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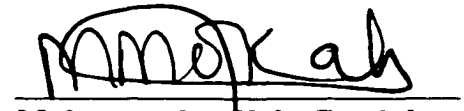
AN ECONOMETRIC ANALYSIS OF TELECOMMUNICATIONS, INFORMATION TECHNOLOGY, AND ECONOMIC GROWTH IN AFRICA: A Case Study Of The Gambia

By

Muhammadou M.O. Kah

A Dissertation

Submitted to the Faculty of Stevens Institute of Technology in partial fulfillment of the requirements for the degree of Doctor of Philosophy



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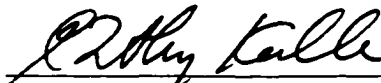

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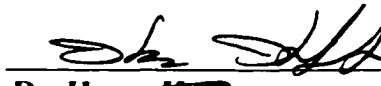

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To my daughter, Mariama M.M. Kah, who is too young to understand the joy she and her mum gives me, I dedicate this work to you.

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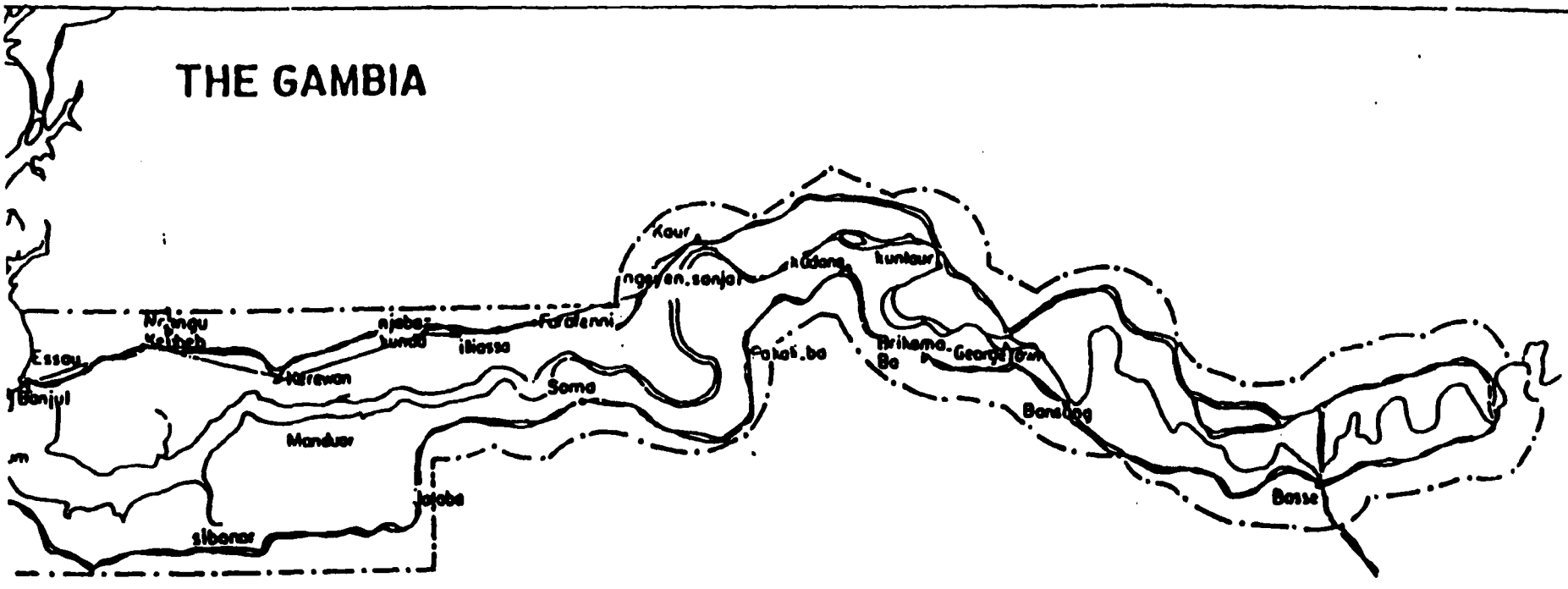
LIST OF ACRONYMS

AFCOM	Africa Communication Inc.
ATM	Asynchronous Transmission Mode
CCE	Central de Cooperation Economique
CFD	Caisse Francaise de Developmment
CFDM	Compounded Frequency Division Multiplexing
COMESA	The Common Market for Eastern and Southern Africa`
CONS	Consumer Spending
CPE	Customer Premises Equipment
CPI	Consumer Price indicators
CTE3	International Gateway Exchange
ECA	Economic Commission for Africa
ECOWAS	Economic Organization of West African States
EDI	Electronic Data Interchange
ERPs	Economic Recovery Programs
ESAF	Enhanced Structural Adjustment Facility
ETACS	Expanded Total Access Communications System
EXP	Exports
FCC	Federal Communications Commission
FDI	Foreign Direct Investments
GAMTEL	Gambia Telecommunications company
GATT	General Agreement on Tariffs and Trade
GBA	Greater Banjul Area
GCDB	Gambia Commercial and Development Bank
GCU	Gambia Cooperative Union
GDFI	Gross Domestic Fixed Investments
GDI	Gross Domestic Investments
GDP	Gross Domestic Product
GMS	Global Mobile Systems
GMTI	Gambia Telecommunications and Multimedia institute
GNIC	Gambia National Insurance Corporation
GNP	Gross National Product
GOV	Governments Spending
GRTS	Gambia Radio and Television Services
GSM	Global Systems Mobile Communications
GSN	Global Network Series
GTTC	Gambia Telecommunications Training Center

LIST OF ACRONYMS (Cont.)

IBE	Information Based Economy
IBM	International Business Machines
IDD	International Dialing Facility
IDRC	International Development Research Council
IMF	International Monetary Fund
IMP	Imports
INV	Investments (Private Sector Investments)
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
KIDRI	Korea Industrial Development Research Institute. Seoul
LAN	Local Area Network
LDC	Least Developed Countries
MNC	Multinational Corporation
NACIP	National Communications and Information Policy
NAWEC	National water and Electricity Company
NGO	Non Governmental Organization
NII	National Information infrastructure
NITB	National Information Technology Board
NMC	National Media Commission
NRC	National Research Council
NTE	National Transit Exchange
OAU	Organization of African Unity
OLS	Ordinary Lease Squares
PCGNI	Percentage Change in Gross National Income
PDN	Public Data Network
PESs	Public Enterprise systems
POTS	Plain Old Telephone Services
PSD	Private Sector Development
PURC	Public Utilities Regulatory Commission
RLU	Remote Line Units
SAL II	Second Structural adjustment Loan
SAPs	Structural Adjustment Programs
SCPC	Single Channel Per Carrier
SDH	Synchronous Digital Hierarchy
SITC	Standard International Trade Classification
SOEs	State Owned Enterprises



GAMTEL

DIAGRAM - Transmission Layout

AN ECONOMETRIC ANALYSIS OF TELECOMMUNICATIONS, INFORMATION TECHNOLOGYAND ECONOMIC GROWTH IN AFRICA: A Case Study Of The Gambia.

Muhammadou Kah

Stevens Institute of Technology

ABSTRACT

This dissertation combines a case study with econometric analysis in order to investigate the socio-economic impact of telecommunications, information technology, and economic growth on The Gambia, West Africa. It will analyze the evolution of telecommunications and Information Technology (IT) in the country, empirically examining the relationship between gross fixed investments, telecommunications infrastructure investments, and economic growth Given that IT is such a significant driving force behind worldwide economic growth, the lack of an efficient and modern telecommunications infrastructure in most African countries hinders their economic progress, growth, and development. Clearly, then, the challenges facing these countries in their attempts to join the global information economy are considerable.

Notwithstanding the above, such an analysis of the telecommunications sector in The Gambia suggests that the sector has developed substantially in recent years. In fact, given her relatively modern telecommunications and national IT infrastructure, my findings suggest that The Gambia may well be able to leapfrog others and position herself as a major "hub" in the worldwide information economy. Major challenges still facing the country, though, include inadequate IT human capital, insufficient private and public investment in IT, minimal support and incentives for the private sector to invest in IT, and a lack of know-how regarding the strategic use of IT to improve business processes, decision-making, and economic efficiency.

An econometric approach - as opposed to the correlation studies that most studies of this type employ - is utilized in order to study the factors influencing economic growth, and especially to highlight the influence of telecommunications investments. The methods employed during the studies include the use of ordinary least squares, Granger-causalities, and a case study approach.

Using time series data to study the relationship between gross fixed investments, telecommunications infrastructure investments, and economic growth in The Gambia, the relationship between telecommunication growth and economy-wide investment was examined and a positive relationship discovered between them. In particular, it was also discovered that telecommunications investment, especially when measured by main telephone lines, is strongly related to economic growth. This result suggests that increasing investment in the telecommunications infrastructure improves the channel between aggregate investment and growth on an economy-wide scale.

This research suggests that increases in infrastructure and human capital investments, together with appropriate policies, have a significant impact on economic growth. The positive relationship found, however, is consistent with the notion that The Gambia must modernize further, and provide a yet more efficient telecommunications infrastructure, in order to pave the way for IT-led development.

CHAPTER I

1.1 Introduction to the Problem

As the title suggests, this dissertation examines the linkages between telecommunications infrastructure and economic growth in The Gambia. The premise here is that socio-economic development of The Gambia depends, not only on an abundance of skilled human capital, but also on the availability of an efficient telecommunications infrastructure. This, combined with a skilled workforce and management, would facilitate easier business transactions and enhance the reliability and availability of the sort of information needed by policy makers, businesses, and individuals .

An adequate telecommunications infrastructure and an increased familiarity with information technology are increasingly recognized as important ingredients in bringing about economic growth and development, enhancing competitiveness, and integrating nations into the global information economy. Recently, this relationship between adequate telecommunications infrastructures and economic development has attracted the attention of researchers and policy makers in developing countries - a shift in research focus propelled by this evidence that advances in telecommunications and information technology facilitate entry into the worldwide information economy.

In this information economy, trade and investment are electronic and nations and organizations compete globally. This contrasts sharply with agricultural and industrial economies and societies – the information economy is more competitive, knowledge-

intensive, democratic, decentralized, and unstable, and it is better able to address individual needs and rapidly "transform" economies. Nevertheless, and as suggested above, this new "frontier" still poses immense challenges and issues, as well as opportunities, for Gambian policy makers. It requires them to be willing to undergo a "paradigm shift" in their quest for economic development - a new national vision, entailing new policies, new regulatory frameworks, and new and expanded investment in telecommunications infrastructure, human capital, and knowledge-related skills must be instituted.

