandan telecommunications market? Laffont et al. (1998) argue that focusing on access pricing principles per se does not give a positive outcome. Consequently, scholars (Armstrong, 2002; Jamison, 1998; Jain, 2003) strongly argue that an efficient level of interconnection rate can be determined only if the regulator has high degree of independence, skills and enough policy instruments at its disposal (Armstrong, 2002; Jamison, 1998; Jain 2003). This raises the questions: What are the challenges the current interconnection pricing regime is facing in the Rwandan telecoms market? What can be done to improve interconnection pricing regulation in Rwanda?

To answer these critical questions of the study, the researcher undertook a case study of interconnection regulation in Rwanda, exploring evidence collected from the regulator, RURA and the three operators MTN-Rwandacell, Rwandatel and TIGO-Rwanda. Multiple source of evidence used in the case study included semi-structured interviews and documentary analysis methods.

1.2 ORGANIZATION OF THE STUDY

The study is organized into seven chapters. Chapter 1 presents an introduction to this study and the context in which it was carried out, the identification of the problem and the organization of the study. The review of literature on topics regarding the interconnection regulation and interconnection pricing regulation are contained in Chapter 2 and Chapter 3. In Chapter 4, the problem statement, the purpose of the study, research questions and the research methodology of the study are described. Presentation of the study findings forms the basis of Chapter 5. Chapter 6 deals with discussion of findings. In Chapter 7, the conclusions and recommendations are presented and suggestions are made regarding possible future research.

1.3 RWANDAN TELECOM SECTOR AFTER GENOCIDE

Rwanda's recently history, which entails the genocide of 1994 and the loss of one million people, left the Rwandan economy devastated and much of its infrastructure destroyed. After 1994, there was an urgent necessity to develop the country both economically and socially. Drawing from other countries' experience that economic and social developments hinge on technology innovations, the telecommunication sector was given the first priority amongst all Rwandan sectors.

The era between 1994 and 2002 was marked with significant innovations in the Rwandan telecommunication sector. In 1995, Rwandatel was the sole fixed-line telephony operator in Rwanda offering voice, data and internet services. Later on after the separation of post and telephony unit, Rwandatel was changed to Rwandatel S.A (Nsegiyumva & Habumuremyi, 2009). In a few years of working, Rwandatel S.A had increased its number of fixed-line subscribers and provided services such as integrated service digital networks (ISDN) [1](RURA, 2004).

However, Rwandatel being the only monopoly in the market, its subscribers were offered poor quality of services and there was wastage of scarce resources such as spectrum since there was no institution to impose obligations on it to upgrade its networks and to manage resources. After a long period of complaints from subscribers and little progress in telephony penetration, the Rwandan government started to anticipate mobile telephony as new trend to increase the telephony penetration to a substantial level in Rwanda (Nsegiyumva & Habumuremyi, 2009).

In 1998, the Rwandan government granted the first license of mobile telephony to MTN-Rwandacell. Tri-Star Investment (an indigenous Rwandan company that was established in 1994 by a group of private Rwandans) is the major shareholder with 50% and MTN group based in South Africa with 50% (Magonyozi, 2008). MTN-Rwandacell started its operations in September 1998.

The launch of MTN-Rwandacell mobile services in Rwanda was a very remarkable innovative step in the Rwandan telecommunication sector. The following year after its launch MTN-Rwandacell had obtained the number of mobile subscribers equal to that of fixed-line telephony. As a result the government of Rwanda started to put more emphasis on telecommunication sector growth as an enabler of social and economic growth in the country. For this to be embraced there was an urgent need to promote competition and efficiency in the telecommunication sector.

To achieve the above objective, in 1999 the government of Rwanda approved a new policy for the reform of the Rwandan telecommunication sector. This included setting up a multi-sectoral regulatory institution, Rwanda utilities regulatory agency (RURA).

[1] ISDN is a set of communication standards for simultaneous digital transmission of voice, video, data and other networks

1.3.1 TELECOMMUNICATION LIBERALIZATION IN RWANDA

The telecommunication liberalization framework in Rwanda was established by the existing telecommunication law which was passed by the transitional national assembly in 2001 by Law No. 44/2001 and Law No.39/2001 (Nsengiyumva & Habumuremyi, 2009). Through this law, RURA was established and was granted authority to regulate telecommunications and to set up a regulatory board. In addition, it required all the operators in the sector to be licensed and creates individual and standard licences (RURA, 2006).

The main aim of the telecommunication reform policy in Rwanda was to restructure the telecom sector so as to break the monopoly of Rwandatel, open the market to new entrants, introduce agencies to enforce fair competition between network operators and service operators and regulate prices where competition was limited (RURA,2004).

Through its privatization strategy, the government of Rwanda sold all of its shares in the fixed-line operator to Rwandatel. In order to promote competition in the telecommunication sector, Rwandatel sold its 28% shares of fixed-line to MTN-Rwandacell in 2004(Nsengiyumva & Habumuremyi, 2009). In June 2005 Rwandatel was formally privatized and its ownership was transferred to Terracom, a US-based IT and communication provider, offering fixed-line services in Rwanda between 2005 and 2007. Furthermore, in 2006 Terracom entered into a process to transfer its shares in Rwandatel to GV Telecom Company, which is based in South Africa. However the council of the regulatory body, RURA and the government of Rwanda cancelled the negotiations after the contract between these two companies had been deemed illegal and invalid. Consequently , RURA granted a licence authorizing the provision of the internet services to MTN-Rwandacell and it subsequently launched services of general packet radio services (GPRS) (RURA, 2006).

Due to the above problems, Rwandatel has passed through several changes of ownership since 2006. In August 2007, the government took back ownership of the company when Terracom failed to fulfil its license obligations. The operator was then re-privatised and sold to LAP Green on 23 October 2007 (Nsengiyumva & Habumuremyi, 2009). LAP Green is a subsidiary of the Libyan government-owned investment vehicle Libyan African Investment Portfolio (LAP). It owns 80% of the company, now again called Rwandatel, while Rwanda social security funds (CSR) owns the remaining 20%. Today, Rwandatel is a fixed-mobile operator, as well as a backbone Internet service provider (ISP) with over 900 kilometres of fibre at its disposal and more than 300 points of presence in the country.

In the broader telecoms sector, the dominant mobile cellular provider, MTN-Rwandacell is dominant in the mobile market with 2,394,364 (RURA, 2010) active mobile subscribers and currently it is covering 95% of the country (RURA, 2010). MTN-Rwandacell continued improving its network's capacity in terms of coverage. The initial investment plan of MTN for the year 2010 was USD 60 millions for increasing the number of sites and modernizing its billing system. There is a significant improvement in its service coverage even though the company experienced great difficulties in terms of quality of service that compelled the Regulatory Board to take corrective measures by imposing financial penalties. For instance, in December 2008, RURA fined MTN-Rwandacell about USD 127,000 for providing poor quality of services since 2007(RURA, 2008). To solve this problem, MTN-Rwandacell has continued upgrading its networks and currently has deployed 150km of fibre optics in Kigali City and 108.5 km of fibre optics within the country.

In 2009, the licensing of TIGO Rwanda S.A as the third mobile operator marked the increase of mobile penetration to 24% of households (NISR, 2009). In 2010, TIGO-Rwanda was declared by the regulatory board as the second mobile operator, with 685,393 active mobile subscribers in the country. Rwandatel is the third mobile operator in the market with 535,710 active mobile subscribers. Table 1.1 below shows the operators in the Rwandan telecommunication market and the dates on which their licences were approved.

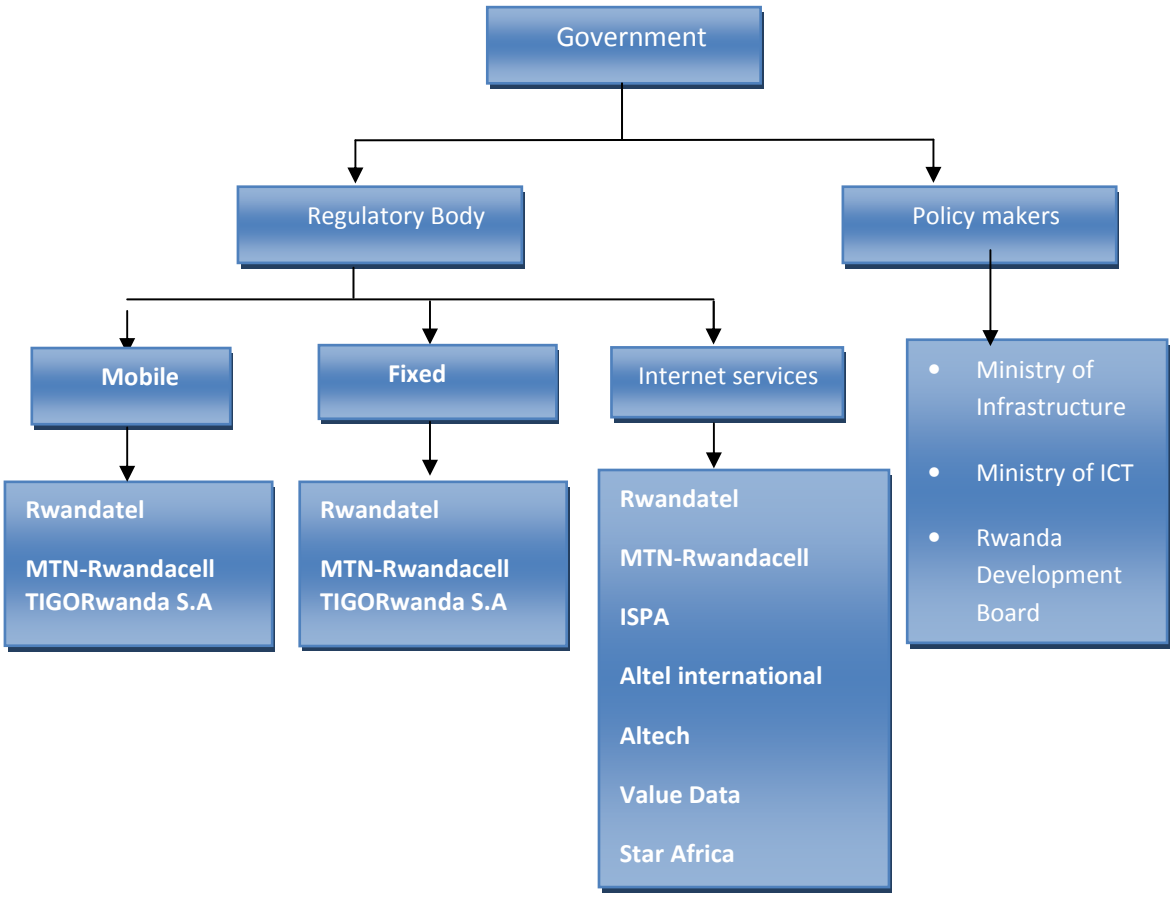
Table 1.1: Operators in the Rwanda telecommunication sector

Company	Type of services	License - year
1. MTN Rwandacell S.A.R.L	Fixed	2006
	Mobile	2008 (Renewal)
2. RWANDATEL S.A	Fixed	2008
	Mobile	2008
3. TIGO Rwanda S.A	National (Mobile and Fixed)	2008

Source: RURA, 2009

The above three licensed companies have the licence commitment to provide service without any form of discrimination throughout the country. With these licensed operators, Rwandan's lives have improved through access to voice and data. For over a decade, telecommunication sector has proven to be the core contributor of social-economic development in Rwanda. The diagram below shows the key players in the Rwandan telecommunication sector.

Figure 1.1: Key players in the Rwandan telecommunication sector



Source: Adapted from RURA, 2008

According to the Figure 1.1 above, the policy makers (Ministry of Infrastructure, Ministry of ICT and RDB) decide policy, then the government of Rwanda through the parliament makes ICT laws, following which the regulatory body (RURA) puts the policies and laws into operation. This separation of functions in Rwanda has facilitated the implementation of ICT policy with relative objectivity and impartiality. Through these policies and laws, the Rwandan telecommunication sector can be regarded as a driver of social and economic growth. The subsection below discusses the contribution of the telecommunication sector to the economic development of Rwanda.

1.3.4 TELECOMS SECTOR'S CONTRIBUTION TO ECONOMIC DEVELOPMENT IN RWANDA

For more than 15 years, the telecommunication sector has been hailed as the main the driver in promoting social and economic growth in Rwanda. This has been evidenced in its substantial contribution to the Rwandan GDP growth.

After the establishment of RURA, there was a tremendous increase in mobile penetration that led to a substantial increase in the annual GDP growth. An increase of mobile penetration from 2% in 2003 to 4% in 2006 contributed 0.24% on the Rwandan GDP growth (RRA, 2007). In 2004, the total contribution of MTN-Rwandacell and Rwandatel on GDP was 3%. Beyond 2004 the number of mobile subscribers increased substantially as a result of increase in the number of mobile operators in the country. This means the GDP also increased beyond 3%. Therefore the table 1.2 below illustrates the evolution of GDP in ten years.

Table 1. 2: GDP growth between 2003 and 2010

Period	GDP Real growth rate
2003	4.00%
2004	3.50%
2005	.90%
2006	5.20%
2008	6.00%
2009	11.20 %
2010	4.50%

Source : NISR, 2003-2010

According to the table 1.2 above, it is very evident that GDP growth rate in Rwanda has been not stable since 2003. It only increased substantially in 2009 by 5.2% but in 2010 it decreased by 6.7 % (NISR, 2010). The tremendous increase in GDP growth rate between 2008 and 2009 can be attributed to the entry of the third operator, TIGO-Rwanda because of its new affordable communication packages such as "TIGO vuga" [2] and "e-Go"[3] in the Rwandan telecommunication sector (RURA, 2010).

Despite this achievement, it is very clear that the GDP is still less compared to USD 900 GDP per capita as Rwanda's Vision 2020 (NICI, 2010). Against this background, it could be

[2] Tigo vuga is a promotion package that allows customers to talk for 100 min with only Rwf 100 within one day

[3] e-GO is an electronic system for selling airtime

argued that for the government of Rwanda to maintain an increase of 8% GDP growth rate per year (as the directives speculate) between 2011 to 2020 will have to invest substantially in new telecommunication infrastructures and put a great deal of effort in regulating telecommunication sector effectively so as to promote facility-based and service-based competition in the Rwandan telecommunication market.

1.3.5 POLICY AND REGULATORY LANDSCAPE IN RWANDA

In Rwanda, the development of the telecommunication industry has been given the first priority over other sectors. This was evidenced in November 1999 when the government of Rwanda approved a new policy reform of the Rwandan telecommunication sector that included establishment of key public institutions in the telecommunication sector such as the Rwanda information and technology authority (RITA), a government body set up to implement the country's national policy, and a multi-sector regulator, RURA. Rwanda also benefits from the membership of the Association of Regulators and Information and Communication for Eastern and Southern Africa (ARICEA) and from the COMESA's ICT policy that was developed to serve as a policy model for the harmonious development and application of ICT across member states (RURA, 2008). The Rwandan telecommunication sector being under the control of the Ministry of Transportation between 1994 and 2001 affected customers negatively. However, after the establishment of the utilities regulator, RURA, it was claimed that the quality of service and efficiency had improved in the Rwandan telecommunication market (RURA, 2004).

1.4 THE ROLE OF RURA IN THE RWANDAN TELECOMMUNICATION SECTOR

Rwanda Utilities Regulatory Agency (RURA) was established by the Law N 39/2001 date the 13th September 2001 and is tasked with the responsibility of regulating the following utilities: telecommunications (networks and services), energy, water and sanitation and transportation (RURA, 2004). With these responsibilities, the improvement of services condition, the protection and promotion of consumers of these regulated sectors have been the key activities of RURA (RURA, 2004). These activities are manifested in issuing and administrating of licences. This is evidenced in the number of standard and individual licenses that have been granted with specific reference to TIGO Rwanda S.A (the third Operator) and the renewal of licence of both MTN-Rwandacell and Rwandatel S.A. In 2008, the regulatory board issued 103 regulatory decisions relating to RURA's administrative

matters, regulatory guidelines and standards, issuance of licences where applicable, tariffs, enforcement by ways of sanctions and the administration of the universal access funds.

Furthermore, in 2008 RURA's performance in the collection of internally generated revenues (License, frequency, fines and regulatory fees) was at 86% representing a sum of Rfw 1.8bn. In order to improve its performance, RURA increased the number of employees from 37 to 105 employees in December 2008 (RURA, 2008) and the salary structure has been improved in order to attract more expertise in the field and to avoid the industry capture. Moreover, from 2008 RURA has sponsored more than 8 staff on master's programs and series of in-house training are conducted within Rwanda for a number of staff from RURA (RURA, 2008).

In order to achieve harmonization of both practices and internal policies of the regulatory agency with the best practices of the regional and international regulatory agency, the regulatory board has championed the cause of strengthening relations with the regional regulatory bodies and international organizations. RURA being a member of ARICEA has improved the regulatory environment in Rwanda. The main objective of RURA is to implement appropriate regulatory frameworks that comply with ARICEA regulatory framework. For instance, there have been frequent complaints among EAC operators and customers that Kenya and Rwanda interconnection rates are too high compared to Tanzania and Uganda. With the help of ARICEA regulatory framework RURA is revising the current interconnection rate regime in order to bring the rates to a fair and reasonable level that will enable the harmonization of interconnection rates in EAC member countries. Despite ARICEA's commitment to harmonize interconnection rates through RURA, Rwanda still charges too high mobile interconnection rates. This shows that there is need to carry out a study on the existing regulation interconnection regime in Rwanda and highlight the challenges it is facing to determine fair and reasonable interconnection rates that can enhance efficiency and effective competition. In general, RURA has been ranked among the best performing regulatory bodies in EAC and Central Africa. This was evidenced by African Telecoms people award 2008 that was received by RURA as the best regulator in 2008. However due to interconnection rate disputes aforementioned, the most challenging task for RURA has been promoting technology innovation in the telecommunication sector (Nsengiyumva & Habumuremyi, 2009).

1.4.1 PROMOTION OF TECHNOLOGY INNOVATION IN THE RWANDAN TELECOMS MARKET

In Rwanda, RURA also has been playing a significant role in providing regulatory and technical support to National Broadband Backbone Network Project (Fiber Optic Cables), the project that provide countrywide broadband connectivity to all Rwandan government departments and institutions for the provision of e-services(RURA, 2008). RURA offered an implementation plan of the project with its related regulatory requirements including matters of rights-of-way authorization for cable trenching and cables lying were issued (RURA, 2008).

In fixed-line market, Rwandatel, under the supervision of RURA, introduced wireless phones, known as easy call and it is now a backbone ISP with over 500 Km of fibres and has more than 300 points of presence in the country (Nsengiyumva & Habumuremyi, 2009). In 2008, Rwandatel S.A launched its new GSM and UMTS systems for providing 2.5G services, 3G services, NGN and MSAN for fixed networks services (RURA, 2008). MTN-Rwandacell is also a backbone ISP and the provider of Wi-Fi, WiMAX, wire line Internet, VoIP, IPTV and mobile Data (RURA,2008) and has deployed 150Km of fiber optics in Kigali City and 108.5 km of fiber optics within up country. Furthermore, MTN- Rwandacell has been ranked as the first to commercially deploy multimedia Telephony (MMTel) based on IMS in all of Africa (Nsengiyumva & Habumuremyi, 2009).

Despite commitment from RURA to promote technology innovation in the Rwandan telecoms market, fixed line penetration continues to decline and MTN-Rwandacell is still enjoying its monopoly position, with a relatively little increase in the overall penetration. This shows that there is much required to be done if RURA is to achieve the target of 5.2 million subscribers in 2012 (RURA, 2008). However, it has been argued that technology innovations and convergence raise policy and regulatory issues and has an impact on the interconnection regime (Bezzina, 2005). This shows that RURA is expected to take regulatory issues such as interconnection rates seriously and to implement effective interconnection regime that can enhance market efficiency in the Rwandan telecommunication sector.

1.5 INTERCONNECTION REGULATION IN RWANDA

Interconnection regulation is essentially aimed at encouraging and the promoting orderly development of telecommunications networks in Rwanda by ensuring and maintaining any-to-any connectivity and safeguard against any abuse of market power in the provisioning of telecommunication services (RURA, 2008). In line with the aforementioned**,** according to RURA (2004) the existing interconnection regime with respect to the law no 44/2002 of 30/11/2001 governing telecommunication in its article 39 stipulates that:

i) All public telecommunications operators should, if requested in writing by other public telecommunication operators, interconnect their network with those of other operators.

ii) Technical and commercial arrangements for interconnection must be concluded by written agreements between the relevant telecommunications operators.

iii) Interconnection cannot be refused if the request is reasonable with regard to applicant's requirements and public telecommunications operator's capacity to satisfy them. The reasons which give rise to a refusal must be explained in detail to the applicant in writing. If agreement cannot be reached between telecommunications operators, any operators may refer the matter to the Regulatory Board.

iv) If the Regulatory Board is unable to facilitate the conclusion of an agreement, the Board may in the interest of all users in the Republic, impose interconnection terms on both parties which are as far as possible objective and reasonable and do not discriminate between the operators.

v) The minister, by Ministerial decree, sets out the general conditions and pricing principles which interconnection agreement must satisfy.

vi) A copy of each interconnection agreement is submitted to the Regulatory Board as soon as the agreement has been signed by the public telecommunication operators. The regulatory body notifies such agreements to the public. Copies may be supplied upon payment of the fee determined by the Regulatory Board.

vii) Discrimination by public telecommunication operators in matters of interconnection is forbidden. Public telecommunications operators shall apply similar circumstances to organizations with which it is interconnected and which are providing similar services.

All the above basic principles for standard interconnection offer were incorporated into individual licence to prevent interconnection disputes among the competitive operators. In order to determine fair and reasonable interconnection rates, Rwanda adopted cost-based interconnection approach. As a result, dominant mobile and fixed operators were required by RURA to charge cost-based interconnection charges in the Rwandan telecommunication sector (RURA, 2004).

However, Nsengiyumva and Habumuremyi (2009) argue that efficiency and competition are still far from effective in the Rwandan telecommunication sector. They further argue that this interconnection policy has been in principle but not in practice. Magonyozi (2008) highlighted that lack of effective interconnection framework has led to interconnection rate disputes between dominant operators and new entrants in the Rwandan telecommunication market.

1.5.1 HISTORY OF INTERCONNECTION DISPUTES IN RWANDA

Interconnection pricing has been the most controversial issue in the Rwandan telecommunication sector. In 2004 there was a dispute between MTN-Rwandacell and Rwandatel over an interconnection rate (Rfw.48) that they had amicably agreed to be paying each other. This dispute was so intense that RURA had to intervene and impose an interim symmetric interconnection rate of Rfw.28 while the consultancy firm, Ingenieurs Conseil Et Economistes Associes (ICEA) was being commissioned to conduct a cost-based interconnection study (RURA, 2004). The purpose of the ICEA study was to support RURA in the calculation of the costs of interconnection for both fixed and mobile operators in Rwanda. In the course of solving this dispute, RURA had different alternatives of cost models such as COSITU, which is the model that was developed by ITU for developed and developing countries especially in calculating the costs, rates and taxes relating to telephony services. This model is based on the enhanced fully allocated costing (FAC) principle. Finally, the regulatory agency recommended using the bottom-up LRIC model (TELRIC) of the World Bank which is recommended by the economic theory. The study was completed in March 2006 and the two operators reached an agreement based on the interconnection rates that were determined by the ICEA.

However, due to the rapid change of technology the sustainability of the current interconnection rate has been an intense debate among the stakeholders. In 2009, for example, MTN-Rwandacell took Rwandatel to court due to its failure to pay the pending

interconnection charges worth $ 3.4 since 2005. Rwandatel, however, argued that the mobile interconnection charge (Frw.40) that was determined by ICEA in 2006 was not fair and reasonable (Butera, 2010). Besides, in June 2010, the new entrant, TIGO-Rwanda and Rwandatel operators have argued that due to technological evolution, such as termination from fixed network to VoIP, from mobile network to VoIP or versa, the current interconnection rate is too high to make their business grow (Butera, 2010).

After consideration of all the disputes and complaints from customers and stakeholders, in 2010 RURA commissioned a second study to revise the existing interconnection rate regime among mobile and fixed operators. The offer was given to PricewaterhouseCoopers, consultancy firm based in UK. PricewaterhouseCoopers will develop interconnection costing models, come up with reasonable and fair interconnection cap tariff and train RURA staff on how to use the model. This illustrates how the regulation of interconnection rates is a challenge to the regulator in Rwanda. It also draws attention to the question of what has been the effectiveness of the current interconnection regime RURA is using to determine interconnection rates.

1.6 IDENTIFICATION OF THE PROBLEM

The UK telecoms regulator, OFTEL, asserted that liberalization per se is not enough, because interconnection has power to determine the winners and the losers in a competitive environment (OFTEL, 1997). In light of this, Jamison (1998) said that competition and efficiency in the telecommunication sector hinge on interconnection pricing regulation. However, Armstrong (2002) highlights that the main regulatory issue has been to ensure that new entrants can access the incumbent's network at appropriate prices, terms and conditions.

In an attempt to ensure a fair and reasonable level of interconnection rate that can enhance effective competition and efficiency in the telecoms market, RURA adopted a cost-based access pricing principle. However, Magonyozi (2008) in his study on interconnection harmonization in EAC argued that efficiency and competition are still far away from effective in the Rwandan telecommunication sector. Salinger (1998:28) argue that "the use of LRIC is theoretically sound, but its implementation in practice is rather complex and could undermine the profitability of the incumbent's investment if poorly executed". In addition, a number of scholars (Armstrong, 2002; Wright et al., 2006; Jamison, 1998 and Jain 2003) argue that cost-based methodologies can only ensure an efficient level of interconnection rate

only if high degree of independence from the government and industries, detailed information from the incumbent, skills and enough policy instruments are at the regulator's disposal.

Since 1998 Rwanda through RURA has had a change of interconnection regime once, however, there is no research has ever been conducted to find out the whether the existing regulation of interconnection regime has ensured fair and reasonable interconnection rates that can enhance efficiency and effective competition. Against this, the present study aims to understand how the existing regulation of interconnection regime in Rwanda has achieved its intended objectives of market efficiency.

CHAPTER TWO: INTERCONNECTION REGULATION

2.1 INTRODUCTION

This chapter presents a review of studies and viewpoints from different researchers and experts in the field of interconnection regulation. It starts by giving a definition of interconnection drawn from different peer reviewed articles and takes into account arguments for and against these articles. With reference to Armstrong (2001) and OECD (2004) arguments on access pricing problem, it further discusses problems associated with interconnection in telecoms market, bearing in mind that most interconnection problems are associated with internalizing network externalities (Armstrong, 2001). This chapter in the second section will give a clear description of network externalities and discuss how their effect on telecom market depends on a type of pricing principle that has been adopted. For instance, literature (Di Pillo et al. 2009; Cave et al., 2003) has shown that attributes of Call Party Pays (CPP) regime, such as price discriminatory strategies has made interconnection a more controversial issue in the Telecoms market. In this regard, the third subsection, will share light on the essence of interconnection in Telecoms market and then discuss how unregulated negotiation may result into high interconnection charges and how these high interconnection charges can be a barrier to competition and finally lead to market failure. After showing this strong desirability of regulatory intervention, this chapter, in the fourth section, will further discuss the interconnection regulation in telecommunication sector. This section will specifically engage in debates and literature around how interconnection should be regulated, who should regulate it according to different viewpoints from different countries' experiences and the role of the regulatory body regulating interconnection. Finally, the chapter will make a conclusion.

2.2 WHAT IS INTERCONNECTION?

Interconnection, according to the World Trade organization is defined as

> linking with suppliers providing public telecommunications transport networks or services in order to allow the users of one supplier to communicate with users of another supplier and to access services provided by another supplier, where specific commitments are undertaken (Chung, 2006:10).