Table 1: The economic shift toward an information-based economy

Economic Period	Critical Resource	Determinants of Wealth	Determinants of Power
Agrarian	Land	Agriculture	Landholders
Industrial	Capital	Manufacturing	Financiers
Info-economy	**Information**	**Services**	**Knowledge Workers**

Table 1 highlights the key decision-makers present in agrarian, industrialized, and information-based economies and isolates the determinants of power and wealth in each stage of progress. It suggests a paradigm shift from a period in which landholders and financiers possessed influence to one in which technocrats with technical and managerial experience direct economies. The agrarian economies, however, include almost all the African economies (including that of The Gambia) as well as most developing economies. Wages are very low due to productivity constraints; governmental tax base and revenue is limited; and the educational and telecommunications infrastructures are inadequate; all of which combine to make economic growth and development extremely

slow. In contrast, industrial economies such as the Czech Republic, Hungary, and Brazil enjoy much higher standards of living thanks to their higher productivity levels. These industrial economies have an abundance of manufacturing plants that produce jobs, enhancing consumption levels and sustaining a degree of economic growth. The transitional economies, which include China, Botswana, and Mauritius, are those evolving from either agrarian or industrial periods. For example, Singapore, South Korea, and South Africa are slowly becoming fully-fledged info-economies. Finally, the full info-economies include the United States, Great Britain, Japan, Canada, Germany, France, and most of the rest of Western Europe. Presently, these economies define the global info-economy and, consequently, possess the highest standards of living, wages, profits, productivity, and economic growth rates. Such info-economies are service and knowledge intensive, depending heavily upon information-based technologies with intellectual capital (knowledge) and adequate telecommunications infrastructures for their efficiency, growth, and economic impact. Given the above, this dissertation argues for a shift in economic development priorities, policies, and strategies in order to effectively use the existing modern telecommunications infrastructure to "leapfrog" the economy of The Gambia from an agrarian economy to an info-economy.

It is the position of this study that the attaining of economic and social progress that translates into improvements in the general quality of life of Gambians, will depend on the ability of the nation's policy makers to develop appropriate applications and uses of IT in all sectors of the economy. An adequate telecommunications infrastructure, and the diffusion and appropriate use of information technology, are not simply luxuries for

the Gambian economy, but are instead the keys to achieving sustainable economic development, attracting foreign investment, promoting governmental efficiency, and improving educational and health services. They will not inject elements of fiscal and economic responsibility or transparency but will enhance the ability of people to do so. It will also improve the control and availability of the sort of reliable information necessary for effective decision-making and monitoring. In short, they will vastly improve the quality of life of the average Gambian.

The telecommunications sector in The Gambia has displayed enormous dynamism, rapidly transforming the ways that the people live and work. Gambians can be reached almost anywhere via their cell phones and personal computers via the internet. They can perform business transactions by placing orders, making payments electronically, browse world-wide news and a access vast repository of needed data and information, e-mail friends and family in the USA, Europe and other parts of the world and receive almost immediate feedback. Busy executives can use videoconferencing facilities to reduce the number of trips they make, and both private businesses and government can procure and expedite delivery of needed goods and services without incurring huge travel expenditures.

Although the number of people using and accessing the internet is small, the numbers are increasing and Gambians have begun experiencing the dawn of electronic business and commerce. This information technology revolution is in its infancy and offers great opportunity and potential for the Gambian economy, but it also poses challenges to Gambian policy makers. The Gambian policy makers would need to develop new institutional models, gradually change existing institutions to take into account the new

dynamics of the information economy. This will require policy makers to develop a national information infrastructure policy, which involves all sectors of the economy. They must ensure a climate of information exchange and sharing which will require an emphasis on the provision of rural connectivity and education. It will also be important for policy makers to be aware of the necessity, requirements, sustenance and maintenance of global connectivity. The creation of a viable private sector development will include ensuring the full participation of all sectors of the economy, transparent policies and corruption-free licensing and procurement procedures. Furthermore, it is important for The Gambia to accelerate the national restructuring of the telecommunications sector and related policies to improve the environment for accelerated development of this sector, in particular the creation of a more attractive environment for increased local and foreign private investment – political stability, transparent and progressive strategies.

A large number of people in developing countries, especially those in Africa, find even the telephone or the internet unfamiliar. Consequently, the information revolution threatens to accelerate the income gap between rich and poor nations and also the gap between rich and poor within a country simply because some have access to information while others do not. For developing countries such as The Gambia, though, the information revolution poses additional social and cultural challenges. For example, thanks to the existence of the Internet, information of all sorts is readily available to almost anyone with access, raising freedom of speech, inappropriate use of information, security, intellectual property, and privacy issues. All of these are of particular importance in The Gambia because the government censors the media. A large number of journalists and citizens, in

exercising freedom of speech, have either been arrested or have seen their means of communication removed (for example, the shutdown of "Radio FM", and the arrest of the former owner of the "Observer" magazine).

However, it is true that any (one) government cannot control the information revolution suggesting the dawn of the democratization of information. Although the opportunity exists, it is still far from being a reality in most African countries. Its important to note that Information concerning events that took place on the other side of the globe is now available almost instantaneously to anyone with access to the internet, but majority of Africans do not have access. But, in contrast with the situation prior to the dawn of the information revolution in The Gambia, the situation is increasingly improving. At that time, the only information available came from the government press; two privately-run but heavily-censored newspapers; a government radio station that was *never* critical of governmental policy; and a private radio station, also heavily censored. The only other sources of information were a few telephones, mostly found in government agencies and in the homes of middle-class civil servants and other members of the "well-to-do." Basically, national information was well guarded, usually non-computerized, and certainly not accessible to the public, factors that in turn contributed to inefficiency, poor management, poor decision-making, and corruption.

Fortunately for The Gambia, it went on to invest in a modern telecommunications infrastructure that has facilitated an information revolution. The use of, and access to, information is now widespread. For example, there now exists a national TV station providing access to other TV networks, such as CNN and the BBC, enhancing the

dissemination of information and, in the process, educating the public to a degree not seen before in this country. The result is a more critical citizenry. Given the opportunity to see how freedom of speech is exercised in other parts of the world, how policy is made and questioned by its stakeholders, the people of The Gambia have begun to ask their own questions. In addition, this investment has also brought the Internet to The Gambia for the first time. Gambians can now send and receive e-mail and surf the World Wide Web (WWW). They are also able to contact list servers abroad, such as Gambia-L in the US, and debate issues and share information with hundreds of Gambians residing abroad, exercising their freedom of speech. Even The Gambia's newspapers are online. Notwithstanding these massive strides, though, the use of IT in the country is still in its infancy – for example, very few people yet have access to a PC, government agencies are not fully computerized, and overall IT capacity is still very low. Consequently, the dawn of the IT revolution and the Internet in The Gambia, and particularly its strategic use in order to add economic and social value to the nation, have not yet been examined by policy makers.

By general African standards, The Gambia's telecommunications facilities and information technology infrastructure are well advanced. Nevertheless, though the number of telephones has increased significantly compared to most African countries, many rural areas still lack a phone service altogether. Consequently, though urban areas are somewhat better provided for, and most businesses have access to *some* services, the economic development of The Gambia as we approach the global information economy will require further telecommunications infrastructure investment in order to ensure even broader access to information. This study attempts to characterize the evolution of the

telecommunications sector in The Gambia and to discuss how it relates to economic development.

The construction of a modern telecommunications infrastructure, however, requires huge investment; telecommunications policy reform; economic and social discipline; effective, responsible, and yet visionary leadership; and, last but not least, a pool of skilled and committed human capital.

Telecommunication has permitted new patterns of development within world economies by enabling the selective reduction of space and time constraints. Studies in the mid 1970s and early 1980s have theorized and then demonstrated that the telephone facilitates economic development, that the payback on investment is several-fold, and that under-investment retards economic development (Hardy and Hudson 1981; Parker 1981; Berry 1981). This dissertation argues, however, that even though investment in telecommunications pays off in the form of economic growth, telecommunication authorities and policy makers should not focus solely on direct monetary paybacks in order to determine whether they should invest in an adequate infrastructure or not. To put it another way, an earlier study concluded that "telecommunications confers benefits on society which are over and above the private benefits represented or captured by the price system" (Pierce, W. and. Jequier, N. 1983, 34). This dissertation builds upon such research by investigating telecommunications in The Gambia in particular and Africa in general.

While the "surface" linkages between telecommunications investment and economic growth have been well studied, some basic questions relating to the actual

dynamics of such linkages still remain relatively unexplored. In addition, while other economies have been revolutionized by developments in telecommunications, African economies find themselves in a state of transition - exhibiting economic neglect, inadequate infrastructures, general mismanagement, and inefficiency. Numerous strategies have been adopted to improve social and economic development in the region, but all to no avail. (World Development Report, 1996).

It is important to note that the innovation and development of a telecommunications infrastructure is directly linked to that particular country's productivity, global markets, and competitiveness. If we equate productivity (π) with efficiency and assign the following equation to its computation (Case & Fair), then:

$$\pi = \kappa / \eta$$

where κ = output and η = resources. Thus, productivity is determined by dividing a country's output by the resources required to produce that output, which include the cost of labor, capital, and technology. Though this represents a simplistic view of the productivity process, it is nevertheless an effective method of looking at economic efficiency. An economy's relative productivity can rise, fall, stagnate, or regress, as is observed in most African economies as they lag behind the rest of the world. The macroeconomic significance of productivity lies in the fact that it is directly related to a country's standard of living - higher rates of productivity are tied to increased economic activity, to resultant higher wages, and to an improved quality of life. Productivity gains can also mitigate inflation while enhancing economic efficiency, growth, and competitiveness. Conversely, the lagging productivity levels that characterize most African economies contribute to rises

in prices, thereby preventing the private sector from elevating wages and expanding. Thus, productivity levels define an economy's future consumption, savings, investment, and debt accumulation levels, and this is represented quantitatively in the traditional income accounting of macroeconomics:

$$\mathbf{GDP = CONS. + INV + GOV + EXP - IMP}$$

where **CONS** = consumer spending, **INV** = private sector investment, **GOV** = government spending, **EXP** = exports, **I** = imports, and **GDP** (Gross Domestic Product) = annual national income. Increased productivity also stimulates higher rates of consumer spending and private sector investment, both of which are needed for effective and efficient private sector participation in economic development. Given all of the above, then, it is reasonable to suggest that rising productivity levels will increase the standard of living, reduce corruption through higher wages and benefits, enhance the profitability of the private sector, improve economic competitiveness and efficiency through reduced production costs, improve exports through competitive pricing, improve government fiscal policy by elevating taxable revenues, and go some way toward restraining inflation and interest rate levels. And to achieve such productivity gains, an adequate telecommunications infrastructure is essential.

The Gambian economy is not only one of the poorest in the world, but it is also one of the few economies where, though a relatively adequate telecommunications infrastructure exists, information technology use is still in its infancy. Consequently, The Gambia still lags behind most of the world's economies as regards turning itself into a global knowledge-based information economy. This state of affairs should be a matter of

great concern to Gambian policy makers and researchers - efforts should be made to investigate other methods to instigate economic growth and development since current approaches have not improved African economies in general and the Gambian economy in particular. Rather, these economies are decaying – increasingly at risk of isolation from the global market place and, consequently, further stagnation. With this in mind, then, this study attempts to answer the question: "Given the telecommunications infrastructure in place, how can Gambian policy makers use it strategically to transform the economy, rapidly and in a sustainable manner, to an information economy that will stimulate economic growth?"

The sensible use of this infrastructure will significantly improve the use, allocation, monitoring, transparency, and accountability of resources by increasing the political and global awareness needed for economic efficiency and effective decision-making. The ability to gather, process, manipulate, and distribute information in a timely fashion is pivotal to successfully participating in the global information economy and is a prerequisite for market access and exchange. The Gambian economy will not grow significantly or in a sustainable manner if decisions are not made to use the telecommunications infrastructure as an economic enabler and stimulant.

It is the position of this research that the decaying of the Gambian economy visible until recently is largely explained by poor management of resources, corruption, unskilled management, inadequate technical human capital, and inadequate information upon which to base quality decisions and promote accountability. These deficiencies most often result in political instability, civil strife, and economic chaos and decay, as observed in most

places in Africa at one time or another (Guinea Bissau, Liberia, Sierra Leone, Rwanda, Congo, etc.) and even in The Gambia during the political changes of 1994.

An adequate telecommunications infrastructure and the diffusion and appropriate use of information technology provides access to an abundance of relatively inexpensive information, unleashes the human capital potential, and could significantly reduce the "brain-drain" syndrome plaguing The Gambia and most other African economies. The strategic use of information technology and a telecommunications infrastructure in this way would also be rewarding to the country as highly-skilled Gambian professionals currently residing in developed countries would be attracted into investing at home. Notwithstanding their present inadequacies, most African economies are rapidly moving towards telecommunications reforms through liberalization, privatization, and the introduction of competition. Such new developments in Africa are extremely encouraging as, thus far, telecommunication was considered a good example of a natural monopoly - an essential public good that governments should provide "non-commercially." Telecommunication services in most African economies are still provided by public enterprises under monopolistic conditions and The Gambia is not an exception to this phenomenon. However, external changes such as progressions in telecommunications technology and the increased globalization of economies, together with prevailing internal conditions including the slow growth of the telecommunications sector, poor infrastructure, poor management, and a lack of capital with which to improve, are eroding the viability of such monopolies. Saunders, Warford and Wellenius (1983) have suggested that the only way for Africa to improve its telecommunication infrastructure is to pave the

way for the rapid diffusion of information technology and capabilities through appropriate forms of liberalization and privatization of the public telecommunication entities currently controlled by government. This will impact economic growth and development and, therefore, this study suggests that African policy makers should resort to liberalization and privatization as the appropriate mechanism to bring about adequate telecommunications infrastructures and growth.

Information technology has brought about a significant change in the evolution of the global economic system. An efficient and modern telecommunications system is considered both the core and infrastructure of the global information and knowledge-based economy - the core because today's major economic activities, such as financial transactions, are predominantly information processing and transmission, while others (e.g., traveling), depend on these facilities; and the infrastructure because it facilitates market entry, improves customer service, reduces costs and distance, facilitates efficient and timely flow of information, link organizations, governments and societies to the global economy, and increases productivity in all sectors.

This dissertation is not arguing that the development of The Gambia's economy depends only, or even primarily, upon adopting and acquiring information technology and investing in the modernization of its telecommunications infrastructure. Rather, it argues that the above measures will improve the ability and efficiency of all the various interacting agents of economic development by providing a degree of synergy and alignment amongst them.

There is no doubt that economic development depends largely upon the educational level, and the access to further education, of a particular economy. Skilled human capital is a critical ingredient of sustained economic growth and development and improvements to the quality of life, and is a prerequisite for successfully reaping the benefits of information technology. Therefore, this study argues that it is via education that the Gambian economy must gradually enhance its IT capabilities, thereby significantly impacting upon work and economic efficiency. It is, therefore, important to integrate the information technology infrastructure into the educational system in order to create a skilled "cyber generation" of Gambians that will, collectively, help The Gambia's economy to be part of the global information economy.

Consequently, The Gambia's policy makers cannot afford to neglect the strategic use of the relatively modern telecommunications infrastructure already in place in order to facilitate the use and diffusion of information technology. As mentioned earlier, The Gambia's economy is behind most of the world's economies, and will in all likelihood be further marginalized, both economically and socially, as the global information economy continues to mature (Akhtar and Melesse,1994; Bureau of National Affairs, 1995; Hanna, 1991; Hawkridge, 1990; Munasinghe, 1989; Odedra et al; 1993; Rada, 1985). In fact, according to the literature, information technology has become vital to national economic development – no longer an option, it is now necessary for economic viability (Akhtar and Melesse, 1994; Bureau of National Affairs 1995; Carter, 1995, Haddad et al; 1990; Hanna, 1991; Hawkridge, 1990; Morehouse, 1981; Palvia et al; 1992; Rada, 1985; UN, 1973; UNEP, 1990; UNESCO, 1991; Wessells,1990). In fact, economies of the world are

experiencing a "gradual paradigm shift" in their socio-economic development, with IT and telecommunications improvements playing a pivotal role in accelerating socio-economic development in those economies that have adopted it in an appropriate manner. A recent World Bank study by Hanna (1991) argues that information ranks with other major development resources, such as human, natural, and financial resources. Therefore, agencies giving development assistance must understand the role of information and information technologies (informatics) in developing countries in order to enable developing countries to respond to what remains a rapidly-evolving global environment.

Although The Gambia has started, sporadically, to incorporate elements of information technology and to improve its telecommunications infrastructure, and has initiated policy frameworks regarding these vital developments, little research has been documented thus far. It is immensely important for policy makers and researchers to initiate efforts to investigate basic information needs, attitudes, culture, infrastructure, and the appropriate use and integration of information technology into all sectors of the Gambian economy. This is because, put simply, the socio-economic development of the nation's economy will depend upon the policy makers' ability to strategically plan, prioritize, and integrate the use of information technology appropriately, and in a sustainable way, into every sector of the economy.

1.2 Statement of the Research Problem

This study will examine the linkages between investment in telecommunications infrastructure development and economic growth in The Gambia. The existence and strategic use of an adequate telecommunications infrastructure, as well as telecommunications liberalization, are becoming prerequisites for a global information economy - paving the way for the diffusion and strategic use of information technology and, thereby, enhancing efficiency and productivity. This will present new opportunities for the development of The Gambia's financial markets by integrating them with the international markets; improve educational access, enhance trade, generate jobs, and improve the management of resources, all of which will lead to rapid economic growth and economic development for the nation.

Researchers have documented the relevance and importance of information technology as a pivotal enabler in economic development initiatives and strategies (Akhtar et al., 1994; Bureau of National Affairs, 1995; Carter, 1995, Haddad et al., 1990, Hanna, 1991; Hawkridge, 1990, Odedra et al., 1993, Palvia et al., Sadowsky, 1993, UNEP 1990, 1992; UNESCO, 1991, Wessells, 1990). A large number of African economies, however, continue to face problems in their quest for economic development and growth. Since obtaining their independence, most of these economies have slowed, stopped, decayed, or regressed, with only a few examples bucking this trend (Botswana, Mauritius, Seychelles, South Africa, Uganda, and Zimbabwe). Notwithstanding these isolated examples, the

general inability to improve economic growth and development can have serious socio-economic and political repercussions both for Africa and the rest of the world.

Hanna (1991), indicated that information technology has changed the production and distribution of goods and services within an economy's import and export sectors. He further suggested that economies are confronted by, and forced to trade using, information technology, which is not widely used in African economies at present (Jules-Rosette, 1990). He argued that, in order for information technology to exist, play a significant role, and impact processes and society positively, there needs to exist an adequate and efficient telecommunications infrastructure and a skilled technical work force within the economy.

Unfortunately, and as referred to above, the majority of African economies have poor telecommunications infrastructures and lack both the investment and the requisite policy framework to bring them up to speed to the information economy. For the likes of The Gambia, with its relatively modern telecommunications infrastructure, there is a need for policy makers to rethink how they can maximize the utility of this infrastructure in order to stimulate economic activity. It is clearly important for African economies in general, though, to invest in modernizing their infrastructures and adopt meaningful policies that will attract foreign investment and enhance their ability to participate in the global information economy.

Unfortunately, however, little work has been done to help us understand the contribution of telecommunications infrastructure investment to economic development in developing countries (Gille, 1984). In fact, there are no comprehensive investigations of the economic impact of telecommunications and IT upon The Gambia or any other African

economy. Considerable efforts *are* now underway, though, by organizations such as the Economic Commission for Africa (ECA), the International Telecommunications Union (ITU), the World Bank, and Africa Communication, Inc. (AFCOM), under the leadership of Professor Raymond Akwule, to investigate the relevance of telecommunications and IT to the economic development debate and to establish how they can be employed to facilitate economic revival and development strategies in African economies.

Notwithstanding these efforts, no comprehensive empirical economic analysis investigating the relationship between telecommunications infrastructure development and economic development, including the use and diffusion of information technology and the challenges and issues faced by The Gambia in particular, has hitherto been conducted. As a result, the economic implications of The Gambia's transition to the global information economy remain poorly understood, and particularly perplexing to Gambian policy makers and donors. The result of this situation is further marginalization of the Gambian economy, already rarely associated with information technology as it is. Those studies related to information technology and telecommunications research that *do* exist tend to omit issues affecting The Gambia or other African economies.

It is the goal of this dissertation, therefore, to remedy this situation by supplying both theoretical and empirical analyses of the relevance of telecommunications and IT to the economic development of African economies. Poor telecommunications infrastructure investment, now more than ever before, undermines Africa's ability to compete effectively in the global information age. In essence, without an adequate telecommunications infrastructure, IT will continue to be a rarity; African businesses and policy makers will not

be able to conduct transactions competitively with the rest of the world; quality information will continue to be scarce; economic growth and development will continue to dwindle; democracy will be undermined; corruption will continue; the quality of life will worsen; poverty levels will escalate further; and yet more civil unrest will ensue. This bleak scenario should, in my view, alarm Africa's policy makers and donor agencies and encourage them to re-evaluate their economic policy priorities in order to include the development of, and further investment in, telecommunications infrastructures and IT.

Laurent Gille (1986), in an International Telecommunications Union (ITU) study, investigated the relationship between telecommunications and economic development by looking at a number of parameters. His approach represents the first attempt to explore the interaction between telecommunications and development; however, further research is required, especially as regards the situation in Africa.

African policy makers have certainly attempted, on numerous occasions, to accelerate economic growth. However, most of these attempts have involved some form of market intervention – such as liberalization policies, Structural Adjustment Programs (SAPs), and Economic Recovery Programs (ERPs) – and have generally failed. Until recently, though, East Asian countries such as Japan, Korea, Taiwan, and Singapore can be seen to have made remarkable progress adopting certain, moderate, interventionist policies. In fact, in a study conducted by the World Bank in 1993, it was suggested that East Asia's superior performance when compared to African countries and/or other developing countries was not down to the fact there was a lower level of intervention; rather, it was because these economies had undertaken *efficient* interventions. East Asia

implemented effective policies, institutions, and practices, and undertook large investments in telecommunications and information technology infrastructures, while minimizing overall price, trade, and macroeconomic distortions as much as was possible (World Bank, 1993).

It is the view of this study that, thanks to the poor utilization of the telecommunications infrastructure, an inadequate stock of skilled human capital, and poor management of resources, both the financial sector and IT are in their infancy and, consequently, economic growth and development have been a constant struggle in Africa. This lack of an adequate telecommunications infrastructure also results in inefficient management and use of resources and a lack of the sort of adequate and timely information required for key decisions, both of which further contribute to the failure of economic development initiatives.

It is also the position of this dissertation that the Gambian economy, in particular, will not enjoy sustainable economic growth and development without effective strategic use of her relatively modern telecommunications infrastructure as an enabler in economic activities. If this infrastructure is used effectively, it will be able to assist in the appropriate diffusion of information technology into all sectors of the economy, thereby enhancing efficiency, effective decision making, and productivity. This will bring The Gambia closer to world capital markets, increase foreign investment, bring jobs to the economy, and increase levels of health and literacy. However, this can only take place if effective policies

and management strategies that make *appropriate* use of information technology are in place. If so, this will facilitate the birth of an efficient and transparent financial market.