From a technical point of view, Vogelsang (2003:10) defines interconnection as "the linking of two networks to provide call origination, transit and termination for each other and

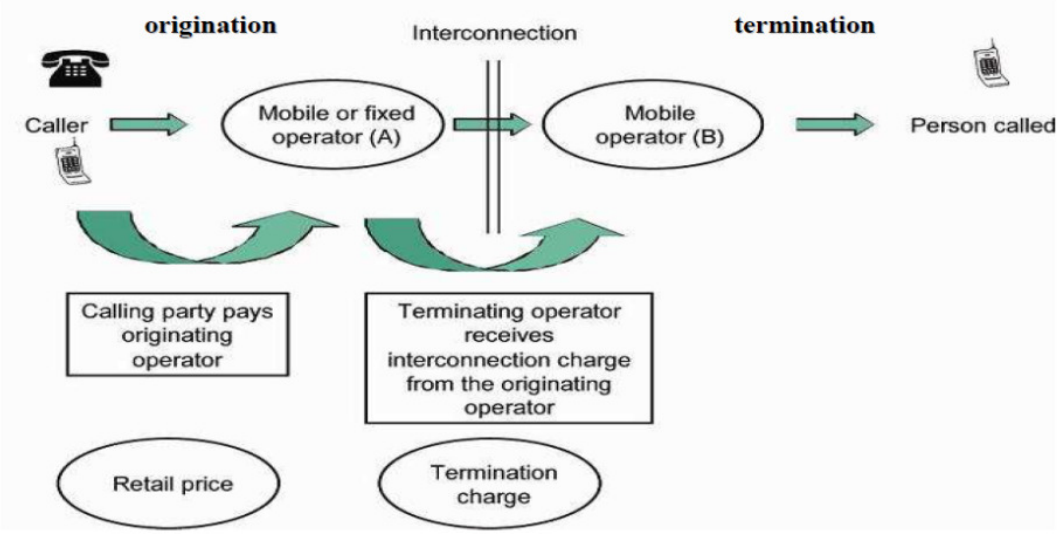
networks operate at the same level of network hierarchy". The FCC also aligns with Vogelsang's definition of interconnection by interpreting interconnection as "the physical linking of two networks for the mutual exchange of traffic" (Melody, 2007:10). However, RURA's interpretation of interconnection aligns with WTO's definition. RURA interprets interconnection as

> physical and logical linking of public communication networks used by the same or a different undertaking in order to allow the user of one undertaking to communicate with users of the same or another undertaking, or to access services provided by another undertaking (RURA, 2004:20).

Unlike RURA's interpretation and WTO's definition, FCC's interpretation and Vogelsang's definition undermine the logical linking of networks. Furthermore, WTO's definition seems to encapsulate some unique parameters that express the rationale behind interconnection and what is required for operators to interconnect than Vogelsang's do. Vogelsang's also entails parameters to draw a line between interconnection and access. For clarification, it literally means that when the network is operating at the same level of network hierarchy we refer to interconnection, otherwise we refer to access. However, neither WTO's nor Vogelsang's definition is clear about the scope of interconnection. In fact, Chung (2006) argued that interconnection disputes in the world are attributed to the incapacity of WTO's interconnection definition to specify domestic and international interconnection rules. However the good thing is that both definitions make it clear that successful interconnection must guarantee the interoperability of telecommunication network and services.

To understand interconnection and the problems related to it, it is worthwhile to first discuss one-way access and two-way access pricing models. Armstrong (2001) and OECD (2004) define one-way access problem as where entrants need to purchase important inputs from the incumbent but not vice versa. While as two-way access problem, which is an interconnection model problem, arises when each firm in the telecoms market must purchase inputs from other firms in the markets (Armstrong, 2001; OECD, 2004). The figure 1 below illustrates an interconnection model.

Figure 2. 1: Interconnection Model



Source: Cave, Bomsel and Neuman (2003)

When the call is made between two customers, two essential elements, call origination and call termination are involved. Call origination is the collecting of the calls from the start point where the user makes the call to the interconnection point between two networks. Whilst call termination service is the collecting of a call from a point of interconnection between two networks to the consumer who is called (ACCC, 2004). To complete the calls, the network owner (operator A) that originates the call generally purchases terminating access from the network owner (operator B) that terminates the calls. The called network sets the termination charges, which are collected from the call-originating customer by the network that originates the call (ACCC, 2004). Under one-way access model, operator A has to pay termination charges to operator B (monopoly in upstream market) but not vice versa, and yet has to compete with operator B in the downstream market(Armstrong,2001). Whilst under two-way access model where operator B and operator A have to purchase inputs from each other it may not be so much of a foreclosure as in one-way access model, but interconnection agreements between operators on terms and condition, especially access charges (Armstrong, 2001).

2.2.1 IMPORTANCE OF INTERCONNECTION

Interconnection is the heart of competition and investment in the telecommunication industry (Falch, 2004). OFTEL (1997) and Melody (1997) argue that liberalization per se is not enough, because interconnection is a cornerstone of the competition. Practically, according to Cave et al. (2003), interconnection rate is been proved to be the company's second largest revenue stream after air time and access. This has been evident in South Africa, in 2008, MTN generated R6.9bn and Vodacom received R7.9bn (18% of its revenue) in interconnection fees (BalanceAct, 2010). ITU (2004) also highlights that interconnection charges of a new entrant typically represent between 40-50% of total operating costs in its first few years of operation. In South Africa, for example, in 2008, Telkom (Fixed incumbent) paid other mobile operators R6.9bn (21% of its revenue) in interconnection fees during its last financial year (BalanceAct, 2010). Of that, R.3bn was paid to Vodacom and the rest was split between MTN and Cell C. In this regard, it appears that inasmuch as interconnection rate are crucial for incumbents to upgrade their networks, the regulator should also know that it is also crucial for new entrants to get a foothold in the market and to compete with the incumbents.

However, Armstrong (2001) highlights that the main controversial issue is to grant operator A (new entrant) access to operator B's network on a fair and reasonable access charges. To explain this issue, in one-way and two-way access models, the OECD(2004) explains that under one-way access model, the problem arises when operator A cannot reasonably duplicate the bottleneck facilities and if the operator B (owner of essential facility) is not willing to let operator A use it at reasonable terms. OECD (2004) and Armstrong (2001) explain that under two-way access model where operator B and operator A have to purchase inputs from each other it may not be so much of a foreclosure as in one-way access model, but interconnection agreements between operators on terms and condition, especially access charges. However, Armstrong (2001) argues that in an intensive competitive market, operator B is likely to use termination charges as an instrument to exclude operator A in the market.

Armstrong (2001) and the OECD (2004) attributed access pricing problems to the internalization of network externalities by Caller Party Pays (CPP) system which gives the operator B (owner of essential facilities) incentives to charge exorbitant access charges in order to exclude operator A in the market. Therefore the next section discusses network externalities.

2.3 NETWORK AND CALL EXTERNALITIES

There are two categories of network externalities; fixed externalities and mobile externalities. Fixed-line network externality is an externality obtained by the fixed-line user to reach and call a mobile-line subscriber, while mobile externality includes mobile extra utility from extra mobile subscription (York & Albon, 2006). In microeconomics, network externalities are defined as follows: the more the number of subscribers the more valuable subscription becomes (Cave et al., 2003). The rationale behind this is that new subscribers decide to join the network because there is a large number of subscribers from whom they can make calls and from whom they can receive a call. Practically this has been proven to be true not only in one network but also in all networks that are interconnected to each other such that customers of one network to be able to communicate with customers of the other network. This utility is one of the reasons why interconnection is mandatory in telecommunication networks. According to Cave et al. (2003) this is specifically to maximize the value of communication opportunities for greater community of users. Therefore not being concerned about these externalities would imply reaching a socially sub-optimal network size (York & Albon, 2006). In short, there is a welfare loss not internalizing the network externalities (Cave et al., 2003).

This effect is termed as externalities based on the fact that they hardly enter into a decision of a user when on the verge to becoming a subscriber to a particular network, unless the pricing regime is adopted to take into account these interdependencies (Cave et al., 2003). However, there are other important externalities in telecommunication networks related to calls, which seem to be neglected but having a high degree of relevancy in interconnection. Normally in a telecoms network the benefit must be shared between the caller party and the receiver party. However, based on the pricing regime that has been adopted this may not be so. According to Lazauskaite (2009), CPP is defined as the regime where the subscriber initiating a call pays the entire cost of a call. This literally means that subscribers on a large network will make more on-net calls but subscribers on a small network make more off-net calls. As a result, Di Pillo, Cricelli, Gastaldi and Levialdi (2009) argue that CPP could produce incentives for larger operators to lower the prices on-net calls and increase the charges of off-net calls in order to drive the small network operator out of the market. In this case, subscribers on a small network will receive less call than they desire. This could be the reason for the subscribers on a small network to shift to a larger network. This call imbalances and price

discrimination strategy under CPP have made the issue of high interconnection charges more complex in telecommunication sector (Di Pillo et al., 2009).

However, Di Pillo et al. (2009) argued that Receiving Party Pays (RPP) regime could address the deficiencies of CPP regime. According to Lazauskaite (2009), RPP is regime where subscribers receiving a call pay all or most of the cost of calls. Under RPP, fixed-to-mobile calls are charged at normal fixed network tariffs and the called mobile party makes payment, which is closely related to the mobile termination rate to the mobile operators (Cave et al., 2003). Therefore, Cave et al. (2003) highlight that the issue of call externalities may be solved by RPP. As a result, some countries such as Northern America, Japan and India have adopted RPP in order to address the issues of dominance, such as call externalities.

Nevertheless, Cave et al. (2003) and Di Pillo et al. (2009) concur with each other that RPP has been less attractive than CPP in many countries. This could be attributed to the fact that some subscribers may switch off their phones to avoid paying for unwanted calls or would decide not to receive calls. This behaviour could lead to a socially sub-optimal level of using services and slow-down of volume in the market (Cave et al., 2003). Consequently, many countries such as UK, Australia, Uganda, South Africa and New Zealand using CPP regime and the issue of high interconnection charges has been addressed by regulation in the telecommunication industry. Laffont et al. (1998) argue that access charges resulted from free negotiation can be a bottleneck to competition. Therefore prior discussing regulation of interconnection in telecommunication sector, it is worthwhile in the next subsection to first discuss high interconnection charges and its impact on the telecommunication market.

2.3.1 HIGH INTERCONNECTION CHARGES AND ITS IMPACT ON THE TELECOMS MARKET

In the course of interconnection negotiations, the incumbent usually has stronger bargaining power than the new entrant. As a result, the incumbent always has incentives to set access charges above monopoly level (Wright, 2000). Armstrong (2001) discussed that the main objectives and instruments of an incumbent is to ensure productivity efficiency, to maximize total industry profit and to extract industry profits for itself. In this regard, he strongly argues that without control the incumbent will always set access prices high. This will have a negative impact on the telecoms market. According to Cave and Vogelsang (2003:48) high prices are defined as “prices above the cost production as determined”.

A wide range of literature (Laffont, Ley & Tirole, 1998; Falch, 2004) argue that high access charges which result from negotiations between competitive operators can be a barrier to effective competition. Laffont et al. (1998) argue that high interconnection charges prevent effective competition in a mature market and erect barriers to entry in transition towards competition. Armstrong (2001) highlights that too high access charges can be an instrument for the incumbent to drive the new entrant out of the market. Furthermore, Falch (2004) also argues that too high access charges discourage competition in the telecommunication market. In the light of this argument, Cave and Vogelsang (2003:54) in their study on the relationship between access prices and investment found that "there is no evidence to support that high interconnection price is a means to encourage infrastructure competition". Instead, they conclude that low access prices encourage entry and enables entrant to compete with the incumbent. This means that interconnection prices should be brought down at a reasonable level in order to enhance competition and efficiency in the market. To achieve this, Intven and Tetrault (2000) explain that there was a need to transition from government–based supply to market-based supply. They further explain that government-based supply regime was characterized by lack of efficiency and market entry barrier such as high interconnection rates set by state-owned operators. To address such competition issues associated with CPP regime, countries such as South Africa, Uganda, UK and Rwanda had to embrace this transition to market based supply. In other words, they adopted regulatory intervention approaches. These include sector specific regulation and competition authority approaches.

2.4 THE RATIONALE OF REGULATION

The term regulation in an industry can belong to one of distinct categories: technical regulation[4]; economic regulation[5] and access regulation[6]. In the Rwandan telecommunication sector, physical and logical interconnection regulation issues are addressed under economic regulation (RURA, 2004). Regulation is used in network industries such as telecommunication industry with unique characteristics such as the presence of elements of natural monopoly, external effects, universal service obligations and asymmetric information.

[4] Technical regulation entails the determination of standards and may extend to issues of safety, environment and privacy (Debbah, 2011).

[5] Economic regulation extends to pricing issues those concerning standard marketing practices (Debbah, 2011).

[6] Access regulation entails issues of ensuring non-discriminatory access necessary, such as infrastructure (Debbah, 2011).

The main purpose of regulation is to let the concerned market operate in an efficient way (Cave and Crowther, 2004). In addition, Intven and Tetrault (2000) highlight that the main objectives of the regulator is to remove barriers to market entry and oversee interconnection of new entrants with incumbent operators. Cave and Crowther (2004) put it clear that the rationale behind regulation is protection against the economic harm associated with the one-sided exercise of market power. To achieve this, Intven and Tetrault (2000) explain that regulation relies on the ex-ante descriptive market conducts, for instance price control (Intven & Tetrault, 2000). Cave and Crowther (2004) highlight that sector specific regulators are considered to be suited to carry out economic regulation. In Australia, for example, traditional specific regulations have been quite successful in delivering both competitive interconnection rates and a smooth implementation of equal access (Spiller & Cardilli, 2007). According to Buigues (2006) this could be attributed to less uncertainty faced by operators associated with ex ante intervention policy. This enables operators to invest in the network infrastructure.

Despite these arguments for regulation, Intven and Tetrault (2000) highlight that some forms of telecommunication regulation have been viewed more damaging than beneficial to the development of national telecommunications infrastructures and services. To underpin this, Buigues (2006) highlighted that in the sectors of rapid change in technology like telecommunication markets, traditional ex ante regulation can create major market distortion and additional costs. Furthermore, Cave and Crowther (2004) highlight that sector specific approach requires large flow of information from the regulated entity. This creates the premise to question whether regulation or competition policy is the appropriate approach to address interconnection issues in the telecommunication sector. Debbah(2011) states that unlike technical regulation, competition authority can also handle economic regulation.

According to Spiller and Cadilli (2007), competition policy operates ex-post and it is a harm-based approach. They further explain that it relies on the ex-post descriptive of the market structure. According to Cave and Crowther (2004) ex-post regulation deals with conducts that reduces competition and raises prices in the telecommunication market. Buigues (2006:23) argues that" in principle, it is easier to ex-post judge if a price is unfair than to set ex ante a fair price". Unlike regulation, Cave and Crowther (2004) highlights that competition policy requires no information operators but just relies on the complaints and gathers information only in connection with enforcement agencies. However, Buigues (2006:23) highlights that

ex-post aspects of competition policy may create uncertainties for new entrants. Furthermore, Spiller and Cardilli (2007) argued that solving interconnection rate issues using competition policy does not seem to work well in many countries. New Zealand, for example, a "light-handed regulation" regime was characterized by lengthy disputes and uncertainty over the acceptable prices (Jamison, 1998:17). In the light of the complementarities and differences between regulation and competition policy, Cave and Crowther (2004) and Buigues (2006), in their school of thoughts, proposed that new regulatory framework of telecom market based on competition analysis principle could be the appropriate ex ante regulation for any other network industries which still needs regulatory intervention. Buigues (2006) strongly argues that competition rules and regulations are not substitutes but complements. In line with this, ITU (2004) highlighted that many countries have adopted ex-post regulation to supplement ex-ante regulations and vice versa. As the result, a wealth of countries have adopted different models of concurrent jurisdiction. These models includes: Firstly, sector specific regulator and competition authority having jurisdiction over the economy-wide competition matters (Geradin & O'Donoghue, 2005). Countries such as United States, South Africa and Chile have opted for this model. Secondly, most of developing countries have no competition authority but a sector specific regulator with sector specific competition mandate. These include Rwanda, Kenya and Dominican republic to mention a few. Lastly there is a least common model that was adopted in New Zealand, where the sector specific regulator is a part of economy-wide competition authority. Based on the fact that this study is about the regulation of interconnection in Rwanda, sector specific regulator with sector specific competition mandate model is relevant in this study than any other model. Therefore the next subsection discusses interconnection regulation in the telecommunication markets.

2.4 INTERCONNECTION REGULATION IN TELECOMS SECTOR

The main objective of interconnection regulation is to ensure that new entrants can access the incumbent's network at appropriate prices, terms and conditions. However, the OECD (2004) highlighted that in network industries one of the most important issue is the pricing for interconnection among the competitors. As a result, according to Peitz (2003) there have been debates on i) whether access prices should be set independently by operators, ii) whether access prices should be negotiated among operators iii) whether access prices should be imposed by the public institutional body. It has been argued that the independent setting of

access prices lead to disputes (Wright & Carter, 2006). This has made it undesirable in many jurisdictions. Consequently, negotiation among the operators seemed to be the next option, however, Peitz (2003) argued that it does not include a clause that specifies what happens when negotiations fail. To address this challenge, many countries have adopted a combination of policies and interconnection regulation regimes. This is to say, negotiations are done between the operators and in case of negotiations breakup, the institutional body intervenes and sets the access prices that are balanced in order to enhance social welfare in the sector. However, there has been an intense debate in all countries on whether this institutional body should be the competition commission or the regulatory body. Although there is spectrum of concurrent models that have been adopted by different countries to address interconnection issues as shown in the previous section, based on the context of the study, the role of sector specific regulator with the sector specific competition mandate to regulate interconnection will be discussed in the next subsection.

2.4.2 THE ROLE OF A REGULATOR IN INTERCONNECTION REGULATION

Further to the discussion above, the main role of interconnection regulation is to ensure that new entrants are able to get access to incumbent's network at appropriate prices, terms and conditions. In principle, in order for interconnection to take place, incumbents and entrants have to negotiate on access terms and conditions. However, since the incumbent has a higher bargaining power than the new entrant, Wright (2000) argues that the incumbent always has the incentives to charge access prices that are above monopoly prices. Laffont et al. (1998) also highlighted that prices resulted from unregulated interconnection negotiation may lead to barrier of entry.

From the above discussions, it is very apparent that the main role of a regulator in interconnection regulations is to promote a successful conclusion of interconnection negotiation between operators in the interconnection sector. However, there is a growing consensus in many countries that advanced regulatory guidelines or specific interconnection rules may be necessary to establish a proper environment to facilitate interconnection. The ITU (2004) highlighted that interconnection negotiations conducted in a regulatory environment without guidelines in place, may lead to regulatory uncertainty and discourages investment. Therefore, Spiller and Cardilli (2007) discussed three regulatory guidelines that should be established by the regulator prior interconnection negotiations process in the telecoms sector.

Firstly, the regulator should establish interconnection guidelines in advance of negotiations. Interconnection guidelines assist all key players, policy makers, the regulatory authorities, the operators and all end users. In addition to the essence of interconnection guidelines, Spiller and Cardilli (2007) said that lack of clear and comprehensive interconnection guidelines leads to delays and deadlocks to solve interconnection disputes in the telecommunication market.

For example, Jamison (1998), said that in New Zealand the interconnection dispute between Communication and Telecom took 5 years to be resolved and costed parties millions of dollars in legal fees, experts advice and management time. However, Peitz (2003) and Jamison (2003) concur with each other that this is attributed to information asymmetry. To support the argument, Peitz (2003) says that in countries where the is no information available, interconnection guidelines tend to be fairly general and Jamison (2003) highlights that regulatory rules also tend to turn out impropriate in the light of actual costs and market conditions.

Secondly, the regulator should publish default interconnection arrangements together with the guidelines in advance of negotiations (Intven & Tétraut, 2000). According to Jamison (2003) this policy can lessen the degree of information asymmetry during interconnection negotiations. Intven and Tétraut (2000) further explain that when the negotiations fail then the default interconnection arrangement will apply. However there is still a concern on the suitability of these default arrangements.

Lastly, Jamison (2003) highlights that the regulator should set deadlines at the beginning of negotiations for the completion of various steps. For instance, the owner of essential facilities or incumbent may be demanded to produce a proposed interconnection agreement in 20 days. Failure to meet the deadlines may lead to regulatory intervention to impose an agreement and independent mediations or arbitration (Intven & Tétrault, 2000). Another alternative could be the consideration of the final arbitration. In this case the arbitrator, which is the regulator, will be constrained to choose one of the parties' offers as a settlement. Spiller and Cardilli (2007:25) believe that this dispute resolution mechanism "serves as the bridge between courts and regulators". As a result many countries, for instance, Chile and Guatemala embraced dispute resolution mechanism with hopes to solve interconnection disputes.

Despite the importance of the three principles to enforce interconnection agreements, Noumba et al. (2004) argue that for interconnection negotiations will be successful and effective only if the regulator is staffed and equipped with regulatory tools. They discuss that these regulatory tools must make it possible to:

a) Effectively enforce the accounting separation principles or unbundling of regulated activities from the competitive ones.

b) Ensure that interconnection rates are non-discriminatory

c) Publish a detailed reference interconnection offer, including description of relevant offers broken down into network elements as demanded by the corresponding modalities, conditions and prices.

d) Ratify interconnection reference offer submitted by dominant operations according detailed procedures

e) Ratify interconnection reference offer submitted by dominant operators according to detailed procedures

f) Ratify the terms and conditions to negotiated interconnection agreement

g) Effectively arbitrage the interconnection disputes.

In spite of the regulator's commitment to ensure that entrants are able to access the incumbent's network on fair terms and conditions in order to promote competition, Jain (2003) highlighted that in most countries incumbents have continued to maintain their dominant positions. In so doing incumbents still charge high interconnection charges to their competitors in some jurisdictions. As a result, Peitz (2003) argues that interconnection prices have been the most controversial issue in interconnection regulation.

2.5 CONCLUSION

Through interconnection regulation, new entrants in many countries have been able to access incumbent's network at appropriate prices, terms and condition. With the intervention of regulatory body, interconnection guidelines have been set before hand to promote successful interconnection negotiations between telecoms operators. However, in countries where CPP pricing regime has been adopted, incumbents still use their monopoly position to charge high interconnection charges in order to exclude new entrants in the market. This shows that interconnection pricing regulation is a serious regulatory issue in the telecommunication

sector. Therefore in the next chapter, this study will discuss interconnection price regulation in the telecommunication sector.

CHAPTER THREE: INTERCONNECTION PRICE REGULATION

3.1 INTRODUCTION

This chapter presents views of researchers, regulatory agencies and policy makers on how efficiency and competition can be achieved through interconnection price regulation. It starts by giving a clear description of price regulation and discusses why interconnection pricing regulation is important in the telecommunication sector. Secondly, it discusses how through conducting an interconnection market review the regulatory agency can identify ex-ante and ex-post pro-competitive regulation remedies that can maintain the balance between the incentives to build the new infrastructure and access to the existing ones. In fact, de Streel (2005) and Peitz (2003) underscore that many countries that adopted pro-competitive regulations could not ensure an efficient level of interconnection rates. Therefore this chapter discusses how determining an appropriate interconnection rate has been a challenge to the regulators and policymakers and what approach many countries have adopted to address this challenge. A range of literature (Chiang, Raton and Lal Hada, 2007; Intven and Tétrault, 2000) argued that the approach to be adopted should bring interconnection rates closer to the real cost of network construction and operation. As a result, the third section discusses the rate rebalancing approaches (cost-based methodology and benchmarking interconnection approach) the regulatory agency can choose from to calculate an appropriate interconnection rate. It also considers the arguments for and against cost-based methodology. It further discusses in details the effectiveness of the cost-based approaches (LRIC, TERLIC, LRAIC and FAC) in calculating an optimal interconnection rate that can enhance productive, allocative and dynamic efficiency, drawing from the argument of Laffont et al. (1998) focusing on the pricing principle only may not lead to achievement of efficiency objectives. The fourth section discusses other ways of implementing interconnection rate and the fifth discusses other enforcements for an effective interconnection regime. Lastly, this chapter will draw a conclusion.

3.2 INTERCONNECTION PRICE REGULATION

Interconnection price regulation, according to Melody (1997) is defined as an instrument that ensures any-to-any connectivity and safeguards against any abuse of market power in the provisioning of telecommunication services. In addition, Jamison (1998) said that

competition and innovation in the telecommunication sector hinge on interconnection pricing regulation. Therefore, in this view, interconnection price regulation despite its newness in the regulatory arena, is perceived as a panacea for unceasingly interconnection disputes that seem to have become a barrier to the promotion of infrastructure-based competition and service-based competition. In underpinning this point, OFTEL (1997) asserted that promoting competition will lead to greater choices of customers of suppliers, services, prices and quality.

Therefore, regulatory agencies and competition agencies are put on the pressure to create effective competition and efficiency through interconnection pricing regulation. Firstly, interconnection negotiation and regulatory intervention has been preferred as the means for competitors to reach mutual interconnection agreements on prices, terms and condition. Cave and Prosperetti (2001) strongly argued that interconnection negotiations always fail in the absence of pro-competitive regulations that articulate the specific terms and condition of major supplier's obligation to its competitors to allow them to enter into the market. In addition to this, they pointed out that regulators should adopt or design policies that promote investment in the infrastructure and lower the entry cost for the service provider.

In order to embrace the above-mentioned objective, many countries have established obligations such as transparency, non-discrimination, accounting separation, compulsory access and price control. However, de STREEL (2005) argued that none of these safeguards offered certainty of anti-competitive behaviours in the market. In addition, Cave & Prosperetti (2001) highlighted that most of the pro-competitive regulation adopted did not restore the balance between incentives to build new infrastructure and access to the existing ones. Cave and Crowther (2004) asserted that this balance is important because excessive or unpredictable intervention can discourage stakeholders from engaging in competition that helps them to attain competition policy objectives.

In the light of the fact that ex-ante interventions enhance market efficiency and ex-post interventions protect the customers, balancing the two interventions in the market may lead to the achievement of the balance between efficiency and competition. Therefore, many interconnection directives recommend the regulatory agency to conduct study on the relevant market in order to identify where to impose ex-ante pro-competitive remedies and impose ex-post pro-competitive remedies.

3.2.1 INTERCONNECTION MARKET REVIEW

An interconnection market review is crucial for the regulatory body to identify appropriate pro-competitive measures to prevent against abuse of market power (Peitz, 2003). It appears from literature such as Armstrong (2001) and Jamison (1998) that though efficiency and competition hinges on interconnection pricing, interconnection pricing has been ranked as the most controversial regulatory issues in many jurisdictions. Therefore as per ITU and EU directives many countries such as South Africa, UK and USA have conducted a review on interconnection wholesale market. This policy has been also incorporated in their local telecommunication framework. For instance, in South Africa, section 67(4) of the ECA suggests that the authority must "Define and identify the retail or wholesale market or market segments in which it intends to impose pro-competitive measures in cases where such markets are found to have ineffective competition".

In Chapter Two it has been discussed that interconnection rate disputes seem to result from existence of network externalities that put the owner of essential facilities on advantage to use its dominant position to deter competition in the market. Therefore in studying wholesale and retail market the regulatory agency or consultants first and foremost determines the market dominance position. There are four steps to determine the market dominance position in a particular market. These steps include 1. Define the relevant market, 2. Assess the market shares, 3. Determine which operators have SMP, 4. Determine competitive remedies. To explain these steps, de Streel (2005) states the market to be regulated should be defined in which the agency intends to impose pro-competitive measures. This can outline the ex-ante or ex-post methodologies that are used to determine the effectiveness of competition in such markets. Secondly, the regulatory agency analyses the market to determine the licensees that enjoys SMP in that particular market. Lastly, the regulator sets out the pro-competitive measures that the authority may impose to address the market failure in the relevant markets. These obligations are to be chosen from a menu provided in the directives (transparency, non-discrimination, accounting separation, compulsory access and price control) or any other type of remedy with the prior agreement of the commission on SMP operators(de Streel, 2005). Furthermore, Cave and Prosperetti (2001) discussed that remedies should be chosen according to four principles: the remedy should be based on the nature of the problem,

justified with regard to one of the two objectives of the existing regulatory framework, proportionate (i.e. the least burdensome), and incentive compatible.

Nonetheless, Melody (1997) argues that of all studies or reviews that have been recommended to the regulatory agencies, only some of them have turned out to be ineffective. Besides, Noumba et al. (2009) found out that a few regulators are equipped to effectively implement the above pro-competitive regulations. They further explained that most of regulators do not have relevant cost information that would allow for effective arbitration of interconnection disputes. Consequently ensuring reasonableness of interconnection prices is still complex issue to the regulatory agency.