Although human capital is needed in a "knowledge-based" economy, in the case of The Gambia educational attainment is very low, despite recent improvements. Certainly, the University Extension Program - started in 1995 and administered by Saint Mary's University, Halifax, Canada - could help increase the human capital stock. The program currently offers Bachelors Degrees in Economics, International Development, Mathematics, Physics, Geography, the Environmental Sciences, and English Language, and the first class, of approximately 66 students, graduated in February 1999. Hitherto, there has been no university-level education in The Gambia - students often pursued their post-high school education overseas (in Great Britain, the USA, other African countries, or other Western European countries). Though most of the sponsored Gambians find themselves at the tops of their classes, they tend not return to The Gambia after completing their education, and thus further exacerbate the brain drain. However, the fact that all 66 of these recent graduates are staying, and already have jobs within the educational sector (as high school teachers) or within the Civil Service, will have a positive effect on the economy in the long run. The high schools in The Gambia are starved of qualified indigenous teachers, and these graduates will fill this void, at least in the interim. At the moment, most high school teachers are from neighboring countries (Ghana, Nigeria, and Sierra Leone), the United States Peace Corps, or volunteers from Great Britain or Canada. However, one real challenge for Gambian policy makers is to strategically build human capital that is not going to depend on the government for employment. Rather, this human capital must

facilitate private sector development that could bring IT jobs from the United States and Western Europe and, eventually, make The Gambia an IT "hub" for the West African region. Given the Gambia's unique geography, size, political and social characteristics, telecommunications infrastructure, relatively non-corrupt and non-bureaucratic Civil Service, improving education system, and political neutrality, this *could* be achieved. To do so, though, it is vital that The Gambia build an information technology component (Computer literacy, software development, internet technology) into her education system. Preferably, she will do so using both her telecommunications infrastructure, and the recent Internet gateway, sponsored by the United Nations Development Program (UNDP). The planned University of The Gambia, to be inaugurated in 1999, should also help to increase the human capital stock of the country; in fact, it represents an opportunity to transform higher education in Africa. The country's telecommunications infrastructure must be used for educational delivery and policy makers should forge strategic alliances with universities in the United States and Western Europe to provide distance learning facilities that will enable the development of information technology, software development, computer science, and management capabilities.

The target of economic growth and development in The Gambia, and the consequent challenges facing the several sectors mentioned above, are not only interdependent, but require the strategic use of the nation's telecommunications infrastructure in order to be achieved or overcome. An adequate telecommunications infrastructure is one of the most important catalysts with which to promote economic growth and development for *any* economy, and this thesis examines the role that such

infrastructure development plays in the economic growth of The Gambia in particular, using an aggregate production function approach.

In summary, this dissertation investigates the socio-economic impact of telecommunications, information technology, and economic growth in Africa by combining a case study with econometric analysis. The evolution of telecommunications and information technology is examined and the linkages between investment in telecommunications infrastructure and economic development in The Gambia are thoroughly investigated. This research seeks to establish such linkages using a cross-country framework.

This dissertation also thoroughly reviews some of the tangible and intangible ingredients of Gambian policies, provides an analysis of the previous literature pertaining to telecommunications sector reform, and then argues for reform in The Gambia. The paper examines the underlying problems affecting the further development of telecommunications in The Gambia by analyzing the stages in the country's telecommunications development thus far.

I review the recent literature regarding endogenous growth theory, which assumes that government policies affect growth through their influence on the real rate of return to capital, and which in turn affects the rate of investment in telecommunications infrastructure and, consequently, economic growth. An econometric growth model is estimated, using data from The Gambia. Regression analysis is used to examine the individual effects of those factors influencing economic growth - in contrast to the

correlation analyses used in most studies of this type. Finally, the basic relationship between IT/telecommunications and economic growth is also investigated.

1.3 Objective of the Research

The main objective of this study is to investigate the socio-economic impact of telecommunications, information technology, and economic growth in Africa by combining a case study with an econometric model. The evolution of telecommunications and information technology is examined, and the linkages between investment in the telecommunications infrastructure and economic development in The Gambia are investigated.

This study is undertaken in an effort to extend the knowledge base regarding IT adoption and diffusion, and to contribute both to the literature on the socio-economic impact of telecommunications and information technology, and to the discussion of their relevance to economic growth and development. It also contributes to the body of literature arguing that investment in an adequate telecommunications infrastructure, and its integration into all economic sectors and societies, will promote economic growth in African countries.

This study also aims to demonstrate to Gambian policy makers that they must urgently rethink their economic development strategies as the world evolves into an information-based economy. I will attempt to argue, empirically, that the further expansion of The Gambia's information technology capabilities, and further improvement

of her telecommunications infrastructure, are necessary ingredients in realizing economic growth and development.

Finally, it is my objective to investigate whether, if by choosing to invest further in a yet more adequate telecommunications infrastructure, The Gambia can "leap-frog" from an agrarian economy to a global information economy, realize significant economic growth, and provide an improved quality of life for its citizens.

1.4 Research Questions

The analyses undertaken in this study will provide answers to the following questions:

1. Is there a relationship between investment in the telecommunications infrastructure in The Gambia and its economic development? Will the adoption of information technology adequately prepare the Gambian economy for the global information system?
2. What is the status of the telecommunications infrastructure in The Gambia?
3. What is the status of its telecommunications policy and reform framework?
4. What are the problems and issues affecting the development of telecommunications in The Gambia?

This dissertation attempts to answer these questions by reviewing telecommunications, information technology, and economic growth and development literature. Resources and documents from the ITU, the UN, the World Bank, the Library of Congress, and relevant journals were consulted, and interaction with World Bank, ITU, and African telecommunications experts was undertaken. Furthermore, two field trips were taken to The Gambia Telecommunication Company in order to review internal documentation and interact with telecommunications policy makers.

Econometric techniques are utilized in this research, using data gathered from the International Telecommunication Union (ITU), the United Nations (UN), the World Bank,

The Gambia Statistics Department, and The Gambia Telecommunication Company. This approach takes this paper beyond that undertaken by previous studies, which adopted correlation techniques in order to establish relationships.

1.5 Significance and Potential Contribution of the Research

This study will add to the existing body of knowledge pertaining to the economic impact of telecommunications and information technology investment in developing countries in general, and in Africa in particular. It will achieve this by empirically investigating telecommunications infrastructure development and its relationship to economic growth and development both qualitatively (via a case study) and quantitatively (i.e., by employing econometric techniques).

African policy makers, when formulating economic development policies that attempt to remedy the economic decline of their economies, have often overlooked the importance of telecommunications and IT. Their telecommunications policies, in particular, have tended to be unfocused and political. Basically, the absence of an established policy framework, along with the lack of recognition of modern telecommunications infrastructures and IT facilities as prerequisites for economic growth and development in the global information economy, has resulted in under-investment. Hence the continued existence of *poor* telecommunications infrastructures in these economies. In addition, those studies that *have* addressed the telecommunications policies of developing countries appear to view the ultimate purpose of telecommunications to be to bring the market mechanism into full swing. Consequently, they have not been

successful in improving the poor infrastructures presently in place. Ignored are such issues as the liberalization or reform of the telecommunications sectors in African countries, in order to enable private investors to modernize, increase access, and facilitate the diffusion and adoption of information technology on a nation-wide basis. Although it must be noted that some African countries *have* started to show an interest in liberalizing and reforming their telecommunications sectors in this way, they have often been frustrated thanks to a lack both of suitable policy frameworks and of research justifying such reform and investment.

Investment in the telecommunications infrastructure is expensive and, given the meager resources available to developing countries and the demands made by their citizenry to invest more on health, education, and food production, such expenditure has to be justified. It is the view of this study, that investment in such infrastructure *must* be undertaken if African nations want to become (or, in isolated cases, remain) a part of the global economy. In essence, and as stressed prior, telecommunications investment is a pre-requisite for the diffusion of information technologies and for the attraction of foreign investment. Furthermore, African countries with poor telecommunications infrastructures will be bypassed by investors and trade partners choosing to invest in countries with more efficient and modern infrastructures and abundant, skilled, and cheap technical human capital.

In particular, further investigation is needed of Gilles' conclusion that there is a positive relationship between telecommunications and economic growth. Gilles (1984) suggests that, if we accept that the transition of an economic order to a superior one takes

place as a result of product differentiation, division of work, specialization, and an increasingly skilled labor force, then the telecommunications networks facilitate this change by allowing the exchange of an increased volume of goods and by establishing linkages between people and places. He further concludes that the development of telecommunications networks provides for a decentralization of the economic system, which he also sees as necessary to achieve growth.

From a theoretical perspective, this dissertation will offer a general explanation of why investment in a telecommunications infrastructure is needed to facilitate the adoption and diffusion of information technology, thus stimulating economic behavior, growth, and development. It also argues that investments have to complement strategic and appropriate reforms aligned to economic development initiatives for the outcome to be positive. It is my belief that the empirical evidence, and the theoretical foundation supporting it, will constitute a persuasive analysis of the economic impact of information technology and telecommunications in the Gambian economy.

In documenting the transformation of the telecommunication sector in The Gambia, this study examines the issues policy makers need to grapple with in order to justify the inclusion of information technology investments in the economic development models of, not only The Gambia, but developing countries in general. The Gambia has been chosen as a case for analysis in this thesis because of my knowledge of this country and because of its relatively recent modernization of its telecommunications infrastructure, which has resulted in huge revenues for the economy following the partial diffusion of information technology into various sectors.

1.6 List of Hypotheses

1. There is a simultaneous relationship between telecommunications investment and economic development. Adequate investment in the telecommunications infrastructure leads to faster economic development, and faster economic development also leads to higher rates of investment in telecommunications infrastructure, ceteris paribus.
2. Economic development is positively associated with telecommunications development.
3. There is a positive association between telecommunications investment and exports.
4. There is a positive relationship between telecommunications investment and the literacy rate.

1.7 Limitations of the Research

This study is limited to a case study of the Gambian economy and its telecommunications development and, due to the unavailability of an adequate data set regarding relevant variables, certain more "robust" econometric approaches to the investigation were not undertaken. This might explain why most researchers have shied away from undertaking quantitative analyses using data sets that pertain specifically to African countries.

1.8 Methodology of the Research

There are numerous social science approaches available with which to analyze both the determinants and impacts of telecommunications. These are usually termed macro versus micro approaches, or secondary versus primary data analyses. In this study, I include a number of these approaches, specifically qualitative and quantitative, in order to provide evidence regarding the relationship between telecommunications and economic growth and development.

A macro-analysis can be cross-sectional or longitudinal. In a cross-sectional macro-analysis, highly aggregate data on various countries - e.g., telephone density and/or gross national product - is compared at a certain time, and the studies by Hudson and Hardy (Hardy & Hudson, Geneva, ITU, 1983) are the most frequently mentioned examples addressing the telecommunications field. Correlation and regression analyses are the typical methods utilized. In addition, cross-sectional regional analyses are used to identify relationships between telephone density and selected indicators - distance, emergencies, infrastructure - by comparing indicator values from various regions. In addition, the influence of urbanization on telephone density was examined, in order to provide an indicator of possible future demand. This is, for example, what Yamamoto tried to do with his Thai data (Yamamoto Paper, Tokyo). However, the problem with this approach is its simplicity, loss of detail, the unreliability and incomparability of the data, and the fact that causal relationships are too often assumed.

Using a longitudinal macro-analysis within a country, the development of indicators at the national level - for example, telephone density, and explanatory variables such as gross national product (GNP), industrial development, development of purchasing power , or the inter-relationships between various telecommunications indicators (see table 13) - are examined with the instruments of correlation and/or regression analysis, including time lags. The approach of longitudinal regional analyses is such that, on the basis of highly aggregate data regarding development within various regions or provinces within a country, it becomes possible to identify potentially unequal distributional features of telecommunications investment. This comparative approach was used by Cleevely for regional planning in Kenya (Telecommunications Policy 4 (4) (2) 1980 108-118); but problems associated with it include multi-collinearity, unknown common factors, unique historical aspects, and the possible neglect of socio-economic changes.