3.2.2 DETERMINING AN APPROPRIATE LEVEL OF INTERCONNECTION RATES

Although it is argued by Cave and Volsgang (2003) that bringing too high interconnection rate as lower as possible will encourage entry and enable the new entrant to compete with the incumbent, a range of scholars (Spiller & Cardilli, 1997 and Falch, 2004), nevertheless, argued that too low interconnection charge also discourages investment and delays facility-based competition in the telecommunication market. Therefore the challenge to a regulatory agency is determining a level of interconnection rate that is not too high and not too low.

A wide range of literature (Chiang, Raton and Lal Hada ,2007; Intven and Tétrault,2000) argued that interconnection price regulation ensures appropriate interconnection charge level that can enhance competition and efficiency if policy instruments that bring interconnection rates closer to the real cost of network construction and operation are adopted. Consequently, many regulatory agencies in different countries to maintain this "delicate balance" (Falch 2004:54), adopted rate rebalancing approaches. According to Chiang, Raton and Lal Hada (2007: 1) rate rebalancing approach is described as "the adjustment of retail prices among services such that prices reflect their actual costs while allowing a fair and market return on investment". The OECD countries' study shows that adoption of rate-balancing approach provided lower interconnection prices in the countries that were surveyed (Intven & Tétrault, 2000).They further said that rate rebalancing increased social welfare by moving prices closer to cost.

Albeit, it is arguably perceived that reduction of interconnection rates is an off-trend for the regulatory agency to enhance competition and efficiency. However, in the mobile market, a great deal of literature (Genako and Vallette, 2009; Frontier economics, 2009) seem to partly

disagree with this perception. Frontier economics (2008) argues that lower mobile termination rate does not imply lower retail prices. Furthermore, Geneko and Vallette (2009) argue that because of "water bed" effect 10% reduction of mobile termination rate leads to an increase of 10% in mobile out going prices on average. According to their findings in 24 European countries, this effect has been proved to be strong in mobile telecommunication market.

Therefore, in the light of the above arguments, it is apparent that inasmuch as the regulatory agency puts much effort in adopting rate rebalancing approaches in order to determine an efficient level of interconnection rate that can enhance effective competition and efficiency in the market, more attention should also be put on the degree of "waterbed" effect in the mobile market. Therefore, the next subsection of this chapter will discuss the rate rebalancing approaches such as cost-based methodologies, benchmarking approach, Efficient Components Price Rule (ECPR) that can be adopted by the regulators to calculate efficient interconnection rate in the telecommunication market.

3.3 TECHNIQUES TO CALCULATING INTERCONNECTION RATES

3.3.1 COST-BASED INTERCONNECTION METHODOLOGY

According to Cave and Prosperetti (2001) for a regulatory agency to adopt or impose pro-competitive remedy, it should focus on remedies that are less burdensome, enhancing efficiency (dynamic, allocative and productive efficiency) and incentive compatible. Based on the impact of information asymmetry in many jurisdictions on regulatory principles, Jamison (1998) asserted that regulatory agency should adopt rebalancing model that will not turn out to be impropriate in the light of actual costs and market conditions.

As a result, in a liberalized market, Noumba et al. (2009) and Peitz (2003) asserted that cost-based access principle will establish a level playing field for a favourable environment that encourages greater participation by the private sector. In the light of the fact that some safeguards could not offer certainty against anti-competitive behaviours due to insufficient information from incumbent's cost, Peitz (2003) and Jamison(1998) seem to argue for cost-based access rule because it impedes excessive profits by the incumbent. Peitz (2003) explains that when the incumbent is subject to this rule, it implies that it will not make any profit from the incoming traffic. Furthermore, Jamison (1998:20) explained that under cost-based access principle, regulations lean towards the incumbent in such way that it allows it to

charge a "reasonable" access mark up. In this regard, Peitz (2003) argues that for regulators to obtain efficient per-minute prices under two-part tariffs would need to set cost-based access prices. Noumba, Gille, Simon and Rudelle (2004) strongly argue that for this objective to be embraced, the regulator must build and enhance its knowledge with respect to the industry cost frontiers and cost drivers. This can be done by determining the cost incurred to produce a specific product or service. Melody (1997) argues that without detailed cost analysis there can be no cost-based pricing. Therefore the next section will discuss some concepts in cost analysis process.

3.3.1.1 CONCEPTS IN COST ANALYSIS

According to Melody (1997) cost analysis is directed towards understanding the more detailed cost relationships in a firm's operation. He further explains that cost analysis attempts to identify cost characteristics which will facilitate pricing, investment and other resource allocation decisions by the firm.

A. DIRECT AND INDIRECT COST

Costs are often classified between direct and indirect costs, especially in estimating the costs of particular services or activities. Direct costs are expenses that are incurred when producing a specific service or a series of services or products (Noumba et al., 2004). Indirect costs are those that have a causal relation to an activity or service, but the relation is indirect and must be studied to examine what the specific relationship is (Melody, 1997). Noumba et al. (2004) highlight that under direct attributable costs it is imperative to classify fixed and variable costs.

B. FIXED AND VARIABLE COSTS

Melody (1997) explains that one of the first distinctions that should be made under cost analysis is the division of a firm's total costs between fixed and variable costs. Fixed cost represents the proportion of the firm's expenses that does not depend on, or vary with the activities of the firm (Noumba et al., 2004). These include capacity costs and other preinvestment expenses. Variable costs are those that are directly related to the production of services on the network (Noumba et al., 2004). These include raw material cost and labor costs.

C. JOINT AND COMMON COSTS

Joint costs are generated by a family of services or products (for example, buildings costs for a telephone firm. From an economic viewpoint, joint costs are costs incurred in fixed proportions every time a service or a product belonging to the same family is produced by the firm, for example, a telephone company incurs joint costs whenever it conveys a local, interurban, or international call (Noumba et al., 2004).

Common costs are those costs shared by all the services or products of the company (for example, the fixed costs of acquiring licenses). Common costs include the remainder of the costs that are not directly attributable or joint, and which are incurred by the firm (Noumba et al., 2004).

Despite this cost awareness, Wright, Guthrie, and Small (2006) strongly highlight that under cost-based access prices regime, incumbents have a tendency to delay the investment in order to recoup their sunk cost in building its network infrastructure. In so doing the incumbent overlooks the extra costs the new entrants and consumers are incurring in the mean time, while waiting for the regulatory intervention. From this point it is apparent that the main challenge to the regulatory agency is encouraging the incumbent to invest earlier.

In the discussion to address this challenge, Wright el al.(2006) explained that high access prices would provide such an incentive by raising the profitability of the project and raising the opportunity cost of delaying investment, nevertheless according to Cave and Volsgang (2003) high access prices reduce the flow of surplus to consumers through high retail prices once the investment has been made. In this regard, Wright el al.(2006) suggest that the preferred access pricing scheme should match the marginal cost of bringing investment further forward in time and the marginal benefits. Wright el al.(2006) in conjunction with Cave and Volsgang (2003) highlighted that the above objective can be achieved by using backward or forward-looking access pricing approach.

3.3.1.2 Forward-looking and Backward Looking approach

According to Geradin and Kerf (2003), under the backward-looking approach the interconnection price encompasses the costs which are specifically attributable to provision of interconnection services plus a share of common costs which cannot be attributed to any specific service. The main advantage of this methodology is that it encourages competition in the downstream market, enables the incumbent to recover its investment since it does reflect

accurately the cost incurred and finally it facilitates negotiation between access seekers and providers. However, it has got drawbacks. Geradin and Kerf (2003) highlight that under backward-looking methodology incumbents have incentives to practice anti-competitive behaviours such as non-price exclusionary practice. Secondly, there is no guarantee that the incumbent will recoup its investments since historical cost accounting may present a distorted picture of the costs actually incurred by the services providers (Guardian & Kerf, 2003).

Forward-looking prices are set at each point in time based on the current cost of building the project (Wright et al., 2006). As the result, several methods of pricing are based on the forward-looking long run incremental cost, which will be discussed with its variations in the next subsection. According to Geradin and Kerf (2003) the under forward-looking approach the incumbent has the incentives to be efficient and reduce the actual costs that it incurs in providing interconnection since the compensation of the incumbent are based on the costs of an efficient firm. Contrary to backward-looking approach, under the forward-looking access price regime the incumbent has no incentives to shift costs from competitive markets to a regulated segment of the market since the interconnection price is based on the actual costs it incurs(Geradin & Kerf,2003).

However, the forward-looking approach also enforces an incumbent to take additional risk due to uncertainties in technology innovations (Wright et al., 2006). Therefore, regulators are required to compensate for this additional risk by increasing the access prices under forward-looking approach. In this regard, it is apparent that forward-looking approach requires a higher initial access price if it is to encourage the same investment performance as backward-looking rule. In this regime, the lower investment cost implies the lower access prices-which also imply the lower profit flow (Wright et al., 2006). However, without regulatory conditions in place it could be argued that this principle may deter customer welfare. Therefore Wright et al. (2006) assert that the ability of backward-looking rule to encourage investment for a given access price result in higher welfare should never be undermined by the regulator and policy maker. Moreover, Wright et al. (2006) highlight that the two main policy implications that should be taken into consideration if these approaches are to be implemented effectively to enhance efficiency and competition in the market. Firstly, regulators and policy makers should give the dynamic efficiency advantages of backward-looking rules more serious consideration. Secondly, if a forward-looking rule is used, the initial access price should set a level higher than it would be the case if a backward-looking

rule is adopted. A high rate is required to compensate the incumbent for the risk it bears when faced with forward looking access prices. Otherwise, the incumbent will delay investment too long unless it receives such compensation. All these issues discussed from above assert that considerable attention should be devoted to design and implementation of access pricing regimes. As a result, the ITU recommends the regulator to carry out cost of service studies to evaluate the reasonableness of the interconnection price in the market (ITU, 2009). The ITU states that the examination of cost needs to be made from more one point of view to reinforce the accuracy of the results, especially in countries where information asymmetry is eminent. ITU recommends three general approaches to cost studies that can be pursued, either separately or in combination. These include bottom-up, top-down and outside-in approach. In this chapter we shall discuss bottom-up and top-down approach only.

3.3.1.3 Bottom-up approach

According to ITU, this method is arguably the most "accurate" approach of measuring unit costs, assuming sufficient data are available (ITU, 2003:50). It is based on the idea that service costs can be indentified from the facilities and other inputs needed to provide the services (ITU, 2003). This approach depends on the availability of complete, disaggregated data on input costs and the relative use of facilities in the provision of different services. This can be analyzed on the historical cost basis or forward-looking incremental cost basis, but any result expressed as pure, incremental facility-based unit costs must be reconciled with joint and common costs and administrative overheads (ITU, 2003).

3.3.1.4 Top-down approach

As per ITU recommendations, the top-down approach begins with aggregate, company-wide cost data such as total annual expenditures, capital investments and operating costs. Ideally, such costs will be tracked according to some general categories, such as whether they are capital or operating costs (Wright et al., 2006). The goal of top-down study is to take these aggregate costs and allocate them among all services provided by carrier. The rationale behind this method is that it makes sure that all the carrier's costs are accounted for (Wright et al., 2006). However, the drawback is that determining an economically justifiable allocation formula is very complex (Wright et al., 2006).

Finally, the top-down method is also used as the integral part of the cost study and is used to estimate capital and operating cost where exact facility input data are unavailable (ITU,

2009). In Australia, for example, top-down analysis is used as an option of settling interconnection rate disputes (ITU, 2009).

3.3.2 Fully allocated costs (FAC)

The concept of FAC is based on backward-looking approach. FAC is an approach where all costs are allocated to one or another service, even where a cost is not caused by a single service (Braeutigam, 1980). FAC is simple and easy to understand comparing to other costing methodologies. Jamison (1998) argues that regulators could also apply FAC to measure costs for USOs. With this approach, the difference between the prices services provider is allowed to be charged in the market and the FAC of the market is treated as the USO. Jamison (1998) further argues that setting prices using FAC protects against anti-competitive cross subsidies. Consequently, traditionally many regulatory agencies adopted FAC to address the problem of the rate structure. As a result countries such as Belgium, Italy, Luxemburg, Portugal and Sweden have implemented FAC as the best approach. Despite being adopted in many countries, Jamison (1998) and Braeutigam (1980) argue that FAC has some drawbacks:

i) The main rationale behind FAC is that regulators can use accounting records to determine the costs caused by particular services. Unfortunately, FAC allocates costs by account. For the reasons explained above, the costs allocated to a service may be less than, or even a lot more than the cost of services.

ii) Formulas shift costs to non-competitive markets. This happens for two reasons. Firstly, the accounting records on which FAC is based do not show why costs were incurred. So it is at best difficult for regulators to prevent companies from acting on the incentives to shift costs incurred for competitive services into prices for non-competitive services. Secondly, usage-based allocators shift cost to non-competitive markets when companies lose market share in competitive markets. This shifts the risk of cost recovery from shareholders to captive customers.

iii) FAC restricts regulated companies' abilities to innovate and to respond to competition in two ways (Braeutigam, 1980).

   a) Firstly, regulatory processes to approve investments and new services cause delays. In US, for instance, local exchange carrier (LEC) video dial tone services, before the passage of the Telecommunication act 1996, had to get approval from FCC before

constructing facilities for video dial tone. This prior approval was required to prevent cost shifting through the accounting process.

b) The second reason FAC limits innovation is that it creates rigid strictures and procedures. For instance, in US, FCC contains artificial distinctions between switched and non-switched services.

3.3.3 Long run incremental cost model

The concept of LRIC is forwarding looking approach. LRIC is defined as "an incremental additional cost the firm incurs in the long run term in providing the additional unit of services" (Falch, 2004:10). The rationale behind the development of LRIC was to enhance economically efficient interconnection prices as economic theory speculates (Melody, 1997). In LRIC pricing scheme interconnection prices are delivered from the benchmark provided by the efficient operator. Therefore interconnection rates must be equal to LRIC in order to maximize efficiency. In so doing, LRIC impedes excessive profits by the incumbent (Noumba et al., 2004). In this light, LRIC regulations provide the regulators with the key tool to manage industry entry (Noumba et al., 2004). Due to this, regulators, policy makers, economists and new entrants are campaigning for LRIC as the best practice and regulatory policy. For instance, United Kingdom, the European Community and the United States have adopted LRIC approach as an approach relevant to real world decision making.

However, the impact of LRIC pricing scheme on determining efficient interconnection rates is inconclusive. Though LRIC's significance hinges on the concept of efficiency, it has been strongly criticized that it has no precision to optimize resource allocation efficiency and its impact in a dynamic framework has been a source to intense debates (Melody, 1997). In this regard, Salinger (1998) in Noumba et al. (2004) argue that implementation of LRIC is complex and could undermine the profitability of the investment of incumbents if poorly executed. Additionally, Valletti (2001) and Armstrong (2001) strongly argue that pure LRIC becomes an appropriate benchmark if the retail-level distortion are eliminated and dealt with effectively by the regulatory instruments.

From these arguments, it could be argued that the effectiveness of LRIC pricing scheme hinges on how it has been implemented and the policy instruments and information that are at regulator's disposal. Top-down LRIC approach can be estimated from the current costs of the existing firm (Falch, 2004). This will yield highest estimates of cost since it does not

allow optimization. In bottom-up LRIC model puts into account fixed cost caused by the provision of interconnection services. Nevertheless, it does not put into account common costs which do not vary proportionally with the provision of interconnection services (Noumba et al., 2004). In so doing, it gives lower estimates of LRIC because it removes all the inefficiencies due to historical development of networks.

In this light, it could be argued that the effectiveness of LRIC pricing scheme depends on the trade-off made by the regulator based on the LRIC estimations. For instance, basing on estimates of LRIC on current costs will deter market entry because the new entrant will pay more than the efficient costs (Wright et al., 2006). Basing on the bottom-up approach is also seems to be problematic. It could discourage the network operator from making investments that are efficient given the actual configuration of the network, since it undermines the existing network configuration. Despite bottom-up being criticized for its lack of realism, it has been highly recommended by ITU for regulatory decision and it is internationally used. For instance, regulators in Australia, New Zealand, the United States, the United Kingdom, Austria, and Switzerland have adopted bottom-up LRIC approach.

The deficiencies of bottom-up LRIC and top-up LRIC could also be attributed to regulatory uncertainty about incumbent's network. Xavier (1997) also argues that calculating forward-looking cost often becomes challenging and time consuming due to the absence of reliable cost information from the incumbent. Armstrong (2001) states that this can be attributed to the distortion in incumbent's retail market. When the incumbent is experiencing distortion in its retail market it tends to give wrong information about its costs.

Due to the complexity associated with LRIC, regulators and policy makers and economists argue for LRIC plus the mark up as the proxy to recoup "access deficit" (Laffont & Tirole, 1996:25). Therefore many jurisdictions have adopted LRIC plus the mark up to overcome deficiencies of LRIC. LRIC plus the mark up include Long run average increment cost (LRAIC) , Total element long run increment cost (TELRIC) and Total service long run increment cost (TSLRIC) were developed (Falch, 2004).

3.3.3.1 LONG RUN AVERAGE INCREMENTAL COST (LRAIC) APPROACH

The concept of long run average increment cost (LRAIC) which is based on a forward-looking cost was developed in USA to maintain the level of interconnection charges in order to induce competition and efficiency in the telecoms market (Falch, 2004). LRAIC can be

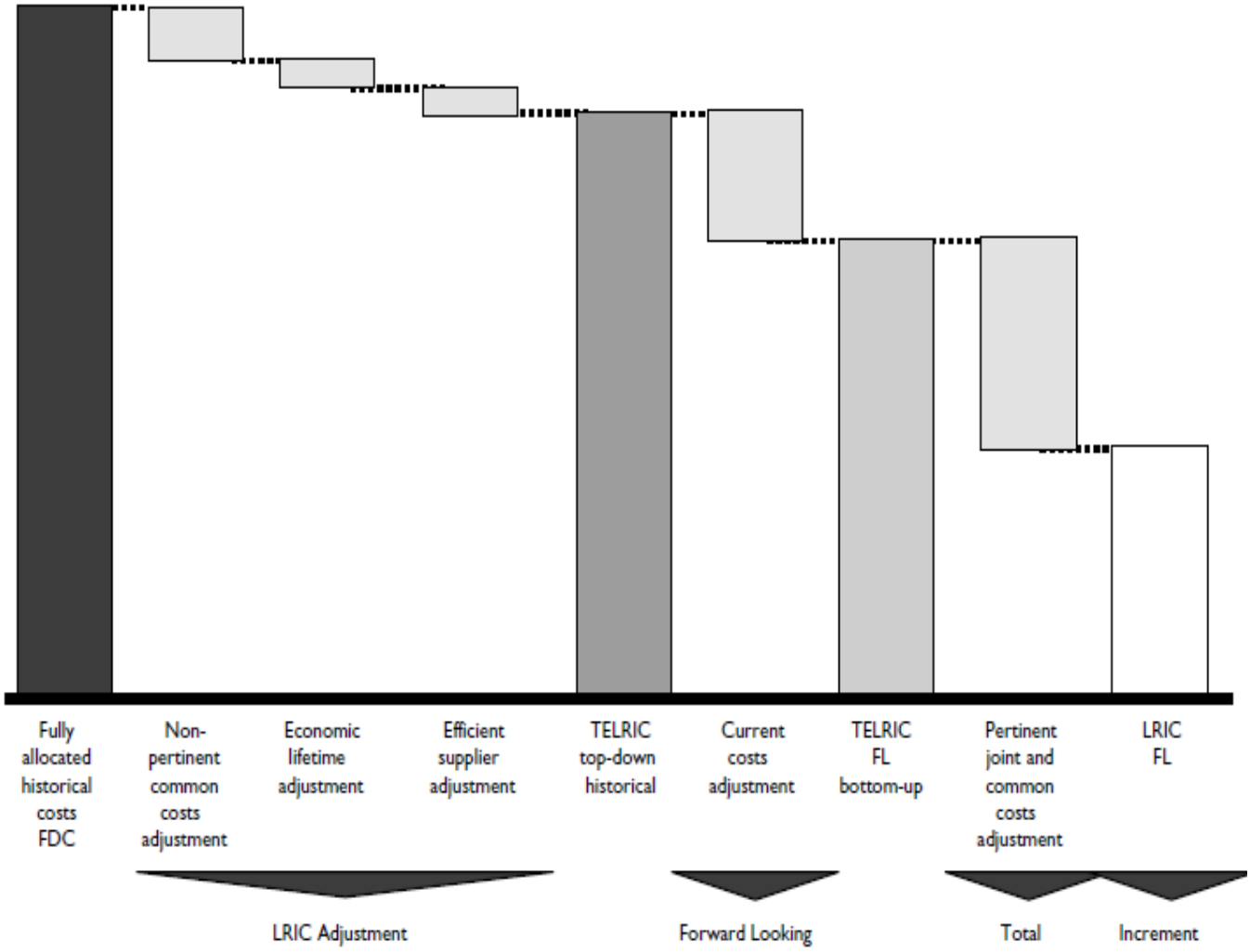
calculated using two approaches, bottom-up approach and top-down approach. The Bottom-up approach is where incremental costs are calculated based on an engineering model which estimates the costs of a modern equivalent network and the allocation of the associated cost. Top-down approach is where incremental costs are calculated based on the actual costs of the operator expressed in current cost terms, and adjusted to remove costs not incremental to the relevant services(Braeutigam, 1980). The difference between LRAIC, TSLRIC and TELRIC is that LRAIC does not include costs shared by more increments. However, it is argued that the definition of very large increments limits the impact of this difference as most costs can be allocated either to the access or the core network (Braeutigam, 1980). Falch (2004) argues that the choice of calculation principle will affect the level of interconnection rates. Hence, reduction of competition in telecommunication market.

3.3.3.2 TOTAL ELEMENT LONG RUN INCREMENTAL COST (TELRIC)

The Total Element Long Run Incremental Costs methodology (TELRIC) estimates additional costs incurred in producing interconnection relative to the costs already incurred by producing a portfolio of other services (Falch,2004). In brief, the TELRIC of interconnection encompasses all the costs that could be avoided if interconnection were not produced (Falch, 2004). In other words, it takes all costs that seem to be directly attributable to interconnection. The TELRIC for interconnection services only takes into account a portion of joint costs and common costs that are related to networks. In this regard, Melody (1997) argues that distinction between TELRIC and FAC is that FAC is a distributing forward-looking costs not actual cost. Furthermore, FCC explained that forward –looking concept was used to allow new competitors to incur costs for their forward-looking decision but not costs arising from the past decision. From this point, it is apparent that TELRIC was designed to facilitate the implementation of pro-competitive policy for local exchange interconnection and network access for LEC competitors (Melody, 1997).

Consequently many regulatory bodies such as OFTEL have shifted from backward-looking approach to forward-looking approaches. To explain how this transition is done, Noumba et al.(2004) explains that starting with the total cost estimate obtained with an FAC-regime, the regulators can move to LRIC step by step by removing layers of cost inefficiencies. The figure 3.1 below shows the transition from historical account cost to LRIC.

Figure 3. 1:Transition from historical costs to LRIC



Source: Noumba et al. (2004)

For the regulator to have effective interconnection regulation, Noumba et al. (2004) explain that the regulator is expected to introduce concepts such as specific nature of cost and pertinence of costs. The figure 3.1 above shows that for the costs to be adjusted to LRIC, non-pertinent common cost, economic lifetime and efficient supplier should be removed. The result will be the total cost of joint related to network, which is TELRIC top-down historical. This is based on the fact that TELRIC only involves not global cost but only common and joint costs that are related to networks. This is a clear distinction between FAC and TELRIC. According to the figure 3.1 joint and common costs that are related to networks are referred to as pertinent costs and those common costs that are not related to networks are referred to as non-pertinent common costs. The second step is to adjust to forward-looking cost by

removing the current cost adjustments. This will lead to TELRIC bottom-up forward-looking. The third step of the process is to remove the relevant common and joint costs related to networks. This will lead to pure LRIC forward-looking cost.

Under TELRIC historical top-down regime, Noumba et al. (2004) argue against the concept of pertinent cost. They argue that the concept of pertinence affects the handling of joints and common costs. They further underpin that there is always a risk in overestimating the common cost. For instance, the dominant operator's could argue high common cost to squeeze out its competitors by reporting costs derived from competitive activities. However they argue for TELRIC bottom-up forward-looking approach. They argue that in cases where the regulator and operators do not have a good knowledge of the industry structure, TELRIC bottom-up forward-looking approach can represent a decision-making instrument that induces improvement on procedures and process implemented by regulator to collect and retrieve information. They further say that it also improves the quality of investment decisions for firms as it naturally enhances the transparency of the interconnection services.

However, the unclear and non comprehensive definition of forward-looking increment has left many regulators in the valley of decisions. This rather simplistic definition of output increment has put TELRIC under rigorous critics on its strength to enhance efficiency in the telecommunication market. Melody (1997:45) argued that under TELRIC regime the expression "forward-looking "seem to mean the evaluation of the existing actual network element. Therefore he argues that TELRIC is not a policy of consumer protection for basic local telephone services. This issues that have been highlighted in TELRIC's theoretical framework seem to make it more complex for the regulators to implement it effectively. Noumba et al. (2004) argue that TELRIC regime poses challenges to regulators and policy makers in satisfying competition policy and consumer protection objectives. For instance, NRAs are required to implement pro-competitive TELRIC studies periodically for them to achieve consumer protection objectives (Melody, 1997). In 2001, FCC argued that TELRIC distorts investment incentives and poses obstacle to an all-IP broadband world because of high termination revenue that provides little incentives for operators to upgrade their network to the most efficient technology or to negotiate interconnection agreements that are designed to accommodate the efficient exchange of IP traffic (Melody, 1997).

However, TELRIC prices being determined by estimations may also lead to some kind of arbitrage exercise. Nevertheless, the accuracy of these estimations depends on the TELRIC method that has been used to implement TELRIC (Noumba et al., 2004).

The study that was conducted in Denmark in 2001 on top-down approach and bottom-up approach found out that the networking cost under top-down approach was twice the costs that were derived from the bottom-up approach(Falch,2005). Falch (2005) asserted that the difference seemed to have emerged from assumptions that were made in allocating joints and common costs. From this point, it is apparent that under top-down approach more estimates are made than bottom-up approach. Falch (2005) argues that high interconnection charges discourage competition and on other hand too low interconnection prices also discourage innovation and facility based competition. Therefore it is up to the regulator using the costing methodologies to determine the "correct" price level of the input (Noumba et al., 2004:200). Noumba et al. (2004) argue that selecting a specific TELRIC method involves regulators into arbitrage exercise. Determining this "delicate balance" (Falch, 2005:5) becomes a challenge to the regulator due to lack of good information of the telecommunication industry cost structure (Noumba et al., 2004:39). However, Noumba et al. (2004) shade light on bottom-up TELRIC approach that it improves procedures and processes implemented by the regulator or operator to collect and retrieve information. They further asserted that it enhances transparency of interconnection service market. On other hand, Falch (2005) emphasizes hybrid model, a combination of both bottom-up and top-down approach.

In comparison with FAC, Noumba et al. (2004) state that depending on the elements considered, the TELRIC method seems to be less favourable to new entrants than the FDC method. Secondly, they explained that if a network section A is subject to substantial depreciation and if current depreciation and if current costs for reconstructing A are similar or higher than the historical costs, TELRIC can lead to higher costs than the one that would be delivered from the FDC method. Lastly, Wright el al. (2006) state that depending on the assumptions made, the TELRIC method can lead to a relatively wide range of estimates.

3.3.4 BENCHMARKING INTERCONNECTION RATE APPROACH

Stork (2009:8) describes benchmarking approach as "a process of establishing interconnection rates based on rates in other jurisdictions". Samarajiva (2001) suggested that developing countries where data is not available, simple models should be used to determine interconnection rates in order not to distort competition. Samarajiva (2001) recommended

benchmarking as a best practice in settling interconnection rate disputes on time. In Korea benchmarking approach has been adopted not as a substitute to cost-based approach but as a complement (Xavier, 1997). Stork (2009) argues that when no appropriate adjustments are done benchmarking results make little sense. He further said that under benchmarking approach, regulators try to model interconnection costs without having enough detailed information on local cost inputs to carry out full forward-looking cost analysis. Reduction in interconnection rates that has induced competition and attracted more investments in Denmark's telecom industry was resulted from implementation of benchmarking approach to supplement its costing methodology (Falch, 2004). In 2003, Botswana Telecommunication Agency (BTA) considered benchmarking methodology as the most efficient methodology to solve interconnection rate dispute between Mascom Wireless Limited, a mobile operator and Botswana Telecommunication Corporation, fixed-line operator(BTA,2003).