Another approach utilized is routine data analysis. Production, accounting, and traffic volume data collected by telecommunications administrations can be used to analyze differences in user structure, the influence of tariffs on demand, and the balance of telephone linkages (e.g., between branches of businesses). Other routine data are used for demand estimates, for the determination of shadow prices, or for the re-aggregation of sectoral data when analyzing the information sector. In these cases, however, a potential problem reaching beyond the usual "macro-problems" concerns the fact that such data is usually collected for *other* purposes - for example, accounting. In other words, differences in tariffs for private and business users can result in falsified data on the user structure and, consequently, cause data quality problems.

Other macro-analysis approaches include a telephone directory analysis and an input-output analysis. The analysis of telephone directories can provide information on the structures and processes pertaining to telecommunications usage within various sectors, regions, and individual businesses. Frequently, the sub-sectors of PTTs are combined in one communications sector; however, these two sectors almost always have differing capital intensities and development paths. Even if these distortions can be eliminated, price distortions, income differences, supply shortages, data quality problems, and aggregation differences (especially in comparisons not limited to one country) are major problems for the analysis.

Microanalysis, on the other hand, consists of surveys, diaries and contact reports, group discussions, Delphi studies, and case studies. Various surveys have been made to glean information on the purposes, objectives, frequency, duration, importance, cost, and time implications of telephone calls in rural villages within developing countries. Such inquiries were made in Korea, concerning agricultural enterprises and light and heavy industry, by KIDRI (Korea Industrial Development Research Institute, Seoul) (1977); in Tanzania, concerning inter-sectoral call linkages, by Kayani; in Indonesian villages, concerning home telephone subscribers, office telephone users, telephone borrowers, and the population in general, by Alfian (East-West Center, 1984); in various Egyptian villages, concerning the cost-benefit ratio of calls, by Kamal (Pool, Kamal, Dessouki & Pool); and in India, addressing the same concerns, in the province of Andrah Pradesh (Kaul). Unfortunately, however, these micro-studies are subject to such problems as limited

representation, reply distortions and refusals, and their restriction to a short historical period.

For example, standardized diary entries and pre-structured contact reports were used as special forms of inquiry by Clark & Unwin in order to compare the use of various communication media (telephone, mail, or meeting) to obtain information regarding differential purposes, contents, and consequences of the various means of communication. In order to collect information on goals, expectations, and objectives, and to ensure that it is exempted from individual distortion, group discussion procedures may be adequate. In Greece, for example, in order to estimate future supply and demand developments for new telecommunications means, Papandreou utilized the Delphi method (1983). This involves a type of sequential inquiry of experts with interim results then submitted for revision.

Most of the results presented in the literature come from case studies; for example, on the regional telephone situation in Alaska (Hudson, 1979); on the Pacific Cook Islands (Hudson, 1983); or on the black market in telephones and price differences between apartments caused by the shortage of telephones in Egypt (Saunders & Warford & Wellenius, Myer). Often, of course, these case studies do not meet the basic requirements of empirical research - i.e., objectivity, reliability, and validity – however, though they are anecdotal, they can often help enlighten important aspects and provide some bases upon which to formulate hypotheses. In the form of comparable case studies, for example, Tyler and Jonscher (1987) organized nine inquiries, in Kenya, regarding missed opportunities that were down to a shortage of, or faulty, telephones. These served as a basis for calculating cost-benefit ratios (Tyler, 1983).

Other approaches include historical analyses, future scenarios, mixed forms, and comparison methods. Historical analyses on the diffusion, acceptance, and efficiency of telecommunications (for example, in Chile (Johnson)), or on competition and regulation in the USA (Brock), or in Europe (Ramadasmurthy), have provided useful insights into development processes; whereas the scenario method, in which potential futures are portrayed, has not been widely applied. An example of this approach was provided by Newstead, concerning Australia, while more general applications of the basic method were chosen by both Day and Pierce. This method is particularly suited to developing countries simply due to the possibility of using IT to entirely "transform" these economies.

Evaluations, regional studies (Kaul, Meijer), sectoral analyses, and cost-benefit analyses (Jonscher), usually apply several of the approaches mentioned above in order to assess or quantify the benefits and effects of telecommunications. On the basis of various combined data sources, including routine data inquiries and estimates, time, energy, and/or cost savings achieved with the telephone were analyzed (Clark, Miller, Saunders, Warford & Wellenius, Tyler). Finally, with the comparative methods approach, the literature sometimes assigns usefulness only to one or other of the methods, without providing justifications.

The multiplicity and arbitrariness of micro-studies, though, can be contrasted with the lack of causality found in macro-studies. Macro-studies are frequently rejected despite the fact that the collecting of primary data is preferred (Saunders, Warford & Jeremy, Mandeville). As Saunders et al. see it, aggregate data analyses have, if nothing else, illustrative value. However, it is methodologically untenable to consider that only micro-

studies are valid, important, and/or significant. They too do not generally permit causal inferences. In addition, data quality, which is an important argument used by numerous authors against some of the approaches referred to above (Clarke & Laufenberg, Saunders, Warford & Wellenius, Miller), can only be assessed expediently within the frameworks of individual studies. In general, too, many publications document the approach, sampling procedures, and data in insufficient detail and, consequently, this too makes it difficult to judge the quality of the data and the results that flow from it.

There is no *one* approach to an impact analysis of "telecommunications" - the field is simply too complex. We are here attempting to assess a technology within its institutional, social, and economic framework, all of which determine its uses and benefits. In other words, the task is not to assess technology *per se*, but to approach, gradually and methodically, the different social, economic, and institutional settings of telecommunications usage, and in the process avoid arbitrariness and vested interests. Thus, in this study, both qualitative and quantitative approaches are utilized to explore the relations between telecommunications and economic growth and development in The Gambia. The rationale behind using a case study *as well* as a degree of empirical analysis is that case studies are an appropriate method for developing theory wherever a fresh approach is required (Bebasat et al, 1987; Eisenhardt, 1989). To put it another way, a single case is sufficient to permit exploration of the correlation between telecommunications and economic development. It is important to note, at this stage, that though in-depth case studies of IT and telecommunications in developing countries such as The Gambia may well provide a useful research approach, they must, in order to be of significant value,

examine the issues from a socio-economic perspective. Thus, serious consideration should be given to the social and economic dimensions of the processes being investigated in addition to the more traditional technical and quantitative aspects that most immediately come to mind when one talks of "information technology" and "telecommunications." In this study, we take a broad perspective.

1.9 Organization of the Research

Before commencing my main analyses, it will be valuable to present a brief chapter-by-chapter outline of this thesis.

Chapter II. A Review and Critique of Selected Telecommunications and Economic Growth Literature. This chapter provides a brief summary of past work on information technology, telecommunications reform, and economic development in developing countries. The aim of this comparative approach is to highlight the differences in the telecommunications reform approaches and experiences of the United States, Japan, and Europe, with the ongoing, and often timid, attempt to bring about reform in Africa and the rest of the developing world. This chapter also addresses the reforming experiences of the World Bank, largely because of its huge involvement in telecommunications infrastructure financing and its influence on the economic development strategies of developing countries. The perspectives of Akwule and Horwitz, two scholars writing on telecommunications reform in Africa, are also included in this chapter.

Chapter III. Macro-Economic Analysis of the Gambian Economy. This is a contextual chapter providing a brief discussion of the Gambian economy. It preludes:

Chapter IV. Socio-Economic Implications of the Telecommunication Sector in The Gambia: A Case Study. This chapter explores the chronology of telecommunications development in The Gambia, the growth in telecommunications infrastructure investment, and the reform efforts currently underway.

Chapter V. Significance of Information Technology to the Economy of The Gambia. This serves as a "transition" chapter, in which the abstract theories discussed in Chapter II are applied to the situation visible in The Gambia. This chapter discusses the connections between telecommunications and economic growth by describing the changes in the global labor market. It further discusses the role of telecommunications and information technology in the reorganization of Gambian Society, public administration, education, agriculture, and manufacturing. This chapter concludes by discussing the challenges facing The Gambia in its information technology management efforts.

Chapter VI. The Evolution of an Information Economy in West Africa: A Framework for Building The Gambia's Information Infrastructure. This chapter discusses the current IT and telecommunications capacity in The Gambia and highlights the main problems that the country needs to overcome if it is to succeed. This chapter also discusses The Gambia's economic development policies and the need to integrate information technology in the country's strategy. This chapter concludes with a discussion on the components needed to develop a National Information Infrastructure and a contingency model for an integrated IT policy.

Chapter VII. Telecommunication Investment and Economic Growth in The Gambia: An Empirical Analysis. This chapter describes the details of the empirical methodology - the scope and level of analysis and the measurement of the variables specified in the research model. The empirical data is also analyzed and its implications and limitations are discussed.

Chapter VIII. Conclusions and Policy Recommendations. This final chapter reviews the entire research effort and examines the wider implications of this work. This thesis concludes with an assessment of its contribution to scientific knowledge, and some reflections as to possible directions for future research.

1.91 Definitions

Telecommunications – Communication at a distance, including voice (telephone) and data (text/image) communications. Other similar terms used almost interchangeably with telecoms include datacommunication, telecom and networking.

Information Technology – All forms of technology involved in capturing, manipulating, communicating, presenting, and using data (and data transformed into information).

Information- Data usually processed data) that are useful to a decision maker.

Information Vision- A written expression of the desired future for information use and management in an organization / economy.

Information Systems- The collection of computer programs, hardware, people, procedures, documentation, forms, inputs and outputs used in or generated by making business data. An information systems consists of these components and their interrelationships.

Information Architecture- A structure that describes the technical components of the information systems infrastructure and the relationships between these components. The technical architecture is concerned with such things as the types of computer hardware, telecommunications networks, topologies, communications protocols and requirements for interfacing local equipment with the network.

Information Technology Architecture- A written set of guidelines for an organization/economy's desired future for information technology within which people can make individual decisions that will be compatible with that desired future; It should include components relating to beliefs or values, data, the technology infrastructure, applications and the management of systems for information technology.

Information Revolution- A radical economic re-orientation in the late twentieth century in which information and knowledge in combination with communication have replaced natural resources and physical labor as the fundamental sources of wealth. This new economy has been referred to as the information age or information economy.

CHAPTER II

A Review and Critique of Selected Telecommunications and Economic Growth Literature

2.1 Overview of the Research Literature

The aim of this chapter is to provide a summary of past work on information technology, telecommunications policy reform, and economic development in developing countries. In this section, I provide a general review of the literature regarding telecommunications reform as an international process unfolding in both the developed and developing worlds; while, in the second part of this chapter, attention is devoted to the reform experiences of the World Bank. There are at least two reasons for this interest in the World Bank. Firstly, the Bank is heavily involved in the financing of telecommunications development in Africa, with advice and direction from the bank's telecommunications experts significantly influencing macro-economic policies and development efforts. Secondly, the World Bank plays an active role in telecommunications reforms in developing countries in general. It sponsored the Structural Adjustment Program (SAP), which was implemented in several African countries and mandated the reforms of the Public Enterprise Systems (PESs), including telecommunications companies. It also plays a role in international policy coordination, often referred to as "policy dialogue."

This chapter further reviews the economic growth and development literature, focusing particularly on the contributions of Raymond Akwule and Robert Horwitz regarding Africa's reform experiences. These two authors are not only among the handful

of researchers who have documented the institutional reform of telecommunications in Africa, but they have also attempted to provide insights regarding the telecommunications process itself. In reviewing different contributions to the telecommunications reform literature, I identify in each selected contribution the presence of each of the following four elements:

1. What, according to the author(s), are the causes of telecommunications reform?
2. Does the author have a preference for any particular form of reform strategy?
3. What role is assigned by the author(s) to international policy diffusion or coordination via external pressure groups or epistemic communities?
4. Does the author exhibit an underlying approach to the causes of telecommunications reform inspired by "structuralism," "Economic-determinism," "technological determinism," "a legal environment-deterministic approach," a "political economy approach," or any combination of such approaches?

2.2 The Telecommunications Development and Reform Literature

2.2.1 Telecommunication's Role in Economic Development in Africa

Rapid changes are taking place in the telecommunications industry and, consequently, many studies have attempted to document and analyze this worldwide phenomenon. However, most of the recent studies have targeted the reforms that have taken place in developed countries (Noam, 1992; Steinfield, 1994; Davies, 1994; Wellenius et al, 1989, 1993; Melody, 1987, 1993; Takano, 1992; The European Bank for Reconstruction and

Development, 1992; Palmer and Tunstall, 1990; Horwitz 1989; Murphy, 1989; Beesley, 1981, 1989, 1992; Faulhaber, 1987; Hills, 1986; Snow, 1986). Nevertheless, there exists a growing body of literature discussing issues related to the reform of telecommunications infrastructures in the developing world, too (Hudson, 1984, 1991, 1993; Horwitz, 1992; Samarajiva, 1991, 1993; Akwule, 1991, 1993; Jussawala, 1992, 1993; Ambrose et al., 1990; Wellenius, 1989, 1993; Beca, 1993; Sussman, 1991; Lent, 1991; Samarajiva and Shields, 1989, 1990a, 1990b; Guttman 1986).

There is a considerable difference in research methodology between the studies carried out in the developed world and those elsewhere. Studies focusing on industrialized countries typically invest considerable effort in building explanatory frameworks regarding the *causes* of telecommunications reform. However, little research has been done to document the reform process *itself* and to analyze its *underlying* causes in the developing world.

Laurent Gille (1984) attempts to explain the lack of sufficient telecommunications investment in developing countries in the following manner:

> Firstly, the capital/labor ratio in the installation and operation of telecommunication infrastructures is very high. It is rarely part of the philosophy behind current development models to encourage this kind of capital-intensive activity; their development means a large drain (particularly African countries whose capital accumulation is still at its infancy) on the gross fixed capital formation of African countries, in which the allocation of resources tends at first to favor production rather than telecommunication infrastructures. This phenomenon is aggravated by the fact that there is a minimum investment threshold that needs to be reached before a country can provide itself with a telecommunication infrastructure reaching a minimum standard of performance. Secondly, such capital-intensive activity can only be based on foreign technology. This implies, for African countries that want to invest in upgrading their telecommunication infrastructures, not only substantial drain on their Gross Fixed

> Capital Formation (GFCF) but also on their currency reserves. That is why this research considers the question of the transfer of technology for telecommunications networks of prime importance, if these two hindrances are to be minimized. They represent, as it were, a non-monetary cost of telecommunication networks, which cannot be taken into account by microeconomic studies.

Gille further argues that developing economies, such as African countries, are still subject to this type of macroeconomic constraint. Nevertheless, despite the apparent "underdevelopment" of telecommunications, this sector still yields exceptionally high returns on investment. Most of the recent telecommunications projects in the developing world have produced an average rate of return of about 18 percent. Moreover, when it has been possible to evaluate the impact of these projects outside the administrations that are specifically providing the services, the "economic" returns on projects are evaluated at an average of 27 percent (Saunders, Warford and Wellenius 1983, 13-14).

Generally, the surplus earned is used for two purposes: (1) to contribute to the self-financing of the networks' development, and (2) to be carried over to other sectors (as is most typical). It was estimated that 50 percent of the profits earned by Indian telecommunications were transferred to the general state budget, and 30 percent were used to cover the losses made by the postal administration (Saunders, Warford and Wellenius, 1983, p.10).

Thus, Gille suggests that, though the returns on telecommunications investment are considerable, and the surplus earned could well finance the development of further telecommunications networks and services, the fact that these surpluses are instead used

to benefit of other sectors explains the limited extent of telecommunications development (Gille, 1984).

Gille also suggested that there exists a relationship between telecommunications and economic growth. If we accept that the transition from one (inferior) economic order to another (superior) one takes place thanks to a process of differentiation of production, division of work, specialization, and qualifying of the population, then the telecommunications networks would appear to be an important part of such a change in so far as they allow the introduction and exchange of an increased volume of goods and establish ties between people and/or places. He further suggested that the development of the telecommunication network provides for the decentralization of the economic system necessary to achieving economic growth. The development of telecommunications generally takes place only at a very advanced stage - when the distribution of wealth in the population allows for the spread of private telephones.

According to Gille, this will evolve along with general changes in economic structures, such as the appearance of new forms of services and the increased automation of production. Such evolution, he argues, can only be progressive. Even now, we still cannot tell exactly what form of service economy will establish itself in countries that industrialized during the 1970s. Nevertheless, no-one can doubt that their emergence is closely related to the functioning of a modern telecommunications infrastructure.

Recent research suggests causality between tele-density and income levels, in that higher tele-densities lead to increased incomes. Studies by Lee (1994) found strong

Granger causalities, in both directions, using Korean data sets. Cronin et al. (1991) found similar results.

Researchers have implicitly broached the question of the extent to which telecommunications can be a channel for socio-economic transfers. They show, for example, the key role of a telecommunications network in opening-up an economy to the outside world, in so far as opening up foreign markets to domestic industry. Paradoxically, though, they never consider the reciprocal role that telecommunications might play in opening up *domestic* markets to *foreign* industries. None of the research reviewed in this study inquired as to what the net result of improving external telecommunications networks might be for a developing country. However, it should be noted that there are studies that show that, in industrialized countries, the development of telecommunications networks between two unequal partners has, in most cases, benefited the more powerful of the two.

A similar investigation concerning the effect of telecommunications upon income distribution, and its impact on peripheral or rural areas, was carried out in 1983 (Jequier-Jipguep, 1983). Jequier-Jipguep formulated a list of advantages, derived by peasants of a particular region, from having access to telephones. He evaluated these advantages and quantified their overall value. Unfortunately, though, he did not extend this research by relating these benefits to those made by shops in the neighboring towns, or assess them in the context of socio-economic interdependencies between social and economic groups. The only area in which this duality has sometimes been recognized is in the impact of the introduction of telecommunication networks upon rural/urban migration.

Discussions of the growing importance of telecommunications and the ways in which this industry has became organized, either as a governmental monopoly or as a private monopoly regulated by the state, is very relevant to this study. Cronin (1993), measuring telecommunications intensity as the relation between a telecommunications input and the sector's gross value of production, found that US industries have, on average, doubled the intensity with which they utilize these services. Some of the most intensive users are from the finance, insurance, and trade sectors, and the fact that the greatest proportional increases between 1965 and 1982 were found in industries showing the smallest levels in 1965, strongly suggests that there is some degree of convergence in telecommunications intensity. This increasing intensity of telecommunications usage is generally attributed to the fusion of information technology and telecommunications; however, several studies have also evaluated the link between telecommunications and development. The World Bank (1994) found a statistical link between growth and several measures of infrastructure, including telecommunications. CEPAL (1992) found a two-way relation: business telephone penetration increments growth; while growth stimulates demand and, therefore, residential phone penetration. Roller & Waverman (1994), using an endogenous growth framework and data for 35 countries covering the period 1970-1990, concluded that there were causal links in both directions and that investment in telecommunications infrastructure led to "spillovers" and increased growth levels. With businesses increasingly operating on a global scale, seeking to achieve economies of scale and to establish a presence in diverse markets, adequate telecommunications are a pre-requisite. However, countries with an adequate telecommunications infrastructure are in

an even better position to attract investment and exploit their natural and geographical advantages if they can offer certain services and possess a pool of skilled labor.

Recent empirical analysis of the link between a country's competitiveness and its ability to sustain high growth rates has identified telecommunications inputs as important, if difficult to measure, variables. The World Competitiveness Report used both quantitative and qualitative variables to measure competitiveness, with an emphasis on the former. Although a country's level of telecommunications development has generally been a qualitative variable, measured through interviews with leading business people, Glaeser (1997) finds that opinions concerning whether a given country is at the "cutting edge" of technological development can be predicted by an index of three rather simple variables: 1) the number of phone lines; 2) the number of fax machines; and 3) the total computing power available.

The importance of such linkages between telecommunications development and progress has led many scholars to analyze the kind of industry structures and government policies which might best encourage the development of this important sector. One approach might be to study the ways in which thinking about these topics has evolved along with the industry itself.[1]

2.2.2 Telecommunication Evolution and Reform in Developed Countries

Historically, the telecommunications sector has often operated under conditions of monopoly and/or been controlled by the government. Though in some cases this state of

[1] Accounts of these are given in Naom (1992) and Viertor (1993).

affairs was a response to the need to collect revenues, in others it was meant to encourage efficiency and broad availability. The European postal system is an example of the former. A monarch awarded concessions for its operation and, carefully preventing competition and controlling rates, exploited the vast revenues that it could generate. In contrast, the early days of the telegraph in Britain saw competition between private providers. However, though rates declined for some years, firms were eventually able to form a cartel and increase their charges. The newspaper industry, as the main purchasers of telegraph services, protested virulently and, eventually, were able to build a movement that led, ultimately, to nationalization and a dramatic drop in rates. On the Continent, this service was offered by a state monopoly from the beginning.[2]

The telephone in Europe had evolved in a manner similar to that of the telegraph. In Britain, the Post and Telegraph Office could have operated telephony from its beginnings, but quarrels over the patent delayed its introduction. Instead, it opted to award non-exclusive licenses to regional operators and to develop the trunk system. Around the turn of the century, however, a decision was taken to nationalize telephony.[3] In The Gambia, in contrast, nationalization took place in 1984.

In the United States, the phone system has always been private. After the invention of the telephone in 1876, the Bell Company held an exclusive patent that it licensed in order to expand rapidly. In 1885, it started developing a long-distance system through a wholly owned subsidiary, AT&T. When its main patents ran out in 1894, Bell

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[2] The monopoly included both post and telegraph, two of the three services of the PTT (Post, telegraph and telephony).

[3] In Germany the Post and Telegraphs took over telephony with the sole intention of using it in rural areas where skilled telegraph operators were hard to find.

encountered significant competition, which it tried to control by not selling equipment to its rivals, and by refusing to connect them to its long-distance network, a strategy which allowed it to buy out many rivals over time. By the 1930s, it had gained itself a near monopoly position, and the Communication Act of 1934 established a system of federal regulation of the sector.

The early evolution of the phone industry thus leads to a monopoly form of organization. The elimination of competition, replaced by state operation or state regulation, was based on the observation that competition could be wasteful because it required duplication of facilities and the loss of economies of scale, and also that competition had proved to be unfeasible given the particular network characteristics of the industry. Both arguments suggested that this sector was a natural monopoly and that, consequently, the choice between a state monopoly and a private but regulated monopoly was unavoidable. Interestingly, however, competition, starting in the United States, has since been eroding the monopolistic positions of incumbent operators.