3.4 OTHER WAYS OF IMPLEMENTING INTERCONNECTION RATES

3.4.1 Asymmetric interconnection regulation

Many NRAs have identified that the positive network externality of the incumbent as a competitive issue, due to the strategy of price discrimination between the off-net and on-net prices. Laffont et al. (1998) highlighted that first movers in the market with greater brand loyalty and large consumer base, can use discriminatory retail prices as a competitive instrument. The mobile or fixed incumbent always offers its subscribers lower on-net termination prices and higher off-net termination prices. This becomes a barrier to entry.

Di Pillo et al. (2009) said that almost all European NRAs have adopted asymmetric interconnection regulation as a feasible regulatory measure. They further explained that in countries where the market is highly concentrated and characterized by the presence of incumbent operators that have a dominant position. In developing countries where there is a lower mobile penetration, the introduction of asymmetric charges is needed to encourage the growth of follower operator on the market, which suffers from a lack of scale due to late market entry. Asymmetric interconnection charges allow higher expected profits in the short term and strengthen the relative competitive position of those follower operators permitted to increase the competition in the long term to the benefit of end users (Di Pillo et al., 2009). In order to obtain a significant market share a certain period of time, follower operators must benefit from the economies of scale, by increasing their market share and their traffic volume.

When follower operator have higher unit costs, it is appropriate to impose asymmetric interconnection charges, which allow them to recover higher termination costs. This is recognized by the majority of NRAs, despite the risk of market entry by an inefficient operator. However, prior any decision to implement asymmetric measure the regulator should implement a public consultation mechanism in order to elicit relevant information on which decisions can be based on. Therefore the next subsection discusses public consultation.

3.4.2 PUBLIC CONSULTATION

Public consultation is one of the regulatory instruments employed to improve transparency, efficiency and effectiveness of interconnection regulation. It is conducted using five regulatory instruments; public hearings, informal consultation, public notice-and-comments and advisory bodies. The rationale behind public consultation is that it increases the information available to the government on which decisions are based. As a result, EU framework directive mandates national regulatory authorities of member states to publish their consultation procedures. As a result many countries, According to Noumba et al. (2004) where pro-competitive regulations turned out to be ineffective due to lack of information from the incumbent's cost have opted for public consultation process. For example, 74% of African countries have adopted and implemented public consultation approach. In these countries, public consultation approach has enabled regulators to assess the fairness and reasonableness of the interconnection rate.

Some countries have implemented more than one public consultation approaches. In the United States a public hearing is attached to the notice-and-comment procedures. In Germany and Korea advisory bodies as well as public hearing approaches have been implemented. Furthermore, Canada, UK and Japan governments recommended their regulatory agencies to conduct information consultation before a formal consultation. It has been shown that with the adoption of public consultation approach the reasonableness of interconnection rates has been ascertained and regulatory decisions have been improved due to the availability of information for the government and the stakeholders. For instance, through ICASA public hearings, Vodacom was able to propose to the regulator to implement a glide path (time frame over which the interconnection rates will come down) in three years starting from 2010 in order to enable them to recoup their sunk cost. From this illustration, it is apparent that

public consultation process can complement the existing interconnection regime form ensuring a fair and reasonable interconnection rate that is acceptable by the involved parties.

Despite ITU's recommendations to develop and developing countries to adopt contemporary models calculate interconnection charges and instruments to complement these modes, Bezzina (2005) argues that competition and efficiency are still far way from effective due unclear and comprehensive interconnection regime. Furthermore, Laffont et al. (1998) highlighted that focusing on the access principle regime alone can give ensure positive results in telecommunication. Therefore the next subsection discusses other necessary enforcements that contribute to the effectiveness of an interconnection regime.

3.5 CHALLENGES FACING INTERCONNECTION REGIMES

Independence of regulatory agencies

Setting up regulatory agencies and adopting regulatory policies is not sufficient to ensure optimal interconnection rates in the telecommunication industry (Jain, 2003). Edwards and Waverman (2006) argue that for the government to influence a regulatory outcome there must a degree to which the NRA lacks independence. Independence here means the ability of the regulator to implement policy without undue interference from the government or industry (Bandanayake, 2005).

However, the degree of independence of NRAs and their susceptibility to government influence varies as across a set of well-developed countries (Edward & Waverman, 2006). Jain (2003) in his study on regulation of the interconnection in India found that Telecom Regulatory Authority of India (TRAI) could not manage interconnectivity in a smooth manner due to a lack of independence. He further explained that the intervention by the minister, judicial bodies and Department of Telecoms(DoT) considerably reduced TRAI's credibility.

Furthermore, Jain (2003) suggests that the scope and powers of regulatory agencies should clearly specify the oversight and enforcement scope to cover the incumbent. In the UK, for example, the telecommunication Act of 1984 clearly stipulated the regulating role of OFTEL to regulate British Telecom (BT). Also as part of its license, BT was mandated to follow the OFTEL's regulations (Edward & Waverman, 2006). He further highlighted that such clarity does not exist in developing countries, for instance, in India, DoT was the policy maker, part regulator and operator until 2000 when the operator was corporatized.

Lack of independence for the regulatory body has an effect on the appropriateness of the interconnection charges. For instance, Falch (2004) in his study to determine the effectiveness of LRAIC on competition in Denmark argues that LRAIC will determine the level of interconnection rates accepted by all parties only if the process is managed by a strong regulator with which is able to stay independent of the huge political and economic interests related to interconnection rates.

Regulatory Capacity

It has been argued that regulatory policies only determine an appropriate level of interconnection charges if the process is being managed by a strong regulator with sufficient technical and administrative expertise (Falch, 2005). Jain (2003) also highlighted that most regulators in developing countries have no essential technical background and mindset to adopt new models to calculate interconnection charges. This has been evidenced in the Indian case (Jain, 2003). TRAI continued to focus on access deficit charges (ADC) and USO funding through fixed line networks, while wireless technologies were growing very fast. It was also slow to give up the historical cost model, as it was given by the need to protect DoT/BSNL, rather facilitating sector growth (Jain, 2003). Falch (2005) also did a case study on the impact of LRIAC approach in Denmark. Falch (2005:17) argues that "the subsequent reduction in interconnection rates in Denmark is the result of a dedicated regulator rather than of the LRAIC approach as such".

Availability of data

Jamison (1998) highlighted that the more information the regulator has at its disposal the more efficient the access charge regime will be. Xavier (1997) also argues that calculating forward-looking cost often becomes challenging and time consuming due to the absence of reliable cost information from the incumbent. Braeutigam (1980) also highlighted that under backward-looking approach regime, incumbents tend to give costs that are not related to cost causation.

Therefore, regulators should recognize this limitation and validate its approach using a variety of models. Jain (2003) suggests that to have a broader basis of acceptance, regulators also need to rely on a number of models (such as top down and bottom up variants) to arrive at indicative costs that can be corroborated. For instance, in India, BT's interconnection pricing review is based on management (top down) as well as engineering approach that examine the cost of hypothetical telecom network of a specified capacity(Jain,2003).

Moreover, Jain (2003) highlighted that one of the critical success factors in the deployment of the telecommunications development fund for supporting rural services was the models based on charges that allowed for an efficient assessment when the cost data is not in place. For instance, the top down model incorporates the actual costs and provides a check on what is achievable in practice (Jamison, 1998). In Chile, for example, the access charges for rural were determined through a model that reflected the operations of an efficient firm.

3.6 SUMMARY

Many countries have embarked on interconnection pricing regulation as the tool to promote infrastructure-based competition and service-based competition. However, efficiency and competition seem to be far from effective in these countries because of too high access charges and too low access charges. Literature has shown that optimal level of interconnection and the awareness of the regulator about "water bed" effect may maintain the balance between incentives to build new infrastructure and access to the existing ones. The challenge to the regulators and policy maker has always been maintaining this "delicate balance" (Falch, 2005:20). In conclusion, in many countries to ensure the determination of optimal interconnection charge that can enhance effective competition and efficiency, cost-based methodologies have been adopted and supplementary approaches such as asymmetric interconnection regulations, public consultations. However, Melody (1997) and Noumba et al. (2004) argued that all studies conducted and approaches adopted by the regulators in 30 years seem to have turned out to be ineffective. Therefore there is a need to know whether cost-based principle has managed to balance the three objectives of efficiency.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1. INTRODUCTION

Firstly this chapter sets out the problem statement, purpose statement and research questions. Secondly, the chapter gives a clear discussion and clarification of the qualitative research method. A detailed explanation of the two collection methods (document collection and interviewing) is also provided. Thirdly, the chapter explains the data collection instruments that were used and sampling techniques used to identify interviewees during the case study. Lastly the chapter details data analysis strategies employed and how reliability and validity of data were ensured in the study.

4.2 THE PROBLEM STATEMENT

Enhancing the effectiveness of infrastructure-based competition and service-based competition in the telecommunication sector has been the main goal of telecoms regulatory institutions. Many regulatory institutions have embarked on interconnection regulation as a mechanism to ensure that new entrants can access the incumbent's network at appropriate prices, terms and conditions. The most important and yet controversial issue in interconnection regulation is interconnection charging in the context of a dominant incumbent (Jain, 2006). Even though the cost-based access pricing principle has been noted as the best pro-competitive regulation to ensure any-to-any connectivity and safeguard the abuse of market power, determining an appropriate level for the interconnection rate that can enhance efficiency and competition in the telecommunication market has been far from effective in many countries.

Thus far, RURA has put much effort into promoting efficiency and competition through interconnection pricing regulation in the Rwandan telecommunication sector. However, an appropriate level of efficiency and competition in the telecommunication market hinges partly on the effectiveness of the interconnection rate regime.

In an attempt to determine an appropriate level for the interconnection rate that is acceptable to all stakeholders, RURA adopted the cost-based access pricing principle. However, Salinger (1998:28) argues that "the use of LRIC is theoretically sound, but its implementation in practice is rather complex and could undermine the profitability of the incumbent's investment if poorly executed". In addition, a number of scholars (Armstrong, 2002; Wright

et al., 2006; Jamison, 1998 and Jain 2003) argue that cost-based methodologies can only ensure an efficient level of interconnection rate if a high degree of independence, detailed information from the incumbent, skills and enough policy instruments are at the regulator's disposal. Therefore, the study aims to understand the interconnection pricing regime in the Rwandan telecommunication sector and to what extent it has achieved its objectives.

4.3 THE PURPOSE STATEMENT

The purpose of this study is to investigate the regulation of interconnection pricing in Rwanda. Armstrong (2002) says that efficiency and competition in the telecommunication sector hinge on the interconnection pricing regulation. Specifically, this study will investigate whether the current interconnection pricing regime has ensured an appropriate level for the interconnection rate that can enhance efficiency and effective competition in the Rwandan telecommunication sector. The study will further make recommendation on approaches that could be adopted by the regulator to improve the regulation of interconnection in the Rwandan telecommunication sector.

4.4 RESEARCH QUESTIONS

The focus of this study is on the interconnection pricing regulation in Rwanda and thus an attempt is made to find answers to the following main research question:

> How has interconnection pricing regulation impacted the Rwandan telecommunication sector?

For practical reasons, this question was broken down into sub-questions as follows:

a) What is the interconnection pricing regime in the Rwandan telecommunication sector?

b) To what extent has the interconnection pricing regime affected the Rwandan telecommunication sector?

c) What are the challenges facing interconnection pricing regulation in the Rwandan telecommunication sector?

d) What approaches could be adopted to improve the regulation of interconnection pricing in Rwanda?

4.5 RESEARCH APPROACH

This study made use of a qualitative and quantitative approach. McMillan and Schumacher (2006:27) say that the use of mixed- method research approach, which combines quantitative and qualitative, is increasingly becoming popular. McMillan and Schumacher (2006:27) highlights that with combined method approach, researchers are not limited to using techniques associated with traditional designs, either quantitative or qualitative, but both research methods are used either simultaneously or consecutively. In this approach the researcher does not attempt to manipulate the phenomena of interest (Patton, 2002). In other words, a qualitative study emphasizes the importance of looking at variables in the natural setting in which they are found (Opie, 2004). Taking this interpretative position will overcome bias as the researcher will be thinking abstractly and critically analysing the situation (Gerhardt, 2004).

4.5.1 CASE STUDY RESEARCH METHOD

In this study the researcher took a case study on Rwandan utility regulatory agency (RURA), MTN-Rwandacell, Rwandatel and TIGO-Rwanda. The notion of the case study was defined by Mohd Noor (2008:1602) and Cassell and Symon (2004). Mohd Noor (2008:1602) defines a case study as a "strategic qualitative research methodology". According to Cassell and Symon (2004) a case study is one which refers to a detailed investigation of phenomena within their context. In conjunction with them, Opie (2004:45) also defined a case study as a "detailed investigation on a real situation, with real people in an environment".

To understand the regulation of interconnection regulation in depth (Bell, 1999), four case studies (RURA, MTN-Rwandacell, TIGO-Rwanda and Rwandatel) were conducted in this study. This is in line with Mohd Noor (2008) argument which states that choices of multiple cases ensure findings given that replication is found in several cases. In this study the researcher attended to understand whether the current interconnection regime achieved its intended objectives in the Rwandan telecommunication sector. This resonates with Mohd Noor's (2008) argument that the case study does not focus on the entire organization but a particular issue or a unit of analysis. Furthermore Yin (1994:13) describes a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and its context are not clearly evident; and in which multiple sources of evidence are used". The multiple sources of evidence in the

case of this research include semi-structured interviews and documentary analysis which will be discussed in detail later in this chapter.

4.7 DATA COLLECTION METHODS

4.7.1 DOCUMENT COLLECTION

One of the two methods the researcher used in his data gathering exercise was document collection. Document collection is an extremely valuable alternative source of data used to supplement information obtained, in this particular research through interviewing (Bell, 2005). According to McMillan and Schumacher (1993) document collection provides an internal perspective as well as the values of the organisation (or the RURA, MTN-Rwandacell, Rwandatel and TIGO-Rwanda).In addition, Henning, Rensburg and Smit (2004: 98) explain that documents are considered as the main source of data in qualitative research. They state that "any document, whether old or new, whether in printed format, hand written or electronic format and which relates to the research question may be of value" (p.99).

In the light of the above arguments, in this study the researcher analyzed documents collected from RURA, MTN-Rwandacell, Rwandatel and TIGO-Rwanda in order to align evidence with the triangulating evidence (Neuman, 2010). The document collected and analyzed included weekly minutes of interconnection agreement documents between operators, annual reports from 2001 to 2010, interconnection rate issues documents and companies financial reports, minutes that were taken in meetings between RURA and stakeholders, companies newsletters and magazines, and the cost-based interconnection study reports for both MTN-Rwandacell and Rwandatel that were submitted by ICEA consultancy firm in 2006. Some issues on interconnection rates among the operators and the regulator vary widely in circulating newspapers like "Rwanda New times", "Invaho", and "Igihe news paper". Most of the documents that the researcher collected and reviewed fall under the category of primary sources of telecommunication data and are also official documents in Bell's (2005), McMillan and Schumacher's (1993) and Best and Kahn's (2003) categorisation of documents.

4.7.2 INTERVIEWING

The second data collection technique that the researcher used was interviews. Interviews according to Fetterman (1997) help in explaining and putting into larger context what the

researcher sees and experiences. Neuman (2006) and Best and Kahn (2003) regard interviews as a research tool for obtaining specific information from another person as it allows the interviewer to access the perspective of the person being interviewed. Thus from interviews information regarding an individual's experiences and knowledge and his/her opinions, beliefs and feelings can be gathered (Best & Kahn, 2003). The major advantage of interviews which has been cited by most writers is its adaptability and flexibility (Bell, 2005; McMillan & Schumacher, 1993).

The researcher used semi-structured interview to solicit for information from key staff of RURA, MTN-Rwandacell, Rwandatel and TIGO-Rwanda. A semi-structured interview was selected as the means for data collection in this study because standardised interviews do not give the researcher a chance to explore respondents' opinions, clarifying interesting and relevant sensitive issues (Bell, 1998). Some freedom to probe was essential to the researcher since interconnection rate seem a controversial issue in all jurisdictions. This attribute added value on this study because the researcher was able to investigate questions which were very critical and sensitive for operators, especially the incumbents to articulate. For instance the question that was related to the fairness of current interconnection rates in Rwanda seemed provocative to some operators that are in interconnection disputes, therefore, the use of semi-structured interviews enabled the researcher to probe it thoroughly.

As regards some of the topics, questions and issues to be covered were selected in advance in order to guide the researcher during the interview (Bell, 2005). In designing the interview guide, questions were worded in a completely semi-structured format (Best & Kahn, 2003). The advantage of using the semi-structured interview according to McMillan & Schumacher (1993) is that it reduces interviewer effect and bias. Bias, it must be note, has been and will always remain the "old enemy" of interviewing (Bell, 2005:116). Secondly, semi-structured interviews allow and easily facilitate the recording, summarizing, organization and analysis of data (Best & Kahn, 2003).

4.8 SAMPLING

The purposeful sampling strategy was used to identify and choose individuals likely to be knowledgeable and informative about the phenomenon of interest (McMillan and Schumacher, 1993). To that effect in this research RURA staff, the acting CEO of MTN-Rwandacell and three experts in the field of interconnection regulation and the heads of department at MTN-Rwandacell, Rwandatel and TIGO-Rwanda were selected as information

rich informants. All these people that were purposefully selected provided the researcher with relevant information during the interview (McMillan and Schumacher, 2006; Neuman, 2006). Other knowledgeable and informative respondents that were purposefully sampled and interviewed using semi-structured interviews were staff from RDB in charge of interconnectivity in the Rwandan telecommunication sector. The researcher therefore compiled 16 semi-structured interview schedules that were used during the data collection exercise.

4.8.1 PILOTING

Before data was collected, the pilot study was conducted in January 2011 with one interviewee. This was done to validate the interview schedule to enable the researcher to think about what to expect from the regulator's and operator's responses. However, the interviewee from the regulator did not have knowledge of interconnection regulation, although this was not at first apparent. Nevertheless, the reseacher used the opportunity to reframe the interview questions to use simpler language.

A further pilot interview was arranged where the selected interviewee was able to give explanations which were very helpful to the researcher as an interviewee had an idea about the current interconnection rate regime.

The reseacher then arranged to conduct interviews with other RURA staff and operators' staff after the researcher was satisfied that the instrument was usable. Appointments were made after working hours and during weekends. Interviews were arranged in such away that they would not interfere with the companies or institutions activities. Before conducting any interview the researcher asked for permission to use a tape recorder in order for interviewees to undertand why the researcher would like to use the tape recorder. Because of on going tension due to interconnection rate disputes between the operators, none of the participants granted the researcher permission to use the tape recorder. After asking for the permission, a brief introduction was given to the interviewee explaining the aim of the study. In the introduction the interviewees were told to be free to express any opinion. They were also told that information collected was strictly confidential

4.8.2 THE PARTICIPANTS

There were more than six departments in each telecommunication company, but the researcher selected only people from the department dealing with interconnection. In this

department, the researcher decided to interview interconnection managers since they seemed to have more experience in interconnection regulation than the rest. In MTN-Rwandacell, the researcher interviewed four (4) interconnection and roaming managers and the Acting CEO. In Rwandatel, the researcher interviewed the two (2) interviewees (interconnection manager and the director of the department). In TIGO-Rwanda, the researcher interviewed four (4) interviewees (interconnection, roaming manager and operations manager). In RURA, out of eight departments, the researcher interviewed four (4) interviewees in the interconnection regulation department. The researcher interviewed the head of the department, the head of the section and two economic regulatory officers. Finally, the researcher also interviewed one employee in charge of interconnectivity in Rwanda Development Board (RDB). Since of each both RURA and selected operators do have interconnection regulation departments, the selected number of participants from this departments are the well-informed informants as they have been involved between interconnection rate issues between operators and regulators. Therefore these 16 represent a high percentage of the total number of key informants. To comply with anonymity and confidentiality agreements, the names were then coded to represent the respondents in place of their real names throughout this chapter.

Table 4. 1: Codes given to all participants in place of their real names

RURA		
NO	**INTERVIEW SCHEDULE**	**CODES**
1	2/2/2011	PR1-RURA
2	2/2/2011	PR2-RURA
3	7/2/2011	PR3-RURA
4	7/2/2011	PR4-RURA
MTN-RWANDACELL		
No	**INTERVIEW SCHEDULE**	**CODES**
1	5/2/2011	PR1-MTNRWANDACELL
2	10/2/2011	PR2-MTNRWANDACELL
3	11/2/2011	PR3-MTNRWANDACELL
4	12/2/2011	PR4-MTNRWANDACELL
RWANDATEL		
No	**INTERVIEW SCHEDULE**	**CODES**
1	5/2/2011	PR1-Rwandatel
2	11/2/2011	PR2-Rwandatel

3	21/2/2011	PR3-Rwandatel
TIGO-RWANDA S.A		
No	**INTERVIEW SCHEDULE**	**CODES**
1	21/2/2011	PR1-TIGORwanda
2	23/2/2011	PR2-TIGORwanda
3	11/2/2011	PR3-TIGORwanda
4	23/2/2011	PR4-TIGORwanda
OTHERS-RDB		
No	**INTERVIEW SCHEDULE**	**CODES**
1	25/2/2011	PR1-RCIP

4.9 PROCESS OF DATA ANALYSIS

As discussed earlier, the study was qualitative but the collected data was analyzed quantitatively. To underpin this, Jorgensen (1989:107) defines data analysis in more details as "breaking up, separating, or disassembling of research materials into pieces, parts, elements or units. With facts broken down into manageable pieces, the researcher sorts and sifts them, searching for types, classes, sequences, processes, patterns or wholes". Macmillan & Schumacher (2006:364) finally stress that qualitative data analysis as a process of organizing the collected data into categories and identifying relationships among those categories to seek explanations of the phenomenon. In the light of the above suggestions, the researcher primarily read and revised the interview question responses in order to come up with a clear and comprehensive meaning of what the respondents were trying to say. Then the researcher identified similar patterns, which became parts of units and then categories. The categories in turn helped in the emergence of the themes grouped on the basis of the interrelations of categories and research questions. To interpret the research findings, the researcher made a comparison and combined the indentified themes in a new way in order to arrive at a new understanding of the interconnection regulation in Rwanda (Macmillan & Schumacher, 2006:373). Similar methods for data analysis that were adopted for the interviews were also used for the analysis of the data collected from document collection or document analysis. To produce analytical conclusion from the study findings, the researcher referred to a wealth of literature on interconnection regulation and techniques of calculating interconnection rates to see whether interconnection regulation in Rwanda comply with the interconnection regulation frameworks in other jurisdictions .

4.10 VALIDITY AND RELIABILITY OF DATA

Although the terms reliability and validity are concepts used in quantitative research, Patton (2001) argues that a qualitative researcher should be concerned about reliability and validity while designing a study, analyzing the results and also judging the quality of the study. In qualitative studies, the researcher is the instrument for data collection. Therefore, in qualitative research, validity and reliability means credibility of the research and the credibility of a qualitative research depends on the efforts of the researcher (Golafshani, 2003). Although reliability and validity are treated as separate terms in quantitative research, these terms are not viewed separately in qualitative research. Instead, terms such as credibility and trustworthiness are used in qualitative research (Opie, 2004; Golafshani, 2003).

To facilitate the patterns seeking exercise and to ensure validity and reliability of data the researcher used the triangulation, sequence analysis and the critical analysis of documents techniques. Triangulation involves cross-validation of data so as to test and compare one source of information against another and to see whether there is a pattern recurrence and corroboration (Wiersma, 1986; Fetterman, 1997). In the data analysis process the researcher triangulated and cross-checked data collected from documents and interviews, firstly about the history of the existing interconnection regime in Rwanda, secondly, the achievements of the current interconnection regime, thirdly the challenges facing the current interconnection regime. For instance, all the responses that were given by the respondents on the current cost-based interconnection regime, the researcher had to cross-check in the documents that he collected from RURA related to the cost interconnection studies that have been conducted on Rwanda telecommunication sector.

The sequence analysis technique organizes information, events in order of occurrence or across time (Neuman, 2006). For instance, the researcher followed up the challenges the current interconnection regime has been facing since 2006 when ICEA consultancy firm was hired to conduct the cost-based interconnection study between MTN-Rwandacell and Rwandatel.

The critical analysis of documents calls upon the researcher to subject documents to rigorous scrutiny to check consistency, truthfulness and authenticity (Fetterman, 1997; Bell, 2005). Thus the operator's annual financial reports, interconnection policy documents, interconnection agreement papers, RURA's annual reports and cost-based interconnection

study report 2005 were thoroughly and rigorously examined to test the truthfulness of these documents. The three methods used in the pattern seeking exercise were used to critically assess, verify, check and examine the reliability and validity of the data and information gathered during the case study.

However inasmuch as the researcher attempted to be objective in his data collection exercise it must be noted and he frankly acknowledge that at times bias can creep in, especially in this study where most of the research participants seemed reserved due to disputes that were going on between RURA and the operators. Bias is regarded as one major cause of invalid and unreliable data (Manion & Cohen, 1980). Having been aware that bias can surface, the researcher tried by all means necessary to be objective and impartial in this study.

CHAPTER FIVE: REVIEW OF INTERCONNECTION RATES IN RWANDA 2003 – 2011

5.1 INTRODUCTION

This chapter presents findings of the study. In this chapter the data is analysed qualitatively, based on a quantitative sample, as discussed in the Chapter Four. The total number of 16 interviewees provides a valid study sample as these key informants represent a high percentage of the total number of possible informants who could make well-informed comments about the regulation of interconnection pricing. This statement is based on the number of years that the interviewees have been involved in solving pending interconnection pricing issues in the Rwandan telecommunication sector, making them rich-informants. The presentation of the findings is organized alongside specific research questions previously stated in the previous chapter of research methodology. These research questions revolve around the following themes:

The existing interconnection pricing regime in Rwanda

- Efficiency of the existing interconnection pricing regime in the Rwandan telecommunication market.
- Major challenges facing the current interconnection pricing regime in Rwanda
- Approaches and strategies that can improve interconnection pricing regulation in Rwanda.

These themes presented above answer the overarching question and critical questions of this study. Rwanda has had several reviews of interconnection regimes since 2003. Therefore understanding the existing interconnection regime by probing how and why it was adopted in the Rwandan telecommunication sector answers the critical question 1 of this study. Investigating the impact of the existing interconnection pricing regulation on the Rwandan telecommunication sector was crucial because it helped the researcher to understand whether the existing interconnection pricing regime has achieved its intended objectives. Furthermore, the sub-themes such as effective interconnection rates and need for change of the current regime under the first theme answer question 2 of the study. For instance, the degree of fairness and reasonableness of interconnection rates is crucial for promoting market efficiency in any telecommunication sector. Different issues highlighted by the operators and regulators on the effectiveness of the current interconnection rates created a chance to probe the third theme; major challenges facing the current interconnection pricing regulation in

Rwanda. This theme answers question 3 of the study. Respondents expressed their personal views on challenges such as lack of policy instruments, lack of regulatory capacity and information asymmetry that have deterred the current interconnection regime to ensure market efficiency in the Rwandan market. Based on the challenges expressed the researcher went on further to probe for the fourth theme by asking the approaches and strategies RURA can adopt in order to address these challenges. The results obtained from this theme answers critical question 4 of the study. In general, after the researcher compiled all the interviews collected from RURA, MTN-Rwandacell, Rwandatel and TIGO Rwanda attending to all critical questions of this study, it was apparent that the results answer the overarching question of this study which investigates how the current regulation of interconnection pricing regulation in Rwanda has impacted the Rwandan telecommunication sector. More details of how results presented in this chapter link with the overarching question and sub questions of this study will further be discussed in the recommendations and conclusions chapter, which is chapter 7 of this study. Prior the presentation of the results obtained from the above themes, the next subsection presents a profile of the Rwandan telecommunication sector.

5.2 RWANDAN TELECOMMUNICATION SECTOR PROFILE

The Rwandan telecommunication sector is made up of three mobile and fixed operators. These include MTN-Rwandacell (incumbent mobile and fixed operator), TIGO Rwanda S.A (second mobile and fixed operator) and Rwandatel (incumbent fixed and a third mobile operator). With this significant number of operators in the market, Rwanda believes promoting fair competition and efficiency will increase telephony penetration enhance promoting economic and social developments. It is this reason Rwanda utilities and regulatory agency was established and granted authority to enforce fair competition between network operators and service operators and to regulate prices where competition was limited (RURA, 2004).