Technological progress and innovation have a profound impact on the feasibility of competition in this industry, and the ability of the government to operate or regulate it. Telephone networks have traditionally had a star topology, with lines running from homes to the local switch, and trunks connecting these switches. In the traditional phone network, too, there was no important distinction between the technology employed by either link. Both access lines and trunks involved a heavy investment in copper wire, and the cost of calls outside of the local area escalated with distance. In setting prices, the cost differences between loops were usually ironed out, while long-distance prices *did* reflect

costs. The introduction of microwave technology, however, made long-distance calling somewhat cheaper and much less sensitive to distance, and the reaction of both firms and regulators was to "pass on" only part of this cost reduction and to use the rest to try to keep access affordable and increase penetration.

This made long-distance telephony highly lucrative and, taking advantage of the FCC's liberal views regarding private networks, a radio repair man in Illinois founded MCI in order to offer point-to-point communication for large firms that had heavy traffic between distant offices. Subsequently, the FCC inadvertently authorized MCI to start offering switched long-distance services, when it obligated AT&T to offer its FX service to MCI, a service that allowed corporations to obtain a private line to the switch in another city, from which it could make unlimited calls at local rates. MCI connected its users to its own switch and bundled it with the FX service of AT&T - in effect, creating a switched long-distance service that would compete with AT&T.[4]

Since the entry was stimulated by cross subsidies resulting from the asymmetrical technological advance, no conclusions could really be drawn regarding whether the industry was or was not a natural monopoly. In fact, most countries continued supporting a model based on a vertically integrated monopoly for many years, despite the fact that the US long-distance market had, essentially, been broken open. [5]

The cross subsidies that had stimulated the entry of MCI, however, were maintained and, when AT&T was broken up in 1984, the financial support that the long-

[4] The entry of MCI could not have occurred without the FCC above 890 decisions, which authorized those frequencies for private networks, and AT&T's development of the stored control switch.

distance division provided internally for the local service division had to be converted into an "arms length" payment between different companies. This gave birth to access charges - rates that the long-distance companies pay to the local operators. [6]

Long-distance costs have been further reduced with the introduction of fiber optics, the price of which has plummeted as a result both of increases in the amount of fiber deployed and advances in the complimentary electronics (Hausman, 1994). This has had an enormous impact on the cost of international long-distance calls thanks to the laying of undersea cable, thus opening a growing gap between price and cost and creating a clear incentive for entry into this service.

In the case of cross border traffic, though, such entry requires the approval of the foreign regulator, which in many cases is not forthcoming as it prefers to see its own operator continuing to exploit its monopoly position.[7]

Among scholars of telecommunications reform policies, Eli Noam (1992, 1994) is to be given credit for his persistent attempts to document and analyze the reform of the telecommunications industry. In his *Telecommunications in Europe (*1992), Noam provides a good picture of the metamorphosis undergone by the industry. He writes:

> A number of far reaching changes in telecommunications policy originated from the United States. Because many were passed under a conservative political regime, they were usually viewed in Europe as the product of American business interests, wrapped in Chicago free market economic

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[5] Several countries eventually opened their long distance service to competition: the UK in 1983, Japan in 1987, New Zealand in 1989, Australia in 1991, Finland in 1992 and Chile, Canada and China in 1994.

[6] In some countries, such a payment is called an interconnection payment. Care must be taken in using the term access rate, as it sometimes refers to the rate paid by subscribers to be connected to the network

[7] This monopoly is based on control of the domestic network and the international gateway.

> ideology. But more recently, Japan and several European countries have begun to adopt similar policies, or at least to discuss changes that previously seemed unthinkable. This indicates that the changes in telecommunications...reflect a more fundamental transition (page 5).

This concept of "transition" is central in Noam's explanatory framework regarding the reform process. Indeed, for him, it is the organizational structure of the old PTT system that is being fundamentally challenged by the current mutations of the sector. However, he believes that the process is still unfolding, and for that reason he prefers to remain cautious: "these changes do not prove that a major reorientation had taken place, and that the problem of state monopoly had been resolved in most countries." To put Noam's argument in a historical perspective, one could go back as far as the year 1505, when "the Hapsburg Emperor, Maximilian, granted exclusive mail-carrying rights to what one would today call a multinational company, the Taxis family of Italy. Although this concession proved to be an unexpectedly rich source of revenue to the Hapsburgs, who shared in the profits, it also required vigilant protection from the incursion of mail systems, of which there was a multitude...Neighboring Prussia went one step further and in 1614 established a state-run postal monopoly. Thus, the PTT system was born as a creation by the Absolutist State for the Absolutist State." Although private, argues Noam, the structure of US telecommunications was not much different because, "It was near monopoly, with a full integration of network operation and equipment manufacturing. Its corporate ideology was shaped by AT&T's patron saint, Theodore Vail, a former postal man..."

It is interesting to note that the three institutional changes described by Noam - namely, a separation from postal services, managerial autonomy as opposed to direct governmental administration, and licensing private firms for the provision of non-traditional basic services - are common steps that have been taken by telecommunications reformers around the world. There must be some political, economic, or other significance attached to such similarities; however, Noam did not seem willing to address them. Instead, he limited himself to saying that he did not mean to suggest that no change had taken place. Rather, Noam asserts that the traditional PTT system was stable for a century, but that, in the 1980s, pressures emerged (as they did in the television sector) that could no longer be contained. By the end of the decade, and after the playing out of harsh political and ideological disputes, global change was in the air.

This statement accurately and objectively reflects that which has occurred in the telecommunications sector. The problem, however, is that the "pressures" are not identified and their respective importance, whether in triggering or accelerating the changes, is not assessed. In addition, the sector's internal dynamics, which created, at a particular point in history, a favorable environment in which the "pressures [for change]...could no longer be contained," also escapes analysis. Once again, this is most likely due to Noam's skepticism concerning the level of commitment that exists regarding the reform of state-owned enterprises around the world.

In a more recent piece, Noam and his co-author, Richard A. Kramer (1994), emphasized their underlying skepticism by entitling their article: "Telecommunications Strategies in the Developed World: A Hundred Flowers Blooming or Old Wine in New

Bottles?" The central theme of this paper challenges the dominant belief that traditional telecommunications organizations are an endangered species. On the contrary, they argue that:

> ...for all the diversity of institutional arrangement the new PTOs [Public Telecommunications Operators] have emerged from a turbulent decade with greater power than before. However, this condition is temporary. In time, corrective forces will emerge. What we are witnessing today, therefore, is the golden age of traditional telecommunications organization (page 273).[8]

Another methodological contribution of this article is the meticulous treatment of several policy options put in motion by the general reform. Noam and Kramer took on the difficult challenge of applying some order and clarity to the emerging new policies. They write:

> In this policy Tower of Babel, can one distinguish some basic structures and strategies? We will identify 11 fundamental building blocks of national strategies for telecommunications. The first 4 strategies pertain to the structure and form of telecommunications markets. They are liberalization, devolution, consolidation, and deregulation. In various combinations, they provide the materials for the new structures that were built in the 1980s. They are concerned with the status of a single unified monopoly. Two other strategies, corporatization and privatization, deal with the question of ownership and control and do not require a challenge to monopoly. A third set of strategies is those of international collaboration: trans-nationalization, international alliances, and harmonization. A final set of strategies is those of high technological development: vertical integration and industrial policy (pages 274-275).

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[8] Eli M. Noam and Richard A. Kramer, "Telecommunications Strategies in the Developed World: A Hundred Flowers Blooming or Old Wine in New Bottles?" in Charles Steinfield, Johannes M. Bauer and Laurence Caby, eds. Telecommunications in Transition: Policies, Services, and Technologies in the European Community (London: Sage Publications, (1994).

This effort to clarify the playing field was expounded upon further when Noam and Kramer came up with a series of operational definitions to the important concepts outlined above. For example, liberalization, a magic word for institutional reformers seldom defined but often descriptively presented, is equated to:

> The introduction of competition into monopolized markets. For equipment, it may involve adoption of standards that do not favor any group of suppliers, simple procedures for type approvals, nondiscriminatory rules for public procurement, and the absence of protective quotes. On the service side, liberalization may involve licensing entrants to provide a particular service, such as cellular telephony or long distance (pages 274-275).

The authors also warn that liberalization is not the same as deregulation, since deregulation is merely a reduction in government-imposed constraints on the behavior of PTOs.

Noam and Kramer pinpoint that "devolution" (as an opposite strategy to "consolidation"), is the policy of dismantling a single monopolistic structure into several units. The prime example of devolution is the divestiture of AT&T into local and long-distance operations. So far, no other country but the United States has pursued devolution; however, it is under consideration in both Japan and Britain.

Consolidation, on the other hand, is a strategy of merging different segments of the telecommunications systems that traditionally perform different tasks. Noam and Kramer point out that, in Denmark, the country's four regional service providers were merged with the national PTT, which provided long-distance services, in order to create a single operator. It is to be noted that consolidation, as defined here, has occurred in most

African countries, where long-distance and national telephony, traditionally operated by different entities, have been merged into new, "consolidated," telecommunications organizations.

Further pursuing their efforts to define the central concepts of the reform culture, Noam and Kramer defined corporatization as:

> ...the transformation of the PTT into a structure semi-autonomous from government, which may still be state owned but controls its own managerial and administrative functions. The monopoly status is not touched by corporatization as such, though once the close link to the government is severed, a process is set in motion that makes further changes more likely. Sometimes the corporatized entity is described as a "private" firm, in the sense that it may be organized under private law provisions, which determines its status in, for example, contract and labor law. But that description confuses legal detail with reality of control, which is still very much governmental...Corporatization may be a first step on the road to privatization (p. 278).

2.3 Telecommunications Privatization

Another important theme in the reform debate concerns the role of privatization in the telecommunications system. Noam and Kramer define it as follows:

> Privatization involves the government sale of shares in the PTT to private investors. However, ownership need not affect the monopoly status. In the United States, AT&T was private and a near monopoly for a very long period. In Canada, private, regional monopolies exist, and long distance competition has only recently been contemplated. Many European privatizations are only partial (p. 279).

Privatization may well encourage efficiencies of operation; however, if an unconstrained monopolist seeks cost reductions without regard to its captive customer, standards may plummet. In addition, such ownership strategies, it should be noted, often depend upon national economic development. For example, privatization in less developed nations generally derives from the need to raise capital - throughout Latin America privatization was used as a method to reduce the heavy debt burden, and in Eastern Europe it is inspired by the need for foreign capital and expertise.

Following their review of the major concepts, Noam and Kramer attempted to put forth the interesting claim that, despite everything, the worldwide process of reforming telecommunications systems might in reality simply be pouring the "old wine" of monopoly and state control into new bottles that will, in fact, strengthen the existing networks. The different strategies outlined above - "the policy menu of the 1980s" - are often seen as major reforming steps; however, Noam and Kramer question the extent to which these reforms really affected the power of the PTOs. Even when they turn their attention to ownership and control reforms, Noam and Kramer express their reservations by pointing out that such reforms, in so far as they have allowed PTOs to gain managerial and financial autonomy, have actually *increased* PTO power. At the same time, the government ministries that have assumed regulatory power have tended to be ineffective - often because they possess only a handful of experts with which to confront these huge telephone organizations. In Sweden, Televerket had 42,000 employees. The regulative ministry, however, had a telecom staff of 6.

In their conclusion, Noam and Kramer strongly assert that:

> ...as institutions [the traditional telecommunications organizations] have not been harmed [by these different strategies of reforms], and indeed, they have benefited. PTOs enjoy a dominant position in the market. They have been energized. Their competitors are tiny, regulatory authorities are frequently ineffective, and their role is enhanced by national industrial policies...This suggests that reforms, instead of being instituted from the outside to curb the traditional monopolies, were rather sought by the PTOs themselves. Reforms were originally advocated from outside and at first resisted by the PTTs, which then reshaped them into accommodating forms...Will the present PTO dominance last? Given the dynamic forces of the telecommunications market, this is unlikely (page 285).