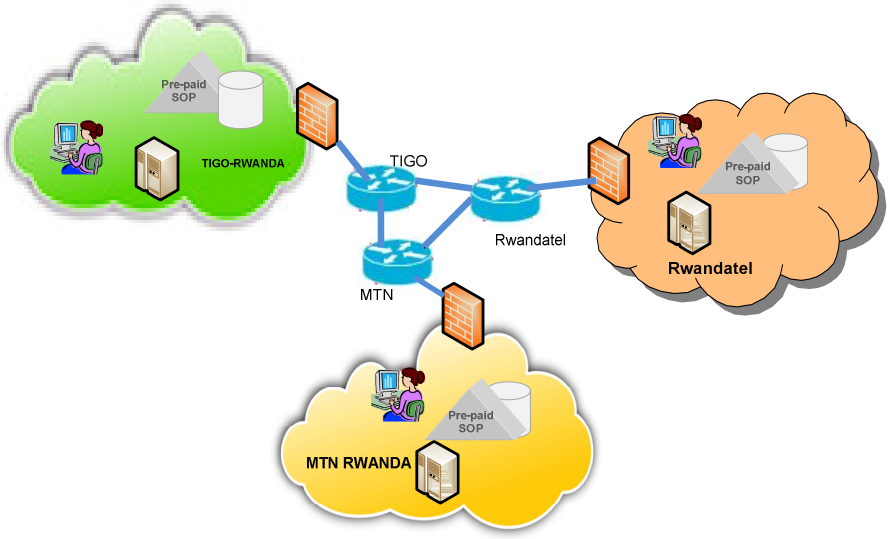
5.2.1 RWANDA UTILITIES REGULATORY AGENCY (RURA)

RURA is a multi-sector regulatory body in Rwanda which regulates telecommunications (networks and services), energy, water and sanitation and transportation (RURA, 2004). It is a government institution with 103 employees and four regulatory board members that were chosen by the Rwandan parliament after every five years. Its main key responsibility is improving service conditions and protecting consumers of these regulated sectors (RURA,

2004). However, due to the overwhelming contribution of the telecommunication sector in social and economic growth than any other sector, the government of Rwanda has been giving priority the regulation of telecommunication sector than other sectors.

This has been seen in the fact has issued several standard and individual licences to new mobile operators such as TIGO-Rwanda and renewing the mobile and fixed licence of MTN-Rwandacell and Rwandatel S.A. Unlike other sectors, to promote efficiency and competition in the telecoms sector, RURA must ensure and maintain any-to-any connectivity and safeguard against any abuse of market power in the provisioning of telecommunication services (RURA, 2008). For this to be possible, the Rwandan interconnection policy requires all public telecommunication operators in the Rwanda telecommunication sector to interconnect their network with those of other operators (RURA, 2004). The figure 4.1 below shows Rwanda mobile and fixed operator interconnection.

Figure 5. 1: Rwanda Mobile and Fixed operators' interconnection



The figure above depicts the interconnection between mobile and fixed operators' networks; MTN-Rwandacell, Rwandatel and TIGO-Rwanda in the Rwandan telecommunication sector. These undertakings interconnection through Microwave links (MW links) and IP networks.

5.2.2 MTN-RWANDACELL

MTN-Rwandacell is a parastatal mobile and fixed telecom company. Its major shareholder is the government with 50% and MTN group based in South Africa with 50%. It is a dominant mobile operator with 2,586,694 (71% of market share) active mobile subscribers and a second fixed operator with 10,995 active fixed subscribers. In order to fulfil its license

obligations, since 1998 the company has invested USD 150 millions to increase the number of sites and modernizing its billing system. Today it has a mobile coverage of 95% of the country. It is also a major ISP and the provider of Wi-Fi, WiMAX, VoIP, IPTV and mobile Data and has deployed 150km of fibre optics in Kigali City and 10.8 km of fibre optics within the country (RURA, 2009).

5.2.3 RWANDATEL

Rwandatel is a fixed and mobile telecom operator. Libyan African Investment Portfolio (LAP) is a major shareholder with 80% and Rwanda Social Security Fund (RSSF) with the remaining 20%. It is a dominant fixed operator with 28,653 subscribers and a third mobile operator with 345,711 subscribers. It has a backbone ISP with 500km of fibres and has more than 300 points of presence in the country. Under the supervision of RURA, it launched GSM and UMTS systems for providing 2.5G services, 3G services and MSAN for fixed networks services.

5.2.4 TIGO RWANDA S.A

TIGO Rwanda S.A is a mobile and fixed telecom operator owned by Millicom Cellular International (MIC). In two years of its launch in the market, TIGO-Rwanda, through its affordable communication packages such as “TIGO vuga” and “e-Go” surpassed Rwandatel to a second mobile market share position with 692,950 active subscribers (RURA, 2010). It is also a third fixed operator with 16 subscribers in the market.

5.3 THE EXISTING INTERCONNECTION REGIME IN RWANDA

The interconnection process in Rwanda started in I998 when MTN Group from SA launched its operations in Rwanda. This was mainly done to allow subscribers of the fixed incumbent, Rwandatel, to communicate with the subscribers of MTN-Rwandacell. For this to be done transparently, both companies had to enter into an interconnection negotiation for them to interconnect at a fair and reasonable access price. However, it has been shown that the Rwandan telecommunication sector has experienced several transitions in interconnection regimes. As the main aim of this study was to know the existing interconnection pricing regime in Rwanda, therefore the table 5.1 below presents the evolution of interconnection regimes in the Rwandan telecommunication sector since 1998.

Table 5. 1: The evolution of interconnection Regimes in Rwanda

Period	Call termination on the fixed network	Call termination on the mobile network	Interconnection Regime
1998-2003	Rfw.48	Rfw.48	Negotiation Between MTN-Rwandacell and Rwandatel-FAC-based rate
2003-2006	Rfw.28	Rfw.28	Interim Costs set by the regulatory agency(Asymmetric interconnection regime)
2006-2011	Rfw.30	Rfw.40	Interconnection rates generated by the study of the expert – TELRIC regime

Source: RURA 2004 & 2007

In Rwanda, interconnection negotiation with the intervention of the regulator as a mediator has been a preferred means for competitive operators to reach interconnection agreements on prices, terms and conditions amicably. According to the table 5.1 during the era of 1998 to 2003, interconnection negotiation between operators was the only regime to determine interconnection rates in Rwanda. In 1998, MTN-Rwandacell after its launch in the market, it entered into an interconnection agreement with Rwandatel, which was the sole fixed operator and the owner of essential facilities by then. As the table 5.1 demonstrates the two companies amicably agreed to pay each other Rfw.48 per call.

However, towards the end of 2003 MTN-Rwandacell and Rwandatel broke up into an interconnection rate dispute. During this case, MTN-Rwandacell strongly argued that Rfw.48 was too high and yet more network traffic was going to Rwandatel, the owner of essential facilities. It further argued that Rfw.48 was a blockade to competition in the Rwandan telecommunication market. RURA, which was established two years before this dispute, in accordance to its mandate, it intervened and imposed the interim symmetric interconnection charges. Hence the table 5.1 depicts that between 2003 to 2006 the interconnection rate was Rfw.28 per call on both MTN-Rwandacell and Rwandatel's networks. This was, however, imposed while RURA was in the process to hire a consultant to carry out a cost-based

interconnection review to determine an appropriate regime that can enhance an efficient level of interconnection in the Rwandan telecommunication market.

As it is highlighted from the table 5.1 above the current cost-based interconnection regime in Rwanda is TELRIC regime. This was recommended by a consultant who was hired by RURA to determine an appropriate cost-based interconnection regime to the Rwandan telecommunication sector. The rates that were determined by the consultant are Rfw.40 for mobile and Rfw.30 for fixed. This was also confirmed by PRI-MTNRwandacell. He asserted that "we [MTN] use TELRIC bottom-up forward-looking approach... even in 2006 the consultant determined the mobile interconnection rates of MTN-Rwandacell using TELRIC". He further explained that the consultant and RURA recommended LRIC plus mark-up model because they benchmarked and found out that Uganda, Kenya and Tanzania are using LRIC plus mark-up models. A respondent from RDB also underpinned that the current mobile and fixed termination rates are TELRIC–based.

However, respondents from RURA asserted that Rwandan interconnection policy advocates FAC or COSITU as the current cost-based model in the Rwandan telecommunication sector. To affirm this, PR1-RURA asserted that "...RURA adopted COSITU which is the same as FAC...the hired consultant proposed that it [FAC] was relevant to the Rwandan market". He further explained that FAC was adopted specifically to incentivise Rwandatel to build the network infrastructure. But after its failure to enhance efficiency and effective competition in the market, RURA adopted TELRIC as a proxy to address the deficiencies of FAC or COSITU regime. He mentioned that FAC-regime was characterized by arbitrary interconnection prices, limited innovation and abuse of power by the owner of the essential facilities. This regime favoured Rwandatel and this resulted into an interconnection dispute with MTN-Rwandacell. To expound this further, PR1-RURA narrated that between 1998 to 2003 Rwandatel used its market power to argue for high access charge that led to an interconnection agreement breakup with its competitor. To affirm that FAC is still being used in the sector, PRI-Rwandatel said that the Rwandatel calculated rates using FAC methodology and submits it to the consultant.

Contrary to this, significant respondents from MTN-Rwandacell asserted that TIGO-Rwanda (the new mobile operator in the market) neither uses FAC nor TELRIC based interconnection rate. PR2-MTNRwandacell asserted that" …we are uncertain about the interconnection regime TIGO-Rwanda has been using since its entry in the market". He further argued that

the regulator should always transparently communicate all incentives offered to new entrants to all the stakeholders so as to avoid regulatory uncertainty. This uncertainty has aroused intense debate among the operators about the appropriateness of access rate TIGO is charging in the market because neither MTN-Rwandacell nor Rwandatel declared to be knowing the cost-based model on which its charges are based, he said.

With respect to the above arguments, the next subsection presents the results attained from interview questions that attempted to investigate the impact of the existing interconnection pricing regulation in Rwanda.

5.4 THE IMPACT OF THE CURRENT INTERCONNECTION REGIME

As it has been mentioned in the previous section, the Rwandan telecommunication sector has experienced frequent interconnection regimes since telecommunication regulatory reform in 2001. However, none of these interconnection pricing regimes seem to have managed to ensure an efficient interconnection rate that can enhance efficiency and effective competition in the Rwandan telecommunication sector. This has been posing a challenge to RURA since 2003. The interconnection rate dispute in 2003 between MTN-Rwandacell and Rwandatel exposed the inappropriateness of FAC-based rate (Rfw.48) that was negotiated between the respective operators in 1998. In the 2004 hearings, MTN-Rwandacell argued that Rfw.48 was too high to encourage competition in the market and make the business to flourish. However RURA attributed this dispute to the accounting systems both MTN-Rwandacell and Rwandatel used to calculate Rfw.48. Respondents from RURA explained that the accounting system was on top-down method, the cost extraction from the operator's accounting and bottom-up method, the computation of total costs based upon network elements individual costs. They further expounded that one of the top-down methods was developed by COSITU in Rwanda telecoms sector.

To underpin this and to concur with MTN-Rwandacell argument in 2003, PRI-RURA responded that

> "…COSITU or FAC-based rate did not enhance efficiency in the market as RURA had expected".

To address these challenges, RURA commissioned a consultant to carry out a cost-based interconnection market review on networks of both Rwandatel and MTN-Rwandacell in order to determine an appropriate pro-competitive remedy to address the interconnection

disputes in the Rwandan telecoms market. The consultant using a TELRIC bottom-up forward-looking cost model came up with call termination Rfw.40 for mobile and Rfw.30 for fixed. Therefore since these rates are currently used in Rwanda, it is worthwhile in the next subsection to present the impact of TELRIC-based interconnection regime in the Rwandan telecommunication sector.

5.4.1 COST-BASED MODEL IN RWANDA: TELRIC

According to MTN-Rwandacell interconnection rate review 2006 report, TELRIC estimates additional costs incurred in producing interconnection relative to the costs already incurred by producing a portfolio of other services. It further explains that TELRIC includes all the costs directly attributable to interconnection, whether these are variables (depending on the level of traffic at a given capacity) or fixed (making up the capacity).

In the light of this, RURA decided to use TELRIC in order to address the traditional interconnection regime (FAC or COSITU)'s deficiencies. This was underpinned by PRI-RDB. He said that

> "...the 2006 consultative review was specifically to determine an appropriate regime that could address the deficiencies of FAC regime".

With respect to this assertion, TELRIC bottom-up forward-looking was expected to enhance efficiency and an effective level of competition in the Rwandan telecommunication market. As a preferred pro-competitive remedy, operators and RURA were hoping that it would determine appropriate interconnection rates and safe guard anti-competitive behaviours from the incumbents. However, the majority of respondents highlighted that TELRIC-regime turned out to be ineffective in the Rwandan telecommunication sector.

Respondents from RURA and Rwandatel strongly argued that efficiency and competition is still far away from effective because of an inappropriate interconnection regime. PR1-RURA said that

> "…the current interconnection regime is a bottleneck to the growth of the industry...because telecom operators cannot price lower than the interconnection charge".

He further explained that interconnection price is crucial to the new entrants in the market and affects the level of competition. The delay of RURA to realise this problem has

strongly affected mobile new entrants in the market he said. In conjunction with this, PR1-RCIP said that

> "...the current interconnection regime has had a strong negative effect on the Rwandan telecommunication level of competition and profitability of telecommunication companies...".

He further explained that Rwandatel and TIGO-Rwanda have been suffering more because of the current TELRIC- regime that does not allow them to make profits in the market. Since Rwandatel launched GSM, 80% of the traffic has been going to MTN-Rwandacell he explained. In light with this, respondents from Rwandatel also explain that since Rwandatel launched its GSM in 2008 it has been making profits for MTN-Rwandacell. To affirm this, PR2-Rwandatel asserted that

> "...it [TELRIC-based rate] has not enabled Rwandatel to upgrade its network...the company is not making profits in the mobile market".

He said that this is why Rwandatel has failed to increase its mobile coverage and why it was not able to pay $ 3.4 m it owes MTN-Rwandacell for interconnectivity. He further explained that the company is on the verge to insolvency. To affirm this, after the researcher collected the data, in April 2011 RURA revoked the GSM licence of Rwandatel. The argument was that Rwandatel failed to fulfil its licence obligations including upgrading its network in the Rwandan telecoms market. Although there are many factors that may have affected the profitability of Rwandatel, according to these findings, the current high mobile interconnection rate seems to have been the overarching factor.

TIGO Rwanda, although still new in the market, has also suffered because of the current interconnection regime in the Rwandan telecommunication sector. PRI-TIGORwanda lamented that

> "...the current regime is unfair because the company [TIGO-Rwanda] is not making any profits since its launch in the Rwandan market".

He explained that the current TELRIC-based rate is a barrier for them to compete with MTN-Rwandacell in the market and to make profits in the market. Like now the promotions which TIGO offers are only on net-calls but in the case of off-net calls the company cannot go below the current rate he said. This opinion is in line with RURA's view and Rwandatel's view that the current regime is a bottleneck to the sector's growth. However, many

respondents asserted the current interconnection regime favours the mobile incumbent in the mobile market. Two respondents asserted that:

> "…Rfw.40 favours MTN-Rwandacell but discourages small mobile operators in the market" (PR1-Rwandantel).

> "...MTN is a prime beneficiary of the current interconnection fees when compared to the other telecoms operators, Rwandatel and Tigo, with minority market share…" (PR2-RURA).

The interconnection consultative review of 2006 was conducted when MTN-Rwandacell was the only mobile operator in the Rwandan telecommunication sector. The consultant highlighted in the report that the rate was calculated only based on MTN-Rwandacell's accounting information, hence favouring MTN-Rwandacell only. This confirms with PR2-RURA and PR1-Rwandatel's general consensus that the current rate benefits only MTN-Rwandacell. This was also affirmed by the defensive responses collected from MTN-Rwandacell on this matter.

In the interviews, all respondents from MTN-Rwandacell argued for the current interconnection regime. They asserted that it has enhanced efficiency and effective competition in the Rwandan telecommunication sector. PR3-MTNRwandacell asserted that

> "It [TELRIC-regime] is appropriate because it has enabled MTN-Rwandacell to upgrade its network and to recoup its investment".

He explained that an effective interconnection regime is the one that certainly allows operators to recover their costs. He said that TELRIC regime has enabled the company to recover its costs invested in building network infrastructures. Respondents from MTN-Rwandacell further said that it also enabled new entrants to enter the market which was the main goal of RURA when it was adopting the current interconnection regime. PR1-MTNRwandacell asserted that:

> "…TELRIC-based regime is effective and it has enabled TIGO-Rwanda to enter the market…and RURA is also in the process to license the fourth mobile operator in the market".

This means that despite small mobile operators' controversies on the effectiveness of TELRIC regime, MTN-Rwandacell strongly perceive TELRIC-regime as a regime relevant to the Rwandan telecommunication sector context. In this regard, RURA concurs with small

operator's argument, however, there is no basis of its relevant based on the fact that RURA had just hired a consultant to study the appropriateness of the current interconnection regime in Rwanda. This presented chance to the researcher to probe the critical question 3 of the study extensively by trying to know operators and regulators' perception on the fairness and reasonableness of the current mobile and fixed interconnection rates in the Rwandan telecommunication sector. This is a key to answering the overarching research question of this study because the degree of fairness and reasonableness of interconnection rates is crucial for promoting market efficiency in the telecommunication sector. Since the main rationale behind the adoption of TELRIC-regime was to enhance a fair and reasonable interconnection rates in the Rwandan telecommunication, the researcher finds it worthwhile in the next subsection to present results that were obtained from the interview question that attempted to probe the opinions of respondents on the appropriateness of the current interconnection rates in the Rwandan telecommunication market.

5.4.3 EFFICIENT LEVEL OF INTERCONNECTION RATES IN THE RWANDAN TELECOM MARKET

The current mobile and fixed interconnection rates have been described as biased because they were determined using MTN-Rwandacell and Rwandatel's information only. In countries like Rwanda where there is not enough information to allow for the arbitration of interconnection rate disputes, the fairness and reasonableness of the level of interconnection rate is likely to be compromised. For instance, in the Rwandatel's cost-based interconnection study report of 2006 the consultant reported that more estimates were made due to lack of information about network traffic (ICEA, 2006). In the MTN-Rwandacell's cost-based interconnection study report of 2006 the consultant also reported that the evaluation of interconnection costs was complex due lack of correct information from MTN-Rwandacell (ICEA, 2006).

With respect to this, in order to understand the impact of the current interconnection regime further, the researcher asked a question to probe whether the current interconnection rates are fair and reasonable in the Rwandan telecommunication sector. Therefore the table 5 below presents the results obtained from the responses attended to the above interview question.

Table 5. 2: Is the current interconnection rate fair and reasonable?

Rate	Fair and Reasonable N=16	Unfair and Unreasonable N=16
Mobile Interconnection rate	5	11
Fixed interconnection rate	0	2

According to the above Table 5.2, it is apparent that respondents even those from the fixed-line incumbent were more interested in articulating on the fairness and reasonableness of the current mobile interconnection rates than fixed-line rates. The overwhelming majority of the respondents 11 out of 16 asserted that the current mobile interconnection rate is unfair and unreasonable. Some explained that it is unfair and not reasonable because it is too high to encourage competition.

5.4.3.1 Too high interconnection rate

Respondents from Rwandatel and TIGO Rwanda highlighted that the Rwandan telecom sector has grown significantly especially in the mobile market since 2006 and technology has greatly evolved, however, interconnection rates are still too high to encourage competition in the market. PRI-TIGORwanda argued that

> "…traffic has grown significantly and technologies... It is also strange to notice how much the retail tariff has decreased so much since that time but not the interconnect rate".

He explained that the number of operators has increased to 3 and RURA is planning to license the fourth operator in 2011. This has substantially increased the number of mobile subscribers to 3.6 m and operators have moved from 2G to 3G services and have also deployed fiber optics in the whole country. In spite of this achievements and technology evolution, the current interconnection rates have been seen as the bottleneck to the sector's growth in the Rwandan telecommunication sector. In the interviews, respondents also confirmed that the interconnection consultative review of 2006 turned out effective because

the consultant and the regulator did not put new technology into consideration. PR2-RURA asserted that:

"…some operators complain that the interconnection rates that prevail today are too high…this is because technological evolution and other forms of interconnection (i.e termination from fixed network to VoIP, from mobile networks to VoIP or vice versa etc) were not taken into consideration during the previous interconnection costing study".

As it is explained in this quote, the majority of respondents all lamented that current mobile rate is too high to encourage competition in the Rwandan telecommunication market. PR2-RURA further explained that this could be the reason why small mobile operators in the market have failed to fulfil the licence obligations such as upgrading the networks to enhance good quality of services in the market. In conjunction with this, PRI-Rwandatel asserted that

> "…Rfw.40 is too high to encourage competition in the market…it is a biased rate because it was determined based only on MTN-Rwandacell's information".

Small operators (TIGO-Rwanda and Rwandatel) strongly argue that the mobile incumbent's incentive is to make sure that the rate is in favour of it. Hence they described the current rate as biased based on the ground that it was determined using only MTN-Rwandatel's information. This is why in the previous section most of the respondents from Rwandetel and TIGO Rwanda asserted that the current regime only favours MTN-Rwandacell. Therefore, they further said that RURA should always be vigilant with the consultants because they can easily be influenced by the incumbent operators during the interconnection market review. To share light on this, PR1-RDB explained that

> "…Rfw.40 and Rfw.30 are not fair and not reasonable because they were calculated using an inappropriate cost-based regime".

Rwanda development board (RDB) perceives that the current interconnection rate is not fair and not reasonable. However, during the interview they highlighted that problem is not the incumbent's influence or lack of information from the incumbent's per se but also an inappropriate current cost-based regime. RURA also concurs with this perception and has called for the review on the current interconnection rates. To underpin this, PR2-RURA further said that

> "…RURA has announced to review the current interconnection rates….because the current interconnection fee of Rfw.40 per call is considered too high by operators with small market share."

This is evidence to show that the current interconnection rate is not fair and not reasonable to enhance efficiency and effective competition in the Rwandan telecommunication sector. Most of the pending interconnection disputes can all be attributed to the failure to bring the interconnection rates at an efficient level.

Despite arguments by Rwandatel and TIGO- Rwanda that the current access rate is too high, respondents from MTN-Rwandacell seem to contend against this argument. They argue that the current mobile interconnection rate (Rfw.40) is fair and reasonable. PR4-MTNRwandacell highlighted that

> "…it [Frw.40] is a fair and reasonable interconnection rate...recommended by RURA and calculated by benchmarking approach".

Based on the fact that it was determined under the supervision of RURA and nothing RURA has done to address its unfairness since 2006, MTN-Rwandacell believes that it is an efficient level of interconnection rate. MTN-Rwandacell further said that the current was determined based on the EAC interconnection rates benchmark. Furthermore, PR2- MTN-Rwandacell said that

> "…Rfw.40 is Fair and reasonable. MTN-Rwandacell has made significant investment in the network. Therefore the costing model should give incentives to recover its sunk cost".

To underpin it further, PR1-MTNRwandacell also explained that:

> "… the current interconnection fees are based on the investment made and the cost incurred in the transfer of calls from network to another…in otherwords the fee is justified by the level of investment a telecom company puts in the operations".

Respondents from MTN-Rwandacell highlighted that the level of interconnection depends on how much the operators have invested and the cost incurred to transfer calls to competitor's network. Based on how MTN-Rwandacell has been able to recoup all the money it has invested in building networks, they strongly perceive the current rate as an efficient rate in the Rwandan telecoms market.

In summary, the perception from small operators that Rfw.40 is too high to encourage competition answers the critical question 2 which probes how the current interconnection regime has affected the Rwandan telecommunication sector. However, MTN-Rwandacell's perception that Rfw.40 is an efficient rate and that it has enabled the company to be efficient in the market shows that small operators' perception per se is not sufficient to address the critical research question 2 of the study. Therefore in the subsection this chapter further presents the results obtained from the subtheme, too low interconnection rate, which emerged during the data collection.

5.4.3.2 Too low interconnection rate

In the fixed market, only 2 out of 16 respondents from Rwandatel were able to share their views on the fairness and reasonableness of the current fixed interconnection rate. PRI-Rwandatel responded that:

...the current fixed rate is unfair and unreasonable…it is too low…this is because RURA thinks that building a fixed network is less costly than building a mobile network. But in reality building fixed network is as costly as building mobile network.

Rwandatel argued that it has not been efficient as it had expected in the fixed market because of too low fixed interconnection rate, Rfw.30, that was determined by RURA in 2006. PR4-Rwandatel attributes Rwandatel's inefficiency to uncertainty of RURA about the dynamics of fixed market business. He said that fixed business was the only pivotal business for Rwandatel but the company now is on verge to insolvency. PR1-RDB also explained that the fact that MTN-Rwandacell and TIGO Rwanda never complain about the fairness of the current fixed rate could be the clear evidence to portray that Rfw.30 is as low as possible.

In the mobile market, despite the advocacy of TIGO-Rwanda for reduction of the current MTN-Rwandacell's mobile interconnection rate, respondents from MTN-Rwandacell also argue that TIGORwanda's interconnection rate is too low to encourage investment and delays facility based competition. PRI-MTNRwandacell responded that "MTN-Rwandacell reported TIGO-Rwanda to RURA that its current interconnection rate is too low to encourage investment in the market". They further said TIGO Rwanda's access rate is not based on any of the known international interconnection guidelines and that they are uncertain about the interconnection regime this rate is based on. Therefore the regulator should take drastic

measures before companies become inefficient and fail to meet their license obligations they said. However PRI-RDB highlighted that:

> "*...the fairness of interconnection rates depends on the cost structures and on whether customers are actually calling and the level of competition . It also depends on the advances on technology…"* .

He further expounded that the level of investment in technology is now high, therefore it is a high time for RURA to call for a change of the existing interconnection regime in order to determine efficient interconnection rate that will promote service-based competition in the Rwandan telecommunication sector.

In a nutshell, the previous section portrayed the contention between small operators and the mobile incumbent due to current exorbitant mobile interconnection rates. As the result they advocate for the reduction of the current interconnection rate to a reasonable and fair level. However, MTN-Rwandacell also argues that TIGO Rwanda's interconnection rate is too low to encourage investment and facility-based competition. Therefore it advocates for interconnection review on TIGO Rwanda's wholesale market. In the fixed market, Rwandatel also argues that Rfw.30 is too low to encourage investment. It also advocates for an increase of the current Rwandan fixed interconnection rate. These results are relevant to the understanding of how the current interconnection regime has affected the telecommunication market- which is the critical question 2 of this study, however, it is also noteworthy to know that the level of interconnection rate is not the only factor that affects the market efficiency and effective competition. With respect to this, the researcher was prompted to ask whether the current interconnection regime is fair or needs modification. This was specifically to know whether the current regime is worth a change. Therefore the next subsection presents the results obtained from the above interview question.

5.4.5 CHANGE OF THE CURRENT INTERCONNECTION REGIME

The results presented above clearly showcased that the level of interconnection rate depends on many factors. The majority of respondents said that it depends on the advanced technology, the level of competition and the level of investments in the telecommunication sector. As a result PR1-RURA said that "…RURA cannot only rely on the operator's arguments to change the current interconnection regime". With repect to this assertion, it was worthwhile for the researcher to ask the next interview question to probe whether the current

interconnection regime is fair or needs modification in the Rwandan telecommunication sector. The Table 5.3 below depicts results obtained from the above mentioned interview question.

Table 5. 3: Is the current interconnection regime fair or needs modification?

	Fair and need modification N=16	Not Fair and need modification N=16	Fair and no need for modification N=16	Not Fair and no need for modification N=16
Interconnection Regime	1	11	3	1

According to the Table 5.3 above, the data on this particular question were presented based on the four categories of responses. Firstly, respondents who asserted that the current interconnection pricing regime is fair but needs modification. Secondly, respondents who asserted that it is fair and needs not modification. Then, respondents who declared that it is not fair therefore it needs modification. Finally, only one respondent, being in the minority, said that it is not fair but does not need modification.

The overwhelming number (11 out of 16) of respondents asserted that the current interconnection regime is unfair and needs modification. Most of these respondents are from Rwandatel, TIGO Rwanda and RURA. Several arguments against the appropriateness of the current interconnection regime between small mobile operators and the mobile incumbent are still echoed in this section. PR3-Rwandatel responded that

> "…the current regime is unfair and needs modification …because 80% of the company's mobile traffic goes to MTN-Rwandacell and the company is making profits for MTN-Rwandacell".

Respondents from Rwandatel explained that since the launch of GSM the company has never been able to make profits as 50% of the operating cost of the company is allocated to interconnection fee per year. They further said that because of the delays in changing the interconnection regime the company has failed to pay $ 3.4 m to MTN-Rwandacell for interconnection fee. In short, they said that Rwandatel has been doing business for MTN-Rwandacell. In addition, PR1-TIGORwanda also affirmed that:

> "…the regime is unfair and need modification because TIGO Rwanda is not making any profits due to exorbitant interconnection charges that cannot make the business flourish".

Respondents from TIGO Rwanda also lamented that they are encountering more challenges in getting a foothold in the market because of the exorbitant interconnection rate MTN-Rwandacell is charging them. They further said that the current interconnection regime is a deadlock for their business to flourish. One respondent said that for a RURA to level a playing field the current interconnection regime should be changed. In the interviewee respondents from RURA also concurred with the perception of respondents from Rwandatel and TIGO Rwanda on this matter. PR1-RURA asserted that

> "…the current interconnection regime is unfair and needs to be changed….because it has been a bottleneck to the growth of the Rwandan telecommunication sector".

All respondents from the regulator share the same view that the current interconnection is supposed to be changed. They said that technology has changed and yet the interconnection consultative review of 2006 did not put it into consideration. It is due to this reason why RURA with the help of RCIP through the World Bank have hired Pricewaterhouse Cooper consultancy firm to carry out a second interconnection cost study on both operators. They further explained that based on this study outcome, the Regulator will be able to determine whether it can reduce the rates or not. But the majority of RURA's respondents confirmed that there is a more likelihood for the current Rfw.40 to be brought down to Rfw.20.

Interestingly, one respondent from MTN-Rwandacell also aligned himself with the above consensus, however, his main reason was that the current regime does not address infrastructure issues

> "…it [current interconnection regime] is not fair and needs modification because MTN was forced to share sites with TIGO-Rwanda and Rwandatel" (PR3-Rwandatel).

However, RURA's respondents explained that the regulator has to make a wise decision because MTN-Rwandacell wants to maintain high interconnection fee in order to recoup its previous investments, at the same time TIGO Rwanda and Rwandatel the current to be brought down to a lower level that can enable them compete effectively with MTN-

Rwandacell. They further said that if RURA fails to make right decision operators may get discouraged to invest in network infrastructure.

As it has been highlighted from above, respondents from MTN-Rwandacell their pursuit is to maintain the current interconnection rate. Significant respondents from MTN-Rwandacell strongly argued that the current interconnection regime is fair and needs no modification. Their explanation was that the regime is enabling them to recover all the investments they have made in building network infrastructure and that it has enabled other operators such as TIGO Rwanda to join the market and RURA is in a process to license the fourth operator.

> "…An appropriate regime is the one that enables stakeholders to recoup their investment…therefore I find it fair because MTN is been able to recover its sunk cost" (PR3-MTNRwandacell).
>
> "… It enabled the TIGO-Rwanda, the new entrant, to participate in the market" (PR2-MTNRwandacell).

Respondents from TIGO Rwanda affirmed that the company is sharing infrastructure site with MTN-Rwandacell. However, they further said that the regulator should make the infrastructure sharing simpler and more cost-effective for all operators in the Rwandan telecommunication sector.

In sum, a significant number of respondents advocated for the change of the current interconnection regime. They argued that it has deterred efficiency and effective competition in the market. However, respondents from MTN-Rwandacell contested against this perception. They strongly argued that the current regime has enabled the company to recoup its sunk cost and enabled new entrants in the mobile market. RURA aligns itself with small mobile operators' perception. However, respondents highlighted that RURA to determine an appropriate regime that will ensure efficient level of interconnection that will be acceptable to all operators. Based on the results above, MTN-Rwandacell wants to maintain high interconnection fee for it to recover its investment, at the same time, TIGO Rwanda and Rwandatel want lower interconnection fee for them to effectively compete in the market.

The argument of the overwhelming (70%) majority that the current interconnection regime is not fair and needs to be changed contributes to the answering of the overarching question and critical question 2 of this study which probes to know whether the current interconnection regime has achieved its intended objectives of market efficiency in the Rwandan

telecommunication sector. However to understand why it seem to have failed to achieve its intended objective as shown from the above results, the researcher asked the question to probe the challenges the current interconnection regime might have faced in the Rwandan telecommunication sector. Therefore the next section presents results obtained from the interview questions that probed to determine the challenges the current interconnection regime has faced in Rwanda.

5.5 CHALLENGES FACING THE CURRENT INTERCONNECTION REGIME IN RWANDA

In the previous section it was apparent that focusing on the current interconnection regime alone is not the only panacea of the interconnection disputes in Rwanda. Therefore in this section the researcher presents the challenges that may have deterred the existing interconnection pricing regime and how they have affected its effectiveness in the sector.

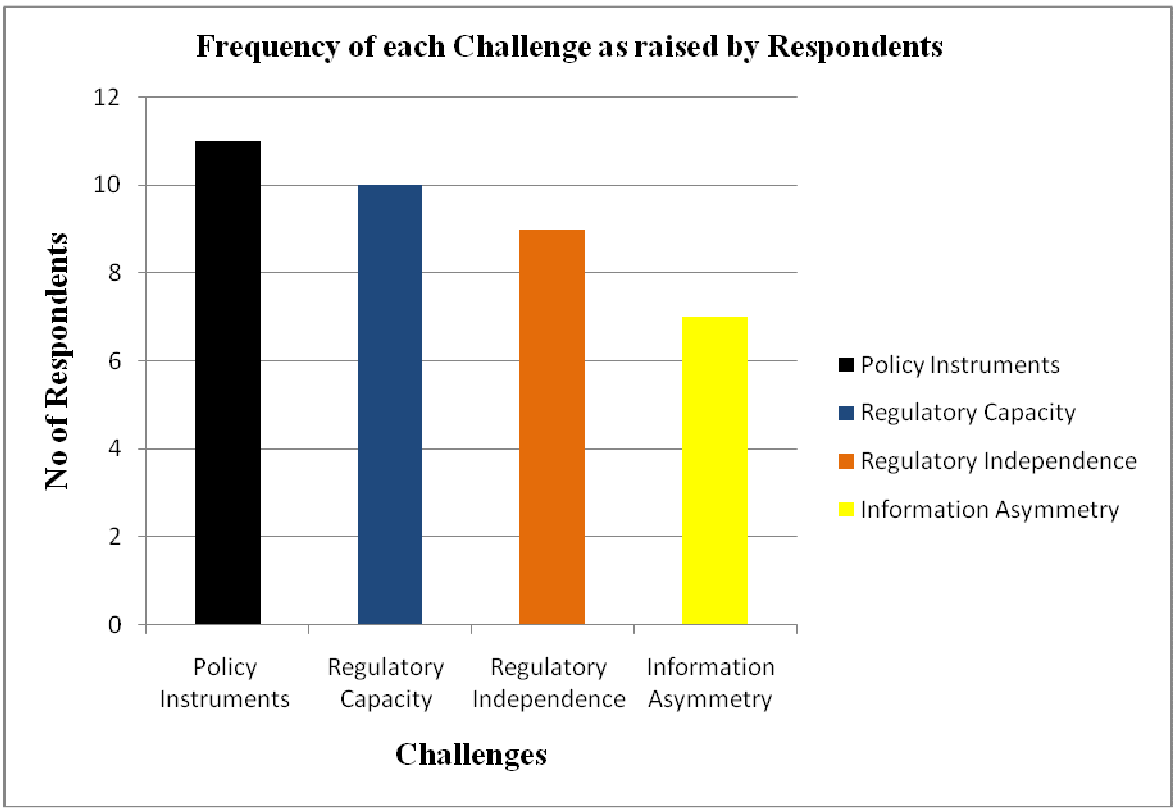
Table 5.4 and Figure 5.2 present results obtained from the interview questions that attempted to probe the challenges the current interconnection regime have faced in the Rwandan telecommunication sector.

Table 5.4: Regulatory capacity, information asymmetry, regulatory independence, and policy instruments

CHALLENGES	RESPONDENTS				
	MTN	RWANDATEL	TIGO	RURA	Percentage (%)
Policy Instruments	3	3	2	3	91%
Regulatory Capacity	3	3	2	2	83%
Regulatory Independence	2	4	2	1	75%
Information Asymmetry	1	4	1	1	58%

Furthermore the Figure 5.2 below illustrates the frequency of each challenge as raised by the interviewees during the interviews.

Figure 5. 2: Frequency of each challenge as raised by the Interviewees



5.5.1 LACK OF POLICY INSTRUMENTS

According to the table 5.4 the overwhelming number (91%) of respondents indicated that the regulator has no sufficient policy instruments to address interconnection regulation issues. Therefore the next subsection presents policy tools that were claimed to be missing in the Rwandan telecommunication sector.

5.5.1.1 Dominant player framework

The average number of respondents asserted that RURA lacks a dominant player framework. PR1-RURA responded that "…lack of the law to determine the dominant operators and non-dominant operators has also affected the current interconnection regime ". He explained that the uncertainty about the dominant player in the market has lead to high cross-network tariffs. Respondents from Rwandatel and TIGO Rwanda said that they are suffering because of policy tools deficit in the sector. They explained that in other countries such as Kenya through a clearly and comprehensive dominant player framework**,** asymmetric

interconnection regulation to incentivize new entrants to compete with incumbents or dominant operators has been implemented. But in Rwanda this has been not possible due to the absence of a clear and comprehensive dominant player framework in place they explained.

5.5.1.2 Infrastructure sharing framework

As a significant number of respondents stated that the main challenge in Rwanda is lack of a clear and comprehensive infrastructure sharing framework. PR1-MTNRwandacell responded that "…MTN-Rwandacell was forced by RURA to share its sites with TIGO-Rwanda and Rwandatel". He further said that Rwanda needs an infrastructure sharing framework that is simpler and cost-effective to promote facility based competition in the Rwandan telecommunication market. RURA respondents also affirmed that inasmuch as RURA longs to licence another fourth operator, infrastructure sharing policy should be drafted beforehand.

5.5.1.3 Dispute resolution mechanism

An average number of respondents asserted that RURA lacks a comprehensive and clear dispute resolution mechanism. PR2-Rwandatel respondents argued that:

"*…lack of dispute resolution mechanism has put small telecoms companies in Rwanda on the verge to insolvency due to disputes that have taken so long without being solved by RURA*"

He explained that Rwandatel at this point is at the edge to collapse in the mobile business market due to pending interconnection disputes RURA has been putting on hold. He said that the more the regulator fails to solve disputes on-time the more industries lose and the more customers are serviced with poor quality of services. PRI-MTNRwandacell also lamented that "…MTN-Rwandacell reported TIGO-Rwanda to RURA for charging too low interconnection charges but RURA has done nothing to solve the matter…". He explained that if RURA keeps being indecisive about this matter, some operators will collapse due to low revenue and lack of funds to fuel network expansion and growth of sector. He further said massive job losses and poor quality of services will be inevitable if not otherwise.

5.5.2 Regulatory capacity

According to the Table 5.4 above, a significant number (83%) of respondents declared that there is lack of regulatory capacity in the Rwandan regulatory environment. They attributed the failure of interconnection regimes in Rwanda to RURA's incapacity. For instance, they

asserted that TELRIC-regime did not enhance efficiency because RURA was not capable of knowing whether the network access costs are actual or not. Interestingly PRI-MTNRwandacell explained that operators' experts are more knowledgeable in the matters related to interconnection regulation than RURA's staff that are still new and have no experience in the field of interconnection regulation. In fact most of the staff in the regulator are fresh graduates and they are still in a learning process he said. In addition, PR2-Rwandatel further uttered that:

> " …the challenge industries are facing is that consultants when they come up with inappropriate rates… you find that the regulator is not in a position to contradict them due to lack of enough regulatory experts to follow-up the cost interconnection study and examine the relevancy of the decisions and outcomes of the process".

He further explained that RURA should recruit experts with hands-on experience in interconnection regulation who can challenge the consultants and experts from the industries.

5.5.3 RURA'S INDEPENDENCE IN INTERCONNECTION REGULATION

The results obtained from the interview questions that sought to probe the independence of RURA in interconnection regulation were presented based on the responses that attended to RURA's independence from government, RURA's independence from the telecommunication industries and RURA's independence in decision making. The table 5.4 below illustrates the results obtained.

Table 5. 5: RURA's Independence in regulating interconnection

	Independence from Government N=12	**Independence from industries. N=12**	**Independence in decision making. N=12**
Solving interconnection rate disputes	0=2 1=7	**0**=8 1= 2	**0**=3 1=7

1=Higher degree of independence, 0=Lower degree of independence

According to the table above, a significant number (7 out of 12) of respondents highlighted that RURA is free from government's influence in processes related to solving interconnection rate disputes. These results guarantee independence in decision making.

Thus, 7 out of 12 confirmed that RURA is independent in decision making in solving interconnection rate disputes. PR2–MTNRwandacell responded that "RURA has been independent in the decision making regarding resolving interconnection disputes". He further explained that RURA has been innovative in improving interconnection regulation by resolving interconnection disputes. He said, for instance, MTN-Rwandacell had planned to disconnect Rwandatel's switch because of the outstanding interconnectivity fee it owes MTN-Rwandacell, however, RURA intervened and shelved the plan. Conversely, some respondents contend against PR2–MTNRwandacell's view. They argue that a batch of interconnection disputes that are still pending in the Rwandan telecommunication sector is an example of RURA's lack of independence in solving disputes. Furthermore, PR1-Rwandatel responded that"…RURA is independent but they are influenced by the government in making decisions regarding setting interconnection rates…". He further explained that independence of the regulator from the government in setting interconnection is a crucial challenge in most of East African countries including Rwanda. He gave an example that the President of Kenya Mwai Kibaki halted KCC, the national regulator, from cutting the interconnection rates in Kenyan telecommunication sector. This demonstrates how operators have more influence in the government than the regulator he said.

According to Table 5.5 above, the significant majority (8 out of 12) of respondents highlighted that RURA has a lower degree of independence from telecommunication industries in solving interconnection disputes. In the interview, Rwandatel and TIGO Rwanda respondents share the same view that in setting interconnection rates the regulator is not fully independent from the influence of the mobile incumbent

> "…MTN still has a strong lobbying in the country" (PRI-TIGORwanda).

> "…Rfw.40 is biased…because MTN lobbied the consultant" (PR3-Rwandatel**).**

They said that MTN-Rwandacell as an innovation telecommunication challenger and an incumbent in the mobile market has been lobbying for high interconnection rates in the sector since 2003. They further asserted that RURA should also be careful when using consultants because they can easily be influenced by the industry. On the other hand, MTN-Rwandacell respondents also claimed that TIGO Rwanda has been lobbying for the cutting of interconnection rates in the Rwandan interconnection sector. PR1-MTNRwandecel highlighted that

"…since TIGO-Rwanda launched its operations in Rwanda it has been lobbying for the reduction of the current interconnection rate in the regulator".

He explained that RURA has to be vigilant to new entrants because their main incentive is always to advocate for the reduction of rates yet when it causes other operators to incur huge losses in the market. They cited that Kenya Communication Commission (KCC) was taken to court by the mobile incumbent due frequent reduction of interconnection rate that was always proposed by the new mobile entrants in the market. The responses from operators show that lack of regulatory independence from the telecommunication industries contributed to the ineffectiveness of the current interconnection regime. This answers sub question three of the study.

5.5.4 LACK OF INFORMATION

All respondents from RURA asserted that the main challenge is lack of sufficient information from the industry operators. In the MTN-Rwandacell cost interconnection study report 2006 the consultant said that" …lack of information to fill the models has rendered the evaluation of interconnection cost difficult" (ICEA, 2006). Furthermore, in Rwandatel's report he also reported that he made a lot of estimations because of lack of information on the detailed structure of traffic. As a result, Rwandatel's respondents strongly argued that RURA is uncertain about the dynamics of fixed market. RURA thinks that building a fixed network is less expensive than a mobile network. They further said that in reality building fixed network is as costly as building mobile networks. Conclusively an average number of respondents share the same view that the current interconnection regime TELRIC-regime failed because the consultant was not able to get detailed information from Rwandatel and MTN-Rwandacell.

5.6 REGULATORY MEASURES TO IMPROVE INTERCONNECTION REGULATION IN RWANDA

The challenges identified in the previous section prompted the researcher to probe what could be appropriate approaches or strategies RURA can adopt to improve interconnection regulation in the Rwandan telecommunication sector. This subsection presents approaches and strategies that were proposed by operators and researchers in the Rwanda telecoms market. This answers sub-question 4 of the study.

5.6.1 Reduction of mobile interconnection charge

Respondents from Rwandatel, TIGO Rwanda and RURA proposed for the reduction of mobile interconnection rate in the Rwandan telecommunication sector. PR3-Rwandatel asserted that:

> "...as Rwandatel, we welcome all attempts to lower the mobile interconnection charges… this will allow consumers the flexibility to enjoy the current 'minute Glut' [more minutes available than the consumers can consume] in the market".

He further explained that if RURA reduces the current mobile interconnection rate, operators in the market will not be worrying about the off-net interconnection rate as a bottleneck again. He further said that low interconnection rate will be very beneficial to subscribers and the general public. To affirm this, RURA also believes that bringing down the current interconnection rate will give a room to adjust pricing because at this stage operators are not able to charge below Rfw.40 in the market. He further said that RURA should do what regulators in Kenya and Uganda did. He said that KCC halved the interconnection to 50% and this forced the operators to cut call rates by an average of 60 per cent. In Uganda, UCC slashed to Shs131 and this has also forced operators to drop calls to an average of shs.200 per minute he said.

5.6.2 An increase in fixed interconnection charge

Rwandatel respondents all proposed for an increase on the current fixed interconnection rate. They argue that the current interconnection rate has not enabled the company to recover from access deficit. Access deficit it means that Rwandatel is not able to recover the average cost of servicing a line through its base subscription charges. PRI-Rwandatel said that RURA should set the rate that will not only allow Rwandatel to recover its access deficit but also its universal service obligations. Though technology is becoming cheaper, the cost of fixed network elements have gone up he said.

5.6.3 Asymmetric interconnection regulation

Respondents from TIGO-Rwanda and Rwandatel highlighted that lack of regulatory incentives affected their performance in the market. As a result they proposed for an asymmetric interconnection regulation. They explained that under this regulation, dominant operators pay highest interconnection call charges while non-dominant operators pay lowest charges, hence allowing him to price his cross-network charges much lower than any other

operator. This will minimize subsidies, attract serious bidders and increase investment for the rural operators in the Rwandan telecommunication sector.

5.6.4 Mobile number portability

In the interview respondents from Rwandatel and TIGO Rwanda shared the same view that establishment of mobile number portability will improve competition in the Rwandan telecommunication market. PR1-Rwandatel responded that"…we [Rwandatel] expect the immigration of customers from one operator to another...this will improve competition in the market". He further explained that a good number of subscribers in the Rwandan telecoms market are very reluctant to shift from one service provider to another due to the expected inconvenience that comes with getting a new phone number and inform all their friends. He said that in Rwanda more people have more than one SIM cards, yet this increases the revenue. This will be solved by the implementation of number portability in the Rwandan telecommunication sector, he said.

5.7 SUMMARY OF THE CHAPTER

Four themes: the existing interconnection regime, efficiency of the existing interconnection regime, challenges facing the current interconnection regime and strategies that can improve the interconnection regulation in Rwanda were addressed in this chapter. Results relating to the perception on the adoption and implementation of cost-based methodologies; FAC, COSITU and TELRIC were presented which revealed the existing interconnection regime in principle and practice in the Rwandan telecommunication sector. This answered the sub-question 1 of the study: What is the existing interconnection pricing regime in Rwanda?

Secondly, the results on the effectiveness of level of current TELRIC-rates (Rfw.40 for mobile and Rfw.30 for fixed telephony) in ensuring efficiency and effective competition related to the second theme of this study were revealed. This showed that the current mobile TELRIC-based rate is too high to encourage competition in the market and the current fixed TELRIC-rate is too low to encourage efficiency in the Rwanda telecoms market. As a result, it was further revealed that the TELRIC-regime is unfair and need to be changed. This demonstrated the degree at which the existing interconnection regime has affected the Rwandan telecommunication market. Thus, this answered the sub- question 2 of the study: How has the current interconnection pricing regulation affected the Rwandan telecommunication market?

Thirdly, the results related to the third theme of the study, the challenges facing the existing interconnection regime; lack of policy instruments, information asymmetry, lack of regulatory capacity and lack of RURA's independence from the telecommunication industries in solving interconnection disputes were also presented. It was revealed that operator's experts are more knowledgeable in interconnection regulation than RURA's employees. Furthermore, the results presented that lack of SMP and Infrastructure framework in place, and information uncertainty between operators and RURA affected the effectiveness of the current interconnection regime. These results answered sub-question 3 of the study: What challenges facing the current interconnection pricing regulation in the Rwandan telecommunication market?

Finally approaches and strategies such as asymmetric interconnection regulation, reduction of the current mobile interconnection rate, increase on the fixed current interconnection and mobile number portability recommended by the respondents addressed the fourth theme of this study which answer the sub-question 4 of this study: What are approaches and strategies can be adopted to improve interconnection pricing regulation in Rwanda?

In general, the results have revealed that the current interconnection pricing regime is characterized by an inappropriate level of interconnection rates that can ensure effective competition and innovation. However, the results has shown that this ineffectiveness should not be attributed to TELRIC-regime but also other factors such as lack of RURA's independence from telecoms operator and information asymmetry. Thus, the results revealed in whole chapter answered the overarching question of the study: How has interconnection pricing regulation impacted the Rwandan telecommunication sector? The link between these findings, the research question and literature theories will be discussed in the next Chapter 6 of the study.

CHAPTER SIX: THE IMPACT OF COST-BASED INTERCONNECTION REGIME IN RWANDA

6.1 INTRODUCTION

In the previous chapter five of this study, the researcher presented the findings by describing RURA's and operators' perceptions on the regulation of interconnection in Rwanda. Since descriptive data do not make sense without interpretation, this chapter draws together results from chapter five, relating them to the study research aims and questions and literature review in chapter 2 & 3. Section 6.2 focuses on the first theme of the study, the existing interconnection regime in Rwanda. Section 6.3 discusses findings relating to the second theme, the efficiency of the existing interconnection regime in the Rwandan telecoms market. Section 6.4 draws together challenges the existing interconnection regime in Rwanda is facing (the third theme of the study). Section 6.5 discusses the findings relating to the fourth theme of this study, strategies and approaches RURA can adopt in order to improve the interconnection regulation in Rwanda. Section 6.7 is a summary of the chapter.

6.2 THE EXISTING INTERCONNECTION REGIME IN RWANDA

After the 1994 genocide the Rwandan telecommunication sector has grown significantly from a monopoly to an oligopoly. It is made up of three mobile and fixed operators. These include MTN-Rwandacell (incumbent mobile and fixed operator), TIGO-Rwanda S.A (second mobile and fixed operator) and Rwandatel(incumbent fixed and a third mobile operator).Therefore for us to understand the existing interconnection regime in Rwanda we need to first understand the access pricing model that is relevant to the Rwandan telecommunication market. In the mobile market, the findings revealed that all three operators are interconnected and they all buy inputs from each other's network. This aligns with Armstrong's (2001) theory of two-way access pricing model. He defines two-way access pricing model as a model where operator B (incumbent) and operator A (small operator) have to purchase inputs from each other. He further explains that under this model for operators to interconnect they have to enter into an interconnection agreement on terms and conditions, especially access charges. This means that all mobile interconnection regulation issues that will be discussed in this chapter will be categorized under two-way access pricing model problems.

In the fixed market, it was revealed that TIGO-Rwanda and MTN-Rwandacell buy inputs from Rwandatel but not vice versa. This aligns with Armstrong's (2001) theory of one-way access pricing model. He defines one-way access pricing model as a model where an operator B buys all inputs from operator B not vice versa. However, except the argument from Rwandatel that the current fixed termination rate is not efficient no other issues were raised in the findings from its competitors. Therefore this chapter will interpret most of the findings on the grounds of two-way access pricing principle.

Under two-way access pricing model, Armstrong (2001) expounds that the main issue is that can free negotiations between operator B and operator A over mutual termination charges induce high prices for subscribers. The findings revealed that in Rwanda before telecoms reform of 2001, the negotiation of interconnection prices and terms among telecom operators without the intervention of the regulator or competition policy institution turned out to be ineffective. The findings depicted that in 2003 the interconnection agreement between Rwandatel and MTN-Rwandacell failed and resulted into a serious interconnection dispute that affected the welfare of their customers. During the hearings of 2003, MTN-Rwandacell argued that the rate (Rfw.48) which they had agreed on amicably was too high to encourage competition in the market. This aligns with Wright's (2000) and Laffont et al.'s (1998) arguments. Wright (2000) argues that under unregulated agreements, the incumbent always has incentives to charge too high access charges. Laffont et al. (1998) also argue that access rate resulted from unregulated negotiations can lead to market failure. Di Pillo et al. (2009) attribute the issues of high interconnection charges in the telecoms market to the caller party pay (CPP) scheme that has been taken as a one-size for all in developing countries. In the light of this, the finding revealed that Rwanda uses caller party pays (CPP) pricing principle. In other words, when subscriber A of MTN-Rwandacell calls another subscriber B of MTN-Rwandacell or subscriber of Rwandatel or TIGO-Rwanda, subscriber A is the one who will pay all the charges. This is predominately used in all East African countries.

Despite CPP being a one-size for all in East African countries, Di Pillo et al.'s (2009) further explain that CPP produces incentives for larger operators to lower the prices on-net calls and increase the charges of off-net calls in order to drive the small network operator out of the market. In light of this, the finding further revealed that in interconnection negotiation of 1998, Rwandatel used its monopoly power to bargain too high access charges (Rfw.48) in order to drive MTN-Rwandacell, the new operator by then, out of the market. This distorted

the market and affected the welfare of their customers. This is a clear evidence to show that free interconnection negotiation induced high charges to subscribers and has been accrue to interconnection rate dispute in the Rwandan telecommunication sector.

The findings revealed that the government of Rwanda decided to address the issue of high interconnection charges by regulating the Rwandan telecommunication sector. Cave et al.(2003) supports this decision when he explains that many countries such as UK, Australia, Uganda, New Zealand to mention a few are using CPP regime and the issue of high interconnection charges has been addressed by regulation in the telecommunication industry.

According to RURA (2004), RURA was granted a mandate to facilitate a successful conclusion of interconnection agreements and to impose interconnection terms on both parties which are objective, non-discriminatory and transparent in case negotiations fail. However, Cave and Crowther (2004) contest against this decision by highlighting that sector specific approach requires large flow of information from the regulated entity when it comes to imposing interconnection terms. Instead, they campaign for competition policy approach. They explain that competition policy requires no information from the operators but just relies on the complaints and gathers information only in connection with enforcement agencies. However, Spiller and Cardilli (2007) align with Cave et al. (2003) in supporting Rwanda's decision. Taking Australia as an example, they explained that specific regulations have been quite successful in delivering both competitive interconnection rates and a smooth implementation of equal access.

The finding further demonstrated that after the break-up of interconnection negotiation between MTN-Rwandacell and Rwandatel in 2003, RURA in accordance to its mandate intervened and imposed the interim asymmetric interconnection charges of Rfw.28 per call on both networks while it was in the process of hiring a consultant to carry out a cost-based interconnection review on both MTN-Rwandacell and Rwandatel's networks. The aim of this review was to determine an appropriate interconnection regime that can enhance an efficient level of interconnection rates in the Rwandan telecommunication sector. This resonates with Pietz's (2003) argument which states that it is not just a matter of intervening that alleviates the interconnection pricings issue but the commitment of the regulator to adopt a clear and comprehensive interconnection policy that specifies what happens when the interconnection negotiations fail. However, the findings revealed that Rwanda has experienced several transitions of interconnection regime since 1998 due to regulatory challenges around

determining an appropriate regime that can ensure fair and reasonable interconnection rates. This resonates with Jamison's (1998) argument that the main challenge to the regulatory agency is determining the regulatory principle that will not turn out to be inappropriate in the light of actual costs and market conditions. Therefore to understand the current existing interconnection regime in Rwanda, the next subsection will discuss RURA's commitment in adopting an appropriate interconnection regime.

6.2.1 COST-BASED INTERCONNECTION REGIME IN RWANDA

The findings revealed that the existing interconnection regime in Rwanda is a cost-based interconnection regime. Lazauskaite (2009:6) explains that cost-based regime is a regime where "prices should reflect their costs plus reasonable rate and should reflect the rate of return which operators are allowed to earn". With this respect, RURA (2004) expounds that Rwanda through RURA adopted cost-based access principle in order to determine the level of interconnection rate that can ensure efficiency and effective competition in the market (RURA, 2004). RURA's respondents explained that cost-orientation ensures allocative and productive efficiency in the telecommunication sector. Cave and Prosperetti (2001) support RURA's choice by arguing for cost-based pricing principle as an effective remedy that can enhance efficiency and incentive compatible. Respondents from RURA further highlighted that cost-based regime is relevant to Rwanda because there is no enough information available. In conjunction with this, Jamison (1998) highlights that cost-based access principle is an appropriate pro-competitive remedy relevant to countries where there is no information available to the regulatory agency. However, Wright et al. (2006) suggest that for cost-based principle to be effective the regulator should choose and implement an appropriate backward-looking or forward-looking cost-based approach to encourage the incumbent to invest earlier.

Nevertheless the findings demonstrate that despite RURA's commitment to adopt appropriate backward-looking or forward-looking approaches, cost based principle has failed to ensure access of new entrants to incumbents' network at fair and reasonable interconnection rates. However, this was attributed to lack of RURA's capacity to choose an appropriate cost-based model and implement it effectively. This resonates with Salinger's (1998) assertion that cost-based models may theoretically be sound, but their implementation in practice is rather complex. Based on the understanding of the existing interconnection approaches in the Rwandan telecommunication sector, the figure 6.1 shows the analytical framework that

explains the contention behind the implementation of cost-based approaches in the Rwandan telecommunication sector.

Figure 6. 1:Analytical framework of the current interconnection regime

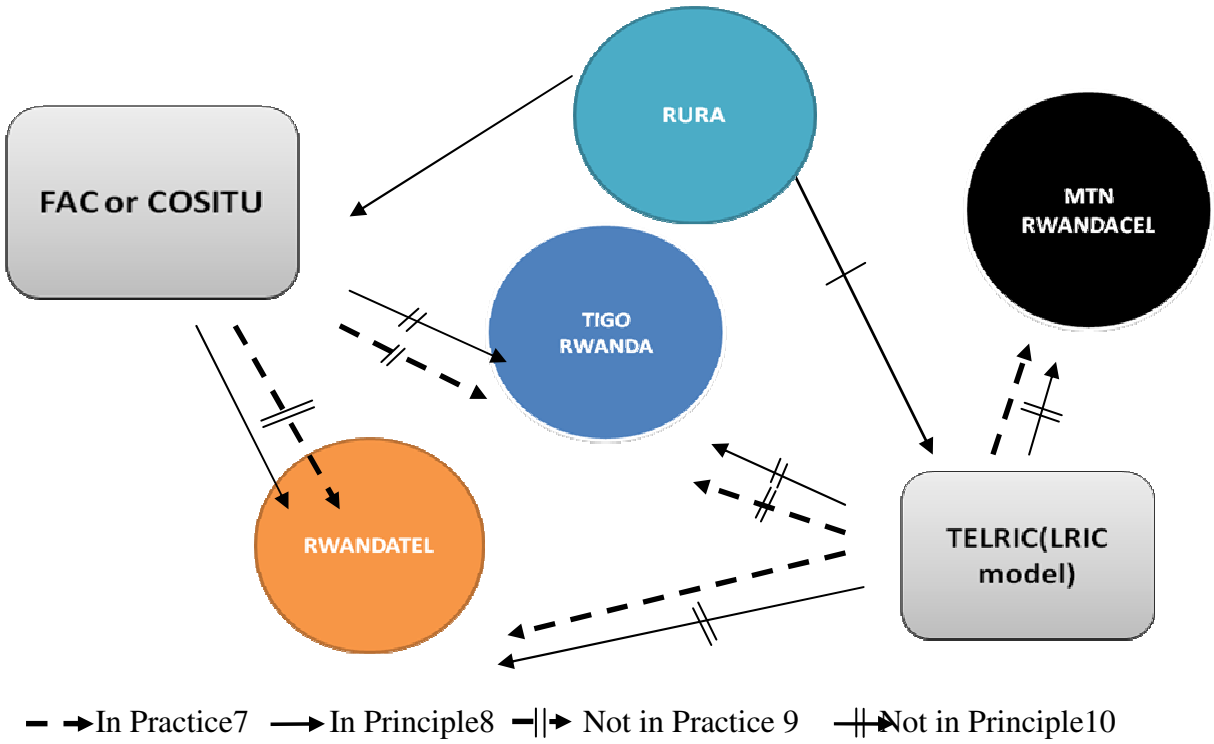


Figure 6.1 above shows that RURA adopted FAC cost-based methodology. This is a model that was developed by ITU for calculating the costs, rates and taxes relating to telephony services. The model is based on the enhanced fully allocated costing (FAC) principle. It also illustrates that FAC is the regime which RURA claims to be in principle in the Rwandan telecoms sector. However the findings depicted that it is in practice in Rwandatel only. This aligns with Nsengiyumva and Habumuremyi's (2009) assertion that Rwanda's current interconnection rule is in principle but not in practice.

Secondly, according to the figure 6.1 above, RURA adopted Total Element Long-Run Increment Cost (TELRIC)-regime. The finding revealed that TERLIC-regime was adopted to complement FAC. However, TELRIC-regime is not in principle but in practice in MTN-Rwandacell and Rwandatel. Lastly, according to the figure 6.1 above neither TERLIC nor FAC is in practice or principle in TIGO-Rwanda. These inconsistencies in the

7 In practice means that the model is being used
8 In principle means that the model is advocated by the policy
9 Not in practice means not being used.
10 Not in principle means not advocated by the policy

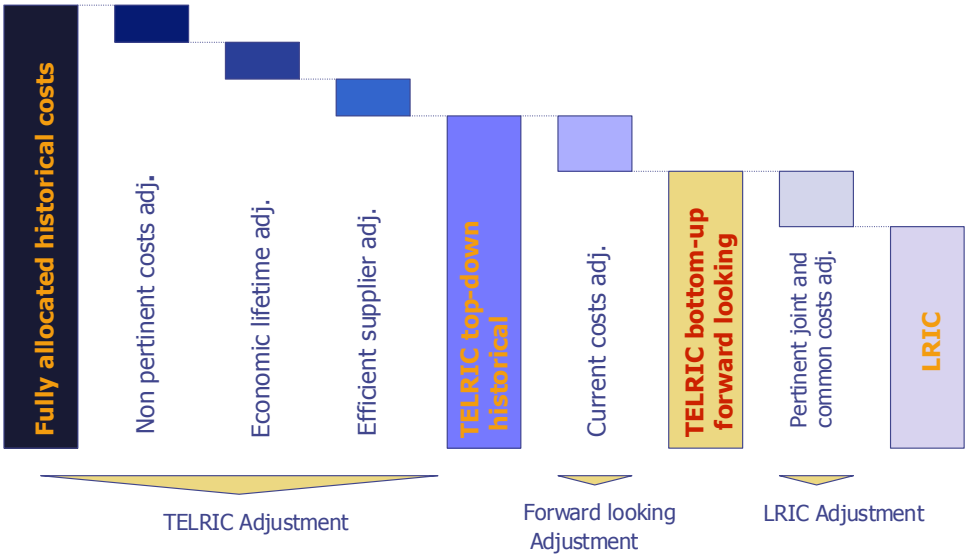
implementation of the current cost-based regime demonstrate how complex it has been for RURA to execute interconnection regime effectively. This is also explained by Salinger (1998) that cost-based regime is theoretically sound but its implementation in practice is rather complex.

However, despite inconsistencies that have been showcased above, the findings revealed that the current fixed and mobile interconnection rates in Rwanda are based on Total Element Long-Run Increment Cost (TELRIC) bottom up forward-looking approach. However, Magonyozi (2008) in his study on the interconnection harmonization of EAC highlighted that lack of effective interconnection framework has resulted into interconnection rate disputes between dominant operators and new entrants in the Rwandan telecommunication market. Therefore since this study attend to investigate whether the current interconnection regime has achieved its intended objectives. The next sub sections will discuss the implementation of TELRIC-regime in Rwanda and its impact on the Rwandan telecommunication sector.

6.2.1.1 Implementation of TELRIC-regime in Rwanda.

According to Falch (2004), TELRIC estimates additional costs incurred in producing interconnection relative to the costs already incurred by producing a portfolio of other services. The findings revealed that RURA implemented TELRIC approach to address FAC-regime's deficiencies in the Rwandan telecommunication sector. To embrace this, Noumba et al.(2004) suggest that in countries where FAC has been a traditional regime, one can move to LRIC step by step by removing the layers of cost inefficiencies. In the light of this suggestion, the findings demonstrate that the consultant also decided to base on FAC historical costs in order to move to LRIC step by step. The figure 6.2 below depicts the TELRIC methodology that was used by the consultant to calculate the current interconnection rates.

Figure 6. 2: TELRIC Methodology used to determine the current access rates

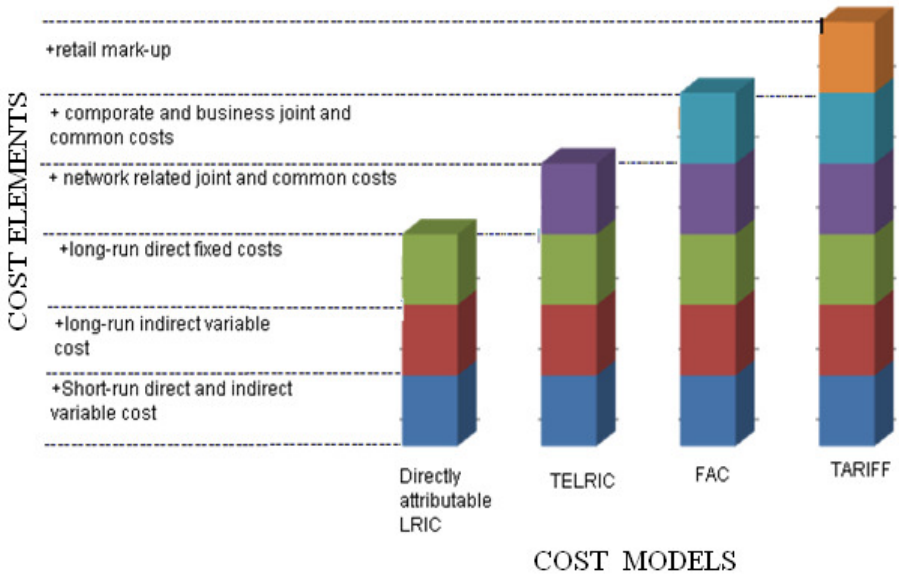


Source: ICEA, 2006

According to the figure 6.2 above it appears that MTN-Rwandacell and Rwandatel prior the cost interconnection review of 2006, their accounts were based on fully allocated costs.

RURA explained that the accounting system was on top-down method, the cost extraction from the operator's accounting and bottom-up method, the computation of total costs based upon network elements individual costs. Noumba et al. (2004) highlight that the difference between FAC and TELRIC resides in the removal of non-relevant common costs. For a clear explanation see the figure 6.3 below.

Figure 6. 3: Cost elements of different cost models



Source: Adapted from Coetzee(2010)

According to figure 6.3, it is apparent that fully allocated cost (FAC) involves all costs or overhead costs. However, TELRIC, which is a type of LRIC plus mark-up, only involves network related joint and common costs. Joint costs are those costs generated by a family of services or products (e.g building costs for a telephone firm) (Noumba et al., 2004). Common costs are those costs that are shared by all services or products (Noumba et al., 2004). With respect to this, the consultant and the regulator to enhance effective interconnection regulation introduced a concept of pertinence of cost as illustrated in figure 6.3 above. Here non-pertinent costs mean those that are not related to network joints and common costs, while as pertinent joints and common costs mean those that are related to networks costs as the figure 6.3 depicts. To adjust to TELRIC historical top-down rates, the consultant removed non relevant costs (e.g marketing, commercial costs, financial costs for bad debts). Furthermore, he considered the investment costs, their economic life and not accounting life as shown in the figure 6.3. This aligns with Noumba et al. (2004)'s argument that one can move to LRIC step by step by removing cost inefficiencies.

With respect to difficulties such as lack of detailed information from the incumbents and lack of enough capacity that were experienced in the course of determining TELRIC top-down historical, RURA with the support of ICEA consultancy firm decided to implement a TELRIC bottom-up forward-looking. This concurs with Noumba et al.'s (2004) suggestion that in countries where the regulator has no good knowledge of the industry cost structure, TELRIC bottom-up forward-looking should be implemented. They further underpinned that

TELRIC bottom-up method represents a decision-making instrument that enhances improvements on procedures and processes implemented by regulators to collect and retrieve cost information.

RURA's decision to adopt a TELRIC bottom-up forward-looking approach is supported by a many scholars. Geradin and Kerf (2003) underpin that forward-looking approach enables the incumbent to be efficient and reduces the actual cost that it incurs in providing interconnection. While as backward-looking approach gives no guarantee that an incumbent will recoup costs it incurs in providing interconnection. This shades light on the reason why Rwandatel used its market power to negotiate exorbitant access charge (Rfw.48 per call) in 2003. Furthermore, Falch (2005) also underpins that bottom-up approach is more preferred than top-down because it involves less assumptions. Lastly, ITU also supports RURA's

decision by recommending bottom-up approach as the most "accurate" of measuring unit costs in countries where sufficient data are not available (ITU, 2003:50).

However, the findings revealed that the interconnection evaluation process was very difficult due to lack of detailed information from Rwandatel and MTN-Rwandacell about network joints and common costs. For instance the consultant reported that he made more estimates or assumptions in calculating the current fixed access rate due to lack of information about the network traffic (ICEA, 2006). The consultant also asserted that lack of information from MTN-Rwandacell to fill the models rendered the evaluation of interconnection cost difficult (ICEA, 2006). This resonates with Noumba et al. (2004)'s argument that the concept of pertinence affects the handling of joints and common costs. They further highlight that when this concept in not effectively applied there is always a risk of overestimating the common fixed costs because the incumbent always has incentives to argue for high common costs to squeeze out its competitors by reporting non-relevant costs. In conjunction with this, Xavier (1997) also argues that calculating forward-looking cost often becomes challenging and time consuming due to the absence of reliable cost information from the incumbent. Therefore it is always necessary to ensure that common costs attributed to the increment are sound.

The findings and discussion above reveal that there are inconsistencies and controversial issues in the implementation of the existing interconnection regime in Rwanda. These align with Salinger's (1998:28) assertion that "the use of LRIC is theoretically sound, but its implementation in practice is rather complex and could undermine the profitability of the incumbent's investment if poorly executed". In the light of this argument and issues showcased above in the implementation of the current interconnection regime, it is worthwhile in the next section to discuss the impact of TELRIC-regime on the Rwandan telecommunication sector.

6.3 IMPACT OF TELRIC REGIME ON RWANDAN TELECOM MARKET

The findings revealed that the consultant recommended TELRIC as the approach that is relevant to the Rwandan telecommunication sector since all the pro-competitive regulations had turned out to be ineffective by then. This resonates with Melody's (1997) assertion which states that TELRIC facilitates the implementation of pro-competitive policy for local exchange interconnection and network access for LEC competitors.

Although RURA had more hope in TELRIC bottom-up forward-looking approach that it would enhance efficiency and effective level of competition in the Rwandan telecoms market, the majority of the respondents highlighted that TELRIC-regime has turned out to be ineffective. A substantial majority (66%) of the interviewees asserted that the current interconnection regime is unfair and needs modification. PR3-Rwandatel lamented that the current interconnection costs are arbitrary. This concurs with Noumba et al.'s (2004) argument that selecting a specific TELRIC-regime leads to arbitrary exercise. This leads to the determination of inappropriate interconnection rates. However, this is contrary to Falch's (2005) and ITU's (2003) argument that bottom-up based approaches entails less estimation and ensure correct cost units where there is no information available. Consequently, the findings revealed that the current regime has been a bottleneck to the growth of the sector. RURA highlighted that current interconnection regime has had a strong negative effect on the Rwandan level of competition and profitability of telecommunication companies. Rwandatel respondents lamented that 80% of the mobile traffic goes to MTN-Rwandacell. TIGO Rwanda further said that 50% of the company's profit is paid to MTN-Rwandacell for interconnectivity.

As the result, TIGO Rwanda and Rwandatel declared that they are suffering in the market because they are making profits for MTN-Rwandacell only. This explains why Rwandatel has failed to increase its mobile coverage and why it was not able to pay $ 3.4 m it owes MTN-Rwandacell for interconnectivity. This affirms Salinger's (1998) argument that poor execution of the access regime could undermine profitability of operators' investment. It also concurs with the argument of Magonyozi (2008) and Nsengiyumva and Habumuremyi (2009). Magonyozi (2008) argued that efficiency in the Rwandan telecoms is affected by lack of a comprehensive and clear interconnection framework. Nsengiyumva and Habumuremyi (2009) also said that competition is far from effective in the Rwandan telecommunication sector due to pending interconnection disputes.

Respondents from RURA and RDB strongly argued that TELRIC-regime did not address FAC-regime's deficiencies in the Rwandan telecommunication. They said that the current regime is inappropriate because the consultant that carried out the interconnection review of 2006 did not consider technology evolution. To shade light on these arguments, Melody

(1997) further argues that TELRIC-regime is characterized by high termination revenue that provides little incentives for operators to upgrade their networks to the most efficient technology. In other words, this means that RURA should not have chosen TELRIC in such a case. This also shared light on the reason why Rwandatel's mobile license was revoked by RURA in April 2011 due to its failure to fulfil licence obligations particularly upgrading networks.

However, MTN-Rwandacell's respondents argued for the current interconnection regime as an effective regime. They explained that TELRIC-regime is fair because it enabled MTN-Rwandacell to retrieve its sunk cost and TIGO-Rwanda to enter into the market. This is a clear evidence to show that the current interconnection regime has been favouring MTN-Rwandacell. This aligns with Armstrong's (2001) argument that due to incumbent's incentives to ensure productivity efficiency, to maximize profits and to extract industry's profits for itself most regulatory principle tend to favour the incumbent more than the small operators in the market.

Nevertheless, at this stage of discussion the researcher it would be irrational to conclude that the current TELRIC-rates are not efficient. The findings revealed that the efficiency of the level of interconnection rates does not depend on the pricing principle only but also on other factors. For instance, PRI-RDB said that the efficiency of the level of interconnection rate depends on the level of competition, cost structures and advances in technology. This concurs with Laffont et al.'s (1998) argument that focusing on the cost-based on pricing principle alone cannot lead to positive results.

Based on the argument above, the researcher found it worthwhile in the next subsection to discuss the operator's and regulatory agency's perception on the fairness and reasonableness of the current interconnection rates in the Rwandan telecommunication sector.

6.3.1 EFFICIENT LEVEL OF INTERCONNECTION RATE IN RWANDA

Jamison (1998) and Armstrong (2001) argue that the main rationale behind adoption of access pricing principle is to determine a fair and reasonable interconnection charge that can enhance efficiency and competition in the market. However, in the findings a substantial number (66%) of interviewees asserted that the current mobile interconnection rate is unfair and unreasonable. Substantial respondents (PR1-Rwandatel, PR1-RCIP and PR2-TIGORwanda) asserted that the current interconnection regime is too high. On the other hand, PR2-MTNRwandacell lamented that interconnection rate for TIGO Rwanda is too low.

Either ways have a direct bearing on the efficiency and level of competition in the Rwandan telecommunication market.

6.3.2.1 TOO HIGH INTERCONNECTION RATE

The findings revealed that the current mobile interconnection rate (Rfw.40) MTN-Rwandacell charges its competitors are too high to encourage competition. Rwandatel and TIGO Rwanda respondents argued that the sector has grown significantly especially mobile market and technology has evolved but the interconnection rate is still too high to make business flourish. Respondents from small operators attributed their failure to become efficient and competitive in market to this exorbitant access charges. To affirm this, Laffont et al. (1998) argue that high interconnection charges prevent effective competition in a mature market and erect barrier to entry in transition towards competition. It also resonates with Falch (2005)'s and Armstrong's (2001) argument which states that too high interconnection charges discourage competition in the market.

Nevertheless, respondents from MTN-Rwandacell share the same view that the current interconnection rate is fair and reasonable. They explain that the current rate has enabled MTN-Rwandacell to recoup its sunk costs and enabled TIGO-Rwanda to enter into the market. In conjunction with this, Noumba et al. (2004) expound that in most cases TELRIC regime rates favours. It also informs RURA's and small operator's perception that the current interconnection regime is biased and favours MTN-Rwandacell only. To support this perception, Cave and Volsgang (2003:54) contest against MTN-Rwandacell's view by saying that "there is no evidence to support that high interconnection price is a means to encourage infrastructure competition".

6.3.2.2 Too low interconnection rate

In the mobile market, the findings revealed that too low interconnection rates charged by TIGO -Rwanda that are not based on any known international interconnection guidelines have deterred investment in the Rwandan telecommunication market. This has resulted into interconnection disputes among the mobile operators. For instance, MTN-Rwandacell reported TIGO-Rwanda to RURA arguing its rates are too low to encourage innovation in the mobile market.

In the fixed market, respondents from Rwandatel also argue that the current fixed interconnection rate is too low to encourage efficiency in the market. In fact, most of the

respondents lamented that Rwandatel charges less fixed termination charges because RURA perceives that upgrading fixed network in Rwanda is less costly than mobile network. This aligns with the argument of LittleChild (2006) and Falch (2005) which states that too low access rates discourage investment and facility-based competition.

In accordance to the above discussions the findings found out that RURA's main challenge is to reduce the current interconnection rate to a level that is efficient. The majority of respondents highlighted that the main challenge is to determine an efficient interconnection rate that is acceptable by all stakeholders. They explained that Kenya Communication Commission (KCC) was taken to court by the mobile operators due to the failure to determine the rates that are acceptable by all stakeholders.

The findings revealed that TIGO Rwanda and Rwandatel advocate for the reduction of the current mobile interconnection rate but MTN-Rwandacell advocates for the increase of the current mobile interconnection rate. Therefore RURA is expected to determine the interconnection rate that is not too high and not too low-the rate that is accepted by all stakeholders. This aligns with Noumba et al.'s(2004:46) argument that regulators should be careful in determining where to move the cursor because "access rate(high value) which are supposed to be favourable to the incumbent will be at extreme; at the other extreme will be the cost value that favours the new entrant". As a result RURA declared that the main challenge is to determine an appropriate level of the termination rate. This further resonates with Falch's (2004:50) argument that regulators have a challenge to determine this "delicate balance".

Furthermore, respondents (PR1-RURA and PR2-RURA) from RURA declared that the reason why RURA commissioned for a second cost interconnection study review is to implement a new interconnection regime that will reduce the current interconnection rates by 50% (e.g. Rfw.40 to Rfw.20).They further explained that reduction on the current mobile interconnection rate, will stop operators from worrying about the off-net interconnection rate as a bottleneck and will be very beneficial to subscribers and the general public. This resonates with Cave and Volsgang's (2003) argument which states that a lower interconnection rate encourages entry and enables the new entrant to compete with the incumbent.

However, scholars (Geneko and Vallette, 2009; Frontier economics, 2008) argue that lower termination rates do not imply lower retail prices in the mobile market. With an example,

Geneko and Vallette (2009) explain that because of "waterbed" effect, 10% reduction of mobile termination rate leads to an increase of 10% in mobile out going prices on average. This means that for RURA to ensure an efficient level of interconnection rates that can enhance efficiency and competition has to be aware of the degree of the "waterbed" effect in the Rwandan telecommunication sector.

Conversely, the findings found out that the failure of the current cost-based interconnection regime in Rwanda to ensure efficient level of interconnection rate cannot only be attributed to its poor implementation and poor choice of the cost-methodologies. This aligns with Laffont et al.'s (1998) argument which states that focusing on the access principle regime alone cannot give positive results in the telecommunication market. To resonate with the above arguments, Falch (2005) also argues that determining an efficient level of interconnection rate is a complex task to the regulatory agency because it entails political and economical interests. Herewith the findings revealed that the effectiveness of current interconnection regime was deterred by other external factors. Therefore the next section discusses the challenges that affected the current interconnection regime from determining an efficient level of interconnection rate in the Rwandan telecommunication sector.

6.4 CHALLENGES

According to the findings there are two facets of challenges that appeared to have hindered the effectiveness of current interconnection regime in Rwanda manifested. These include lack of enough regulatory capacity to choose appropriate cost-based methodologies and to implement it effectively, lack of information, lack of independence and lack of policy instruments. This finding clearly aligns with the argument of some scholars (Armstrong, 2001; Jamison, 1998; Falch, 2005) which states that cost-based access principle will determine an efficient interconnection rate if it is managed by the regulator with higher degree of independence, skills, sufficient policy instruments and information at its disposal. With respect to this argument the next section discusses both challenges that have deterred the current interconnection regime from achieving its intended objectives in the Rwandan telecommunication sector.

6.4.1 LACK OF REGULATORY INDEPENDENCE IN INTERCONNECTION REGULATION

In the findings an overwhelming number (75%) of respondents asserted that RURA has higher degree of independence from the government and in decision making in solving interconnection disputes. These findings align with Edward and Waverman's (2006) argument which underpins that for the government or the industry to influence a regulatory outcome is an indicative that the national regulatory agency (NRA) lacks independence. Moreover, to shade light on these findings, Jain (2003) in his study on interconnection regulation in India, he argued that TRAI could not manage interconnectivity in a smooth manner due to lack of independence. However, in the findings a substantial number (63%) of respondents declared that RURA has a lower degree of independence from the industries when it comes to solving interconnection disputes. Falch (2005) argues that LRIC determines an appropriate level of interconnection rate accepted by all parties if the interconnection regulation is managed by a strong regulator which is able to stay independent from the huge political and economic interests related to interconnection rates. In summary, the findings revealed that for the new interconnection regime RURA is yet to be implemented to achieve its intended objectives of market efficiency, RURA should be able to stay independent from the influence of the industries in solving interconnection disputes.

6.4.2 LACK OF REGULATORY CAPACITY

Despite RURA's commitment in increasing the number of staff to 103 with an outstanding salary structure to avoid any regulatory capture and sponsoring more than 8 staff for masters' degree attending to regulatory issues. The overwhelming number (83%) of the respondents however revealed that RURA lacks sufficient capacity to regulate interconnection in the Rwandan telecommunication sector. This resonates with Falch (2005)'s argument which states that LRIC determines the level of interconnection if the regulation process is managed by the regulatory agency with sufficient skills.

The findings revealed that lack of sufficient capacity to choose and implement the appropriate cost-based methodologies affected the level of interconnection rates in the Rwandan telecommunication sector. To affirm this point, PRI-Rwandatel said that FAC-regime failed to achieve its intended objectives because of RURA's incapacity to know whether the costs are clear or not. In the interview, PR2-Rwandatel expressed his concern by responding that the challenge industries are facing is that consultants when they came up with inappropriate models and rates the regulator is not able to evaluate and critic the outcome in the favour of customers and operators. This aligns with Jain (2003) and Noumba

et al.'s (2009) argument which states that in developing countries where the regulatory agency has no capacity to calculate the costs involved in determining the interconnection rates the regulatory principle has turned out ineffective.

6.4.3 LACK OF POLICY INSTRUMENTS

Amongst the issues affecting the current interconnection regime in Rwanda is lack of sufficient policy instruments or tools, with issues of lack of criteria to determine the SMP operators or dominant player framework, lack of infrastructure sharing framework and lack of dispute resolution mechanism being raised by many respondents as barriers to an effective interconnection regulation in Rwanda. The overwhelming majority (91%) of the interviewees asserted that RURA lacks policy instruments that can complement the current interconnection regime to calculate an appropriate level of interconnection in the Rwandan telecommunication sector.

6.4.3.1 Dominant player framework

The average number of respondents asserted that RURA lacks a dominant player framework. They explained that uncertainty about the dominant player in the market has led to high cross-network tariffs. Pietz (2003) suggests that market share and market definition computations are the starting point of determining the market dominance position. They explained that in other countries such as Kenya through a clearly and comprehensive dominant player framework**,** asymmetric interconnection regulation to incentivise new entrants to compete with the incumbent has been implemented. To align with this, Pietz (2003) explains dominant player framework is crucial because it helps the regulator to identify relevant markets in which it intends to impose pro-competitive measures in case where such markets are found to have ineffective competition. To underpin this, Noumba et al. (2009) highlighted that when the regulator fails to determine the dominant operators remedies adopted are likely to turn out inappropriate in addressing the abuse of market power. This could be one of the reasons why small mobile operators in Rwanda have failed to meet their license obligations to the extent of being revoked by the regulator.

6.4.3.2 Lack of infrastructure sharing framework

Amongst policy instruments that are lacking in the Rwandan telecommunication sector, lack of infrastructure sharing framework was the second most frequently mentioned issue by the

interviewees. MTN-Rwandacell and TIGO Rwanda said Rwanda lacks a cost-effective site sharing framework that can enable operators to be effective. Respondents from TIGO Rwanda lamented that its good MTN-Rwandacell allowed it to share the sites, however, the sharing fee is charging is too high to compete or to make profit to build its own network. Respondents from MTN-Rwandacell said that they have been forced by the regulator to share sites with new entrants in the market. In the light of this, Jamison (1998) explains that infrastructure sharing encourages network deployment and coverage improvement in un-served areas. He further says that infrastructure sharing controls anti-competitive practices in the telecommunication sectors.

6.4.3.3 Lack of dispute resolution mechanism

The findings revealed that a huge number of pending unsolved interconnection disputes has affected the efficiency and competition in the Rwandan telecommunication sector. They explained that small companies are on the verge to insolvency due to disputes that have taken so long without being solved. They further said if RURA keeps being reluctant massive job losses and poor quality of services will be inevitable. This resonates with, Magonyozi's (2008) findings in his research on harmonization of interconnection regulation in EAC. He said that poor quality of customer services and inefficiency in the Rwandan telecoms sector are associated with lack of dispute resolution mechanism.

6.4.4 LACK OF INFORMATION

The findings revealed that lack of detailed information by RURA from the operators has turned out adopted regulatory principles ineffective. In the MTN-Rwandacell's cost interconnection study report for 2006 the consultant states that lack of information to fill the models rendered the evaluation of interconnection cost difficult (ICEA, 2006). In conjunction with this, Xavier (1997) also argues that calculating forward-looking cost often becomes challenging and time consuming due to the absence of reliable cost information from the incumbent. Furthermore, In Rwandatel's report the consultant also revealed that the consultant made more assumptions due to lack of detailed information on network traffic (ICEA, 2006). This aligns with Melody's (1997) argument that a lot of estimation may lead to an arbitrage exercise. Furthermore, respondents (PR1-RURA and PR2-RURA) asserted that the failure of the current interconnection regime is due to the fact that consultant did not get detailed information from the incumbent. Melody (1997) and Noumba et al. (2004)

highlight that in countries where the regulator lacks enough information from the operators, cost-study approaches have turned out ineffective.

6.5 REGULATORY MEASURES TO IMPROVE INTERCONNECTION REGULATION IN RWANDA

The findings revealed that employees from the industry have more knowledge in regulating interconnection than employees from the regulator. This created a premise to probe from the industry and other stakeholders the approaches and strategies RURA can adopt to improve the effectiveness of interconnection regulation in the Rwandan telecommunication section. Therefore in this subsection the researcher will discuss regulatory measures that were proposed by operators and researchers in the Rwandan telecoms market.

6.5.1 Asymmetric interconnection regulation

All respondents from TIGO-Rwanda and Rwandatel highlighted that as new entrant in the mobile market, RURA did not give the company a regulatory incentive for them to be able to compete with the mobile incumbent, MTN-Rwandacell. This has become a competitive strategy for the incumbent to maintain its dominant position in rural and urban areas. This resonates with Dymond's (2004) argument that unfair interconnection practices plagues and hinders the emergence of competitive markets. As a result, small mobile operators proposed that RURA should adopt an asymmetric interconnection regime. This aligns with Di Pillo et al.'s (2009) argument. They argue that the rationale behind asymmetric interconnection regulation is to readdress the consequences of market power. Furthermore, Dymond (2004) also underpins that this regime ensure rural communication developments. As a result, many countries such as South Africa, have implemented asymmetric interconnection regulation in order to incentivize new entrants in the telecom market.

6.5.2 Reduction of mobile interconnection charge

An overwhelming number of respondents argued that the current mobile interconnection rate is too high to encourage effective competition in the Rwandan telecoms market. They argued that bringing down the current interconnection rate will be beneficial to subscribers and the general public. They explained that this has been viable in Kenya, the reduction of the access rate by 50% forced the operators to cut down their retail prices to a fair and reasonable level. This resonates with Cave and Volsgang's (2003) argument which states that a lower interconnection rate encourages entry and enables the new entrant to compete with the

incumbent. However in order this to be effective the regulator has to be vigilant. With Kenya being an exceptional, in other countries the reduction of interconnection rates does not necessary imply reduction in the retail prices. In fact, Geneko and Vallette (2009:20) argue that because of "waterbed" effect 10% reduction of mobile termination rate leads to an increase of 10% in mobile out going prices on average. This means that RURA should be aware of the degree of "waterbed" effect in the Rwandan telecommunication sector in order to make sure that the reduction in the mobile interconnection has ensured effective competition and viability of customer benefits.

6.5.3 Increase of fixed interconnection charge

The findings revealed that there is a huge difference in interconnection charges between fixed and mobile networks, with the mobile receiving a higher termination rates. Rwandatel argues that the current interconnection rate has not enabled the company to recover from access deficit. They further argue that though technology is becoming cheaper, the cost of fixed network elements have gone up. As a result they proposed for an increase on the current fixed interconnection rate.

6.6 SUMMARY OF THE CHAPTER

This chapter discussed results presented in chapter five by relating them to the study research aims and questions and literature review in chapter 2 & 3. Firstly, the finding revealed that RURA adopted cost-based access pricing which is arguably underpinned by a range of scholars (Armstrong, 2001; Jamison, 1998; Pietz, 2003) as the best pro-competitive remedy to address market issues in developing countries. The findings revealed that the choice and implementation of cost-based pricing models in Rwanda was rather complex in accordance with the findings of Salinger (1998) and Jamison (1998). Despite this, the findings revealed that TELRIC-regime is the existing interconnection regime that is in practice in the Rwandan telecoms sector. This answers critical question 1 of the study: what is the existing interconnection regime in the Rwandan telecommunication sector?. Secondly, the findings revealed that the current level of TELRIC-based rates discourages efficiency and effective competition. It was apparent that the current mobile interconnection rate (Rfw.40) is too high to encourage Rwandatel and TIGO-Rwanda to compete with MTN-Rwandacell as it was been revealed by Falch (2005) and Armstrong (2001). Furthermore, it was revealed that the current fixed interconnection rate (Rfw.30) is too low to encourage innovation according to

Falch (2005). This answers sub-question 2 of the study: how has the existing current interconnection regime affected the Rwandan telecommunication market?.

Fourthly, the findings further demonstrated that ineffectiveness of the level of the current interconnection rates should not be attributed to TELRIC-regime per se but also on other factors. It was revealed that lack of sufficient regulatory capacity, lack of policy instruments and information asymmetry one way or the other affected the effectiveness of the current cost-based interconnection regime in Rwanda. This resonates with the argument of Armstrong (2001), Jamison (1998) and Falch (2005).

This answers question 3 of the study: What are challenges facing the existing interconnection regime in the Rwandan telecommunication sector?. However, with the adoption of asymmetric interconnection regulation, reduction of the current mobile interconnection rate, increase of the current fixed interconnection rates, mobile number portability, and establishment of the new interconnection regime based on forward-looking approach Rwandan telecommunication industries believe that interconnection regulation will be effective in Rwanda. This answers sub-question 4 of the study: What are approaches and strategies can be adopted by RURA to improve interconnection regulation in Rwanda?

CHAPTER SEVEN: STRATEGIES TO IMPROVE INTERCONNECTION REGULATION IN RWANDA

7.1 THE SUMMARY OF THE STUDY

The aim of this study was to investigate the regulation of interconnection in Rwanda. Specifically the study was investigating the existing interconnection regime and how it has affected the Rwandan telecommunication sector. The conclusion highlights all the overall observations regarding the core research questions stated below:

a) What is the existing interconnection pricing regime in Rwanda?

b) How has the existing interconnection pricing regulation affected the Rwandan telecommunication sector?

c) What are the challenges facing the current interconnection pricing regime in the Rwandan telecommunication sector?

d) What can be done to improve the regulation of interconnection pricing regulation in Rwanda?

To do this, the literature that had a direct bearing on the purpose of this study was reviewed. Under Chapter 2, the literature on the definition of interconnection, the nature of telecommunication network, the interconnection regulation in the telecoms was thoroughly reviewed. However, Peitz (2003) argues that efficiency and competition in the telecommunication sector hinge on the interconnection pricing regulation. In light of this argument in Chapter 3 of this study the literature on interconnection price regulation in telecommunication sector and techniques to calculate interconnection rates was extensively reviewed.

In this study, a mixed approach (both qualitative and quantitative approaches) was used through a number of research instruments including; semi- structured interviews and documentary analysis.

The study revealed that the Rwanda telecommunication sector has grown significantly after the genocide of 1994. However, the study has shown that granting access to incumbent's network at a fair and reasonable access rate has been the biggest controversial issue in all the regimes. Armstrong (2001) and Wright (2000) argue that the main issue under two-way access pricing model is to under free interconnection negotiation incumbent always have incentives to charge high access charges. Between 1998 and 2006 free interconnection negotiation between MTN-Rwandacell and Rwandatel induced too high interconnection

charges that led to market distortion and affected their customers. However, the study found out that the issue of high interconnection rates and interconnection disputes are linked to the current caller party pays (CPP) regime that is being used in all East African Countries including Rwanda. Di Pillo et al.'s (2009) explain that CPP produces incentives for larger operators to lower the prices on-net calls and increase the charges of off-net calls in order to drive the small network operator out of the market.

The study further revealed that the government of Rwanda established RURA in order to address issues of high interconnection charges in the telecommunication sector. Proponents of sector specific approach argue that it has been quite successful in delivering both competitive interconnection rates and a smooth implementation of equal access. The study revealed that to address the interconnection negotiation break-up between MTN-Rwandacell and Rwandatel, RURA commissioned a consultant to conduct cost-based interconnection market review. The rationale behind was to determine an appropriate interconnection regime in the telecoms market. In this aligns on Pietz's (2003) argument that intervention per se cannot alleviate interconnection pricings issue commitment of the regulator to adopt a clear and comprehensive interconnection policy that specifies what happens when the interconnection negotiations fail.

RURA adopted cost-based interconnection principle as the panacea to ensure fair and reasonable interconnection rate in Rwanda. Nevertheless, efficiency and competition are still far from effective in the Rwandan telecommunication sector due to inconsistencies in the existing cost-based methodology and its practices.

The study demonstrated that the adoption of TELRIC bottom up forward-looking regime to address the FAC or COSITU-regime deficiencies was an appropriate choice but its poor implementation in practice has deterred efficiency and competition in the Rwandan telecommunication sector. The study found out that the current mobile interconnection rate (Rfw.40) is too high to encourage Rwandatel and TIGO Rwanda to compete with the mobile incumbent, MTN-Rwandacell. Consequently, it was revealed that the current access rate has become a bottleneck to growth of the Rwandan telecoms market. On the other hand, too low current fixed interconnection rate (Rfw.30) charged by Rwandatel has discouraged investment. Furthermore the study revealed that TIGO Rwanda's mobile rates are neither based on TELRIC nor FAC and are also too low to encourage competition and facility-based competition. As the result, Rwandatel and TIGO Rwanda asserted that the current

interconnection regime is unfair and needs modification, however, MTN-Rwandacell strongly argue that the current interconnection regime has enabled the company to recoup its investments and has enabled new entrants to enter the market. Therefore the main challenge to RURA is how to determine an appropriate level of interconnection that can enhance efficiency and effective competition in the Rwandan telecommunication sector. However, RURA has to be vigilant while deciding the level of the interconnection rate that will be acceptable by all the stakeholders. Rwandatel and TIGO Rwanda argue that low mobile rate will be very beneficial to subscribers and the general public. RURA also believes that bringing down the rates will give a room to adjust pricing because Rwandatel and TIGO Rwanda cannot charge below the current interconnection rate. However, MTN-Rwandacell argues that if RURA brings the current termination rate some operators will collapse due to low revenue and lack of funds to fuel network expansion and growth of sector. He further explained that massive job losses and poor quality of services might be inevitable if not otherwise. Nevertheless, Cave and Volsgang (2003) argue that high interconnection price is not the sole means to encourage infrastructure competition. Instead they argue that lower interconnection rate encourages entry and enables the new entrant to compete with the incumbent.

However, despite the argument from small operators and the RURA for the reduction current mobile interconnection rate, literature has highlighted that in other jurisdiction regulatory measures have turned out ineffective due the presence of "waterbed" effect. Therefore RURA is required to be aware of the magnitude of "waterbed" effect if a fair and reasonable level of interconnection rate is to be attained.

Despite the inappropriateness of the current cost-based methodologies, the study revealed that RURA's incapacity and lack of enough information to effectively implement TELRIC bottom up forward-looking approach also affected the level of interconnection rates in Rwanda. Furthermore, the study revealed that regulatory external challenges such as lack of sufficient policy instruments; infrastructure sharing framework and dominant player framework, lack of independence from the government and industries from setting and solving interconnection rates also have one way or the other deterred the effectiveness of the current interconnection regime in Rwanda.

In a nutshell, operators, researchers and regulatory staff strongly believe that the reduction of the current mobile interconnection rate, the adoption of the asymmetric interconnection

regulation, number portability and establishment of the new interconnection regime based on forward-looking will ensure the viability of interconnection regulation in the Rwandan telecommunication sector. The table 7.1 below shows the summary of the findings of the study.

Table 7.1: Summary of the findings

Research Questions	Findings
What is the existing interconnection regime in Rwanda?	Cost-based pricing model: TELRIC forward-looking bottom-up model. Mobile ICX rate: Rfw.40 Fixed ICX rate:Rfw.30
How has the existing interconnection regime affected the Rwandan telecommunication market?	• Cost-based pricing methodology was poorly implemented. • Mobile ICX rate (Rfw.40) is too high to enable small operators' (Rwandatel and TIGO-Rwanda) to compete with MTN-Rwandacell and this has affected the profitability of TIGO-Rwanda and Rwandatel because they cannot charge below this ICX rate. • TIGO-Rwanda's interconnection rate is not based on TELRIC. It is too low to encourage efficiency. • Fixed ICX rate (Rfw.30) is too low to encourage investment and facility-based competition in the Rwandan telecommunication market. • TELRIC-regime is unfair and needs to be modified or changed.
What are the challenges facing the existing interconnection regime in Rwanda?	• Lack of sufficient regulatory capacity to regulate interconnection in Rwanda. Employees from operators are more knowledgeable in interconnection than employees in RURA. • Lack of dominant prayer framework. This has led to cross-network tariffs. • Lacks of a cost-effective site sharing framework that can enable the operators to be effective. • Lack of RURA's independence from industries in solving interconnection disputes. MTN has more lobbying power than Rwandatel and TIGO-Rwanda. • Information asymmetry. MTN-Rwandacell and Rwandatel did not give correct information for their network actual costs and traffic as the result it became difficult for the consultant to

	calculate TELRIC rates.
What can be done to improve interconnection regulation in Rwanda?	• Adoption of the new interconnection regime. • Reduction of the current mobile interconnection rate(Rfw.40) • Adoption of Mobile Number Portability • Regulatory Capacity building • Strategies to mitigate Information asymmetry; improve public consultation process and new regulatory framework based on competition analysis principle. • Adopting technology neutrality

7.2 CONCLUSION

First and foremost this study concludes that the current cost-based interconnection regime in Rwanda was poorly implemented. As a result, the current TELRIC-regime has not been able to determine the level of interconnection rates that can enhance efficiency and effective competition in the Rwandan telecommunication sector. Salinger (1998:28) puts it clearly that *"the use of LRIC is theoretically sound, but its implementation in practice is rather complex and could undermine the profitability of the incumbent's investment if poorly executed"*. It was apparent that although the current fixed and mobile interconnection rates were calculated using TELRIC-regime, FAC is also being used by Rwandatel and TIGO-Rwanda neither uses TELRIC-regime nor FAC-regime. This regulatory uncertainty in implementing TELRIC-regime has been a competitive advantage for MTN-Rwandacell, the prime beneficiary of TELRIC-regime and undermining the profitability of the fixed incumbent, Rwandatel. The study found out that the current cost-based regime does not give incentives to operators to deploy new technology and it was clearly evident that RURA in proposing the implementation of the current regime, it did not recognize the adverse effect on the Rwandan telecoms market of moving too quickly to the new regime.

Secondly, the study concludes that the current mobile interconnection rate is too high to encourage small mobile operators, Rwandatel and TIGO-Rwanda to compete with MTN-Rwandacell and to upgrade their networks to the most efficient technology in the Rwandan mobile telecommunication sector. In 2001, FCC argued that TELRIC distorts investments and competition because of high interconnection revenue that provides little incentives for operators to upgrade their network (Melody, 1997). It was apparent that the current interconnection regime is a bottleneck to the telecoms sector's growth. Rwandatel and

TIGO-Rwanda are suffering in the mobile business because they cannot charge below the current mobile interconnection rate which is too exorbitant.

Thirdly, this study concludes that the current fixed interconnection rate is too low to encourage Rwandatel to recoup its access deficit. Falch (2004) puts it clear that too low access rate deters investments and delays facility-based competition in the telecommunication market. It was clear that RURA was uncertain about the fact that fixed network elements are as costly as mobile network elements hence setting the rate that does not enable Rwandatel to recover its access deficit and also to achieve its universal obligations.

Fourthly, this study concludes that the complexity of interconnection regulation process in Rwanda is somehow linked to the weaknesses that are pertaining to the Rwanda's nature of intervention to address interconnection disputes. Buiges (2006) puts it clearly that the nature of public intervention in controlling interconnection prices should not be undermined if market efficiency objectives are to be achieved in telecommunication networks. Although Rwanda adopted sector specific regulation approach as the panacea of interconnection disputes, in this study it was apparent that all pro-competitive remedies turned out ineffective due to lack of detailed information from the incumbent's network. Cave and Crowther (2004) highlights that sector specific approach requires large flow of information from the regulated entity.

Fifthly the study concludes that the current interconnection regime failed to deliver its intended objectives due to regulatory uncertainty that is resulted from lack of clear and comprehensive interconnection negotiations processes in the Rwandan telecommunication sector. Armstrong (2001) highlights that under two-way access pricing models the main challenge is to ensure fair and reasonable access charges through free interconnection negotiations among the operators. The study found out that the pending interconnection rate disputes that were identified in the sector are the result of lack of clear interconnection negotiations guidelines in place. This has been also attributed to the failure of the current cost-based interconnection regime. Jamison (1998) says that if there are clear and comprehensive interconnection negotiation guidelines, the regulatory principles also tend to turn out ineffective the light of actual cost and market conditions.

Finally, this study concludes that the current level of mobile and fixed interconnection rates in Rwanda was not only affected by the poor implementation of TELRIC-regime by RURA and the consultant but also lower degree of regulatory independence from the government

and industry in setting interconnection rates, lack of a comprehensive infrastructure framework and dominant player framework, lack of enough regulatory capacity and information asymmetry. Jain(2003) expounds that setting up a regulatory agency and adopting regulatory policies is not sufficient to ensure efficient level of interconnection rates in the telecommunication industry. Scholars (Armstrong, 2002; Jamison 1998; Jain, 2003; Edward & Waverman, 2006; Falch, 2005) argue that an optimal level of interconnection rate can be determined only if the regulator has high degree of independence, skills, enough information from the incumbent and enough policy instruments at its disposal.

7.2 IMPLICATIONS AND RECOMMENDATIONS

According to the findings and discussions in this study it was revealed that the failure of the current interconnection regime in Rwanda was associated with its challenges discussed in Chapter five of this Study. Therefore the researcher developed a set of recommendations in line with the challenges and suggestions that were showcased by respondents on what could be done by RURA to improve the interconnection regulation in Rwanda. Considering the findings of this research, the following recommendations can be made:

7.2.1 CAPACITY BUILDING

Capacity building in a regulatory agency refers to the identification and implementation of institutional and management process that make the regulation "effective"[11] and efficient"[12]. RURA should increase the technical and administrative skills especially in interconnection regulations. RURA should not target to reach the threshold size of staff but to focus on experts who will enhance competence in the regulatory environment. This will address the problem of information asymmetry and regulatory capture that have been showcased to prevail in the Rwandan telecommunication sector. Therefore before RURA adopts a new interconnection regime, there is a need for RURA to train its staff how to use cost-based models effectively and efficiently and how to be in the position to convince the operators about the determined interconnection rates in case the consultant comes up with contradictory interconnection rates. For instance consultants should always provide in-house trainings to RURA employees especially interconnection and economic regulators on how to use and regulate interconnection using the established regime effectively.

[11] Effective refers to the ability to deliver regulation as per intentions set for it
[12] Efficient refers to the minimization of scarce resources in delivering regulations

7.2.2 DOMINANT PLAYER FRAMEWORK

Many developing countries have embarked on safe guarding against any abuse of market power by conducting wholesale or retail interconnection market review. These include Kenya, Uganda and South Africa to mention a few. Therefore RURA should benchmark and implement a clear and comprehensive dominant player framework. This will enable RURA to define and identify the market segments in which to impose pro-competitive measures-such as asymmetric interconnection regime- in case where such markets are found to have ineffective competition. Furthermore, this framework will also stop the dominant prayers in the market to charge cross-network exorbitant tariffs.

7.2.3 DISPUTE RESOLUTION MECHANISM

RURA should update the regulation on interconnection by adding the dispute resolution mechanism to resolve issues of interconnection in timely basis for the benefit of consumers. A lot of disputes have taken more than expected time and this must be resolved with time frame set and if possible intervention as per regulatory procedure. The customers are the ones affected with any delay on resolving the disputes issues. This will resolve the pending interconnection issues in the Rwandan telecommunication sector for the benefit of costumers and operators.

7.2.4 QUALITY OF SERVICE ON INTERCONNECTION LEVEL

In order to improve interconnection regulation in Rwanda, quality of service has to be taken as a key factor in IP-based Networks. RURA should be equipped with the test gears investigating the network quality of Rwanda for MTN-Rwandacell, Rwandatel and TIGO-Rwanda. Customers are not satisfied with this service especially those from outside as they feel the difference with their network.

7.2.5 INFRASTRUCTURE SHARING FRAMEWORK

Infrastructure sharing is a tool which RURA can use to encourage network deployment and coverage improvement in un-served or underserved areas. Rwanda should implement an infrastructure sharing framework. Infrastructure sharing is used to control anti-competitive practices such as high interconnection pricing of essential facilities and services. It will reduce the capital expenditure and operating cost of the operators in the industry and also improve Rwandan economic efficiency.

7.2.6 TECHNOLOGY NEUTRALITY

Technology neutrality means that different technologies offering essentially similar services should be regulated in similar manner. Technology neutrality has been hailed as the appropriate approach to proceed in the ICT arena. Countries neighboring Rwanda, such as Tanzania and Kenya have embarked on technology neutrality license in order to encourage operators to invest in new technology without any regulatory hindrance. With respect to these assertions and on the ground that lack of sufficient information from the stakeholders led to ineffectiveness of the current interconnection regime, the researcher recommends RURA to adopt technology neutrality regulations. This will encourage telecom operators in Rwanda to invest in new technology without any regulatory hindrance.

7.2.8 STRATEGIES TO MITIGATE INFORMATION ASYMMETRY

7.2. 8.1 Improvement of public consultation process

Information asymmetry has been identified in this study as the most challenging issue in the Rwandan interconnection regulation. Adopted cost-based interconnection approaches have turned out to be ineffective due to lack of detailed information from dominant operators. Improving public consultation process will increase the information hence quickening the decision-making process. It will further improve the transparency efficiency and effectiveness of interconnection regulation.

7.2.8.2 Improvement of interconnection negotiation process

Firstly RURA should establish guidelines in advance of any interconnection negotiations. These guidelines assist policy makers, customers, regulatory authorities and operators. The finding delays in solving interconnection disputes are due to lack of clear and comprehensive interconnection guidelines in place. Secondly, RURA should publish default interconnection arrangements together with the guidelines in advance of negotiations. This strategy will alleviate the degree of information asymmetry in the Rwandan regulatory environment.

Last but not the least, RURA should set deadlines at the beginning of negotiations for the completion of various steps. For instance, MTN-Rwandacell may be demanded to produce a proposed interconnection agreement in 15 days. Failure to do this, dispute resolution mechanism or regulatory intervention may be applied.

7.2.8.3 A new regulatory framework based on competition analysis principle

In order the degree of information asymmetry to be mitigated in the Rwandan telecommunication sector. The study recommends RURA to implement a new regulatory framework based on competition analysis principle. Based on the regulatory uncertainty that was identified in this study in the Rwandan regulatory environment, this strategy is the appropriate ex ante regulation in the absence of detailed information.

7.3 AREA OF FURTHER RESEARCH

This study provides a basis on which further research needs to be done in the regulation of interconnection in Rwanda, given the fact that 16 people who participated in this study do not warrant the generalization of findings. However this study underlines that information asymmetry and lack of sufficient regulatory capacity have been the main challenges that affected the current interconnection regime from delivering its expected objectives in the Rwandan telecommunication sector. Moreover, the rate at which Rwanda has reached building next generation infrastructure networks in order to enhance convergence-the merging of telecommunication technologies-shows the speed at which interconnection services are evolving on in the Rwandan telecommunication sector. Consequently, the limited scope of this study in terms of interconnection services cannot portray a clear picture of interconnection regulatory issues in the Rwandan telecommunication sector of today. Therefore the future research could be the interconnection challenges in a converging environment specifically on the policy implications on the Rwandan telecommunication regulators.

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Appendix 1
INTERVIEW GUIDE: RURA

1) Can you please tell us about the existing interconnection regime in Rwanda?

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……

2) Please also share a little of the history of interconnection regulation in Rwanda?

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……
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……....

3) What is your view on interconnection regulation in Rwanda with respect to the following issues:

(a) How does the regulator work to resolve interconnection disputes between operators?

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4) Which cost-based models, for example, FAC or LRAIC do you use to calculate interconnection rates? And Why?

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i) Do you believe that the current interconnection regime has enhanced market efficiency in the Rwandan telecommunication sector? If no give reasons. If yes give an example…….....

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ii) In your view, what are the challenges the current interconnection regime is facing?

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iii) Would you please tell us what has been done by RURA to address these challenges?.....
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iv) As a regulator, what do you think can be done to improve interconnection rate regulation in the Rwandan telecommunication sector?

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Appendix 2

INTERVIEW SCHEDULE /GUIDE: Researchers in the Rwandan Telecommunication sector

1. What is your opinion or view on the interconnection regulation in Rwanda?

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1) Is the current interconnection rate fair and reasonable to enhance market efficiency?
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2) In your opinion, what are the challenges facing the current interconnection costing regime in Rwanda?
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3) Is the current interconnection costing regime fair or needs modification?
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4) In your view, what could be done to improve interconnection regulation in Rwanda?
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Appendix 3

INTERVIEW GUIDE: MTN-RWANDACELL and RWANDATEL

1) Can you please tell us about the existing interconnection regime in Rwanda?
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2) Please also share a little of the history of interconnection regulation in Rwanda.
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3)What is your view on interconnection regulation in Rwanda?

a) In your opinion, is the current interconnection (mobile and fixed) rate fair and reasonable?
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b) What are the challenges the current interconnection regime is facing?
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c) Is RURA fair and independent in resolving interconnection rate disputes? Give examples
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d) Is the current interconnection regime fair or needs modification?
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4) What type of cost-based models, for example, FAC or LRAIC or benchmarking do you use to calculate interconnection rates?
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a) Is it encouraging efficiency in your business? If yes or no, Give Reasons.

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5) In your view, what can be done to improve interconnection rate regulation in Rwanda?

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