As demonstrated, then, Noam (both alone and with Kramer) has constructed a consistent explanation of what has happened to the industry based upon a strictly structural analysis of "who loses, who gains, and who retains power." For him, the reform movement is clearly a battle for position between different forces in the telecommunications markets; however, he consistently prefers to keep his focus upon the structural changes and their real impact on the power of the PTOs - the "new PTTs." He seems suspicious of the sincerity of the reforms made by the PTOs and, having viewed some of the outcomes of the reform process thus far, he doubts their acceptance of the concepts of sharing power and markets. He attempts to show, in essence, that change is being handled according to the PTOs own agendas.

This study contend that Noam's contribution to the reform debate is significant, anti-conformist, and truly original. Notwithstanding this, however, he fails to comprehensively address the forces behind the pressures for change, and does not attempt

to identify how the "11 strategies [which] constituted the primary policy menu in the 1980s" were spread around the world. In other words, he does not *demonstrate* the existence of certain important forces devoted to policy diffusion, policy coordination, and/or policy harmonization (Noam), or policy dialogue (World Bank). However, another significant study in the available telecommunications reform literature is that provided by Meheroo Jussawala (1993), who compiled an interesting volume centering upon the issue of change. In that volume, she presented an article, "The Challenge of Change," outlining her own vision of the global impetus for change and reform. Unlike Noam, who characterizes the current situation as little more than an interesting period of transition, Jussawala refers to it as a "revolution in telecommunications technology." She strongly argues that the current transformation in the telecommunications sector is technologically driven.

Jussawala's position regarding the reforms and changes are drawn from a study of the impact of technological change in the industry; she develops her argument – particularly as regards the United States, Canada, Europe, and Japan – by building a causal relationship between such technological change and the ensuing reforms. She then uses these two factors to paint a general picture of what she calls "the information-economy." The problem here, though, is that we have a typical case of a structural approach combined with a causal analysis. This combination provides a deterministic system with which to explain the changes that have and are taking place; however, the flaws of determinism become more apparent as one begins to realize just how much is downplayed, or even entirely overlooked, in order to preserve the consistency of the

argument. Basically, all the players that face each other, from the PTOs - defined by Noam as a powerful interest group and, thus far, a winner - to the industrial policy makers, to the political decision-makers, to the private investors, to the international financial agencies, are either completely left out or portrayed as insignificant to the process of change. The "technological change approach" says a lot about the structures and their mutations, but little about human agency and the dynamics of national and international power relationships. It is also deterministic when explaining policy diffusion and coordination.

A different approach to explaining telecommunications reform is displayed in Rohan Samarajiva's article, "Institutional Reform of Telecommunications in Sri Lanka." Samarajiva first attempts to identify the major historical turning points in the formation of the Sri Lankan national telecommunications policy. He chooses the year 1980 as the beginning of the process of reform in Sri Lanka - a year in which the country showed a vanguard attitude by charging ahead of most other Third World nations. He pauses in 1984, the year in which privatization took place, and then moves on again and focuses upon the year 1991, which saw the occurrence of three major moves toward further institutional reform – the introduction of the Sri Lankan Telecommunications Act, the establishment of a regulatory authority (the Office of the Director-General of Telecommunications), and the corporatization of the Department of Telecommunications, which became Sri-Lanka Telecom (STL).

These three events are, of course, highly significant occurrences in any analysis of institutional changes. For example, the introduction of competition, in particular, marks a

desire to liberalize the market. However, as Samarajiva explains, though the Telecommunications Act provides an official framework, competition was at work years before its enactment. "The resale activities of the telecommunications bureaus," he writes, "were a form of rudimentary competition. More significantly, the first license for cellular service was given to Celtel Lanka Ltd. (owned 25% by Millicom of USA, 25% by Comvik of Sweden, and 50% by local and foreign investors) under the Telecommunications Ordinance, before the new legislation of 1991" (page 16).

Along with its informative value, the most important aspect of Samarajiva's work, at least for the purposes of this study, is his attempt to examine the *causes* of all these changes in Sri Lankan telecommunications. The statement noted above can be viewed as an invitation to *other* researchers engaged in the issue/area of telecommunications reform to take this process further. It certainly explains why *I* am taking on this topic as a research area. To move on, though, Samarajiva identifies three key factors that might be presented as intervening factors or players in the causes of the reform process in Sri Lanka. They are:

1. The influence (and sometimes active involvement) of the World Bank, the Asian Development Bank, and the Commonwealth Secretariat;
2. The former colonial master, Great Britain, which trained numerous Sri Lankan senior bureaucrats and politicians and left a legacy of legal and political systems, also "appears to have played a major role as an intellectual and ideological influence" (page 21). The similarities in legal and political traditions create "the conditions for

learning from Britain," and also organizational ties such as Commonwealth "make such learning easy;" and

3. The epistemic communities theory, which can be applied to identify those "itinerant experts who share certain world views and serve as agents of policy diffusion...The flow of ideas regarding institutional reform may be usefully analyzed within this framework. In addition to the various British experts brought in through the Commonwealth Secretariat, Dr. Mohan Munasinghe, an expatriate Sri Lankan employed by the World Bank as an energy economist, played a key role in the reform process." (page 21).

By factoring in these interesting external forces, Samarajiva does not, however, intend to imply that the Sri Lankan reform experience was driven externally. The best proof of this comes from the weight of internal political factors, both endogenous and exogenous, that affected the telecommunications system and which, ultimately, explain the failure of the 1984-1989-reform initiative.

By also asking question about "the winners and losers in the Sri Lankan institutional reform," Samarajiva clearly situates his article in the political economy tradition of telecommunications analysis. The political economy approach is neither deterministic nor structuralist; instead, it tries to identify the complex dialectics of new institutional arrangements, structural arrangements, and structural modifications, and to see the issues from different perspectives according to the varying interests and motivations that are always present. Identifying the winners and the losers, then, tells us a lot about the nature of that which is at stake, the rivalry between factions of the dominant

group, how far reformers were able to go, and what compromises and concessions were necessary.

Another significant contribution to the reform literature, which also uses an epistemic community approach, is Peter F. Cowhey's, "*The International Telecommunications Regime: the Political Roots of Regimes for High Technology*" (1990). In this article, Cowhey presents a blend of the political economy approach and a techno-structuralist approach to the changes. Cowhey is indeed in the domain of political economy when, in trying to "model the significance of changes in regime " (here the international telecommunications regime), he selects as a first indicator "a change in who wins and loses in the market, as reflected in the new market terms." He also observes that "politicians align with epistemic communities and invite them into the inner circles of power," and that "[if] the states interested in regulatory change have significant international market power - interpreted here as the power of nations (and their firms) as buyers and sellers in the market's industrial organization - they may successfully challenge the existing international regime. In the telecommunications industry, for example, the United States, Japan, and the UK have enough market power to stimulate global reform when they unilaterally change their national telecommunications" (page 172).

However, when Cowhey attributes a primary role in driving the current changes to technical innovation, he enters into the realm of technological determinism. He observes that "technological innovations in telecommunications have been an impetus for

reexamination of the regime, a process leading to an alternative organizing policy principle and a new epistemic community for the telecommunications markets."

Overall, despite what appears to be some methodological imprecisions, Cowhey's contribution remains significant, for he brings into the telecommunications reform debate four important and original themes. Firstly, he claims that the "change" in telecommunications has something to do with a shift in belief or a decomposition of the epistemic community, which previously provided the ideological base and the intellectual justification for a monopolistic structure. Secondly, he analyzes the role GATT will have to play as an institutional milieu from which the reformers can coordinate their strategies and launch attacks upon the status quo. Thirdly, he provides an interesting characterization of two different positions in telecommunications reform policies: those that adhere to the "Little Bang", and those that adhere to the "Big Bang." Finally, he suggests three criteria with which to measure the impact of change in a regime, which he illustrates by reference to telecommunications. I will briefly review each of these issues.

Cowhey discusses the role played in the telecommunications regime changes by the epistemic community, stating that:

> ...the belief that telecommunications was a " natural monopoly" set the agenda for regulation, and international institutions such as the ITU provided a social organization (a quasi-corporatist framework) to improve the coordination expectations. The rise of a new epistemic community comes as a result of political reformers looking for an alternative community (a "counter-hegemony") that can successfully show it how to extend its ideas from the domestic to the global market, [meaning that] the international regime faces a formidable challenge. An

> assault on the regime's underlying principles is especially threatening to the legitimacy of the regime because much of its normative order rests on the convictions of its current epistemic community. Telecommunications reformers first challenged the presumption of monopoly in domestic markets. When they wanted to act internationally, they discovered that the only epistemic community with a politically feasible set of alternatives was the one dedicated to free trade (page 123).

This statement is interesting for several reasons. Firstly, Cowhey seems to be arguing a sort of "instrumental link" between an epistemic community and the "powers" that use its services (its knowledge and analyses). He also argues that, in times of crisis - of challenges and uncertainty - "political reformers" or "telecommunications reformers" are open to the ideas of alternative epistemic communities that can meet their new expectations and needs. This process represents how the powers construct a "new" legitimacy – by basing it on a new alliance with a new epistemic community that will provide them with the requisite "arguments." This would appear to characterize the relationship between "telecommunications reformers" and the "free trade-epistemic community."

Cowhey sees the attempt to bring into the international telecommunications regime a new major player, GATT, as a smart move. As he states: "the current GATT round features a major effort to bring communications and information services under its purview. The reform coalition wants GATT to extend its international review process to telecommunications services and to apply the approach used in the domestic oversight of bureaucracies. Since it is impossible to define all barriers to trade in services, they want

the GATT parties to come to an agreement on markets to be liberalized and on broad principles defining fair competition. Parties would then use trade talks as a grievance procedure about any item that impinges on what the Montreal Midterm Review of the current GATT round defined as the principle of "market access" for services."

Cowhey argues that there are two approaches to reform, delineated in terms of pace and scope. Those who would prefer to move at a slower pace are advocating a "little bang" approach to reform, while the proponents of the "big bang" approach favor a global and total change in the rules - e.g., "introducing competition in basic telephone services and in the network facilities that provide them." Cowhey described five major components to the little bang approach as it applies to advanced economies:

1. A slow reduction of cross-subsidies for the average household and small business. Most governments want to avoid major new burdens on these constituents (household voters and small businesses); consequently, they retain *some* level of cross-subsidy.
2. The redefinition of the role of the dominant telephone company. Countries separate postal and telephone services, thereby curtailing subsidies to the post, and then separate policy-making in the government from the actual operation of the telecommunications system. Some countries are privatizing domestic telephone services in order to increase the gulf between regulators and the National Telephone Company. In addition, many countries are requiring the telephone company to create separate subsidiaries for basic and enhanced communications services.

3. The third component of reform focuses on the provision of CPE [Customer Premises Equipment] and enhanced services. Most countries have sharply curtailed their PTT's traditional monopoly over the sale of CPE. This has rapidly lowered prices and ended such annoyances as being forbidden to attach the optimal modem to a corporate network simply because it is not offered by the PTT.
4. The fourth component of reform pertains to the provision of network equipment. The new policy nominally liberalizes procurement practices. Reform will not only open a larger minority share to new foreign suppliers on a more open competitive basis, but it will also introduce more flexible measures for certifying the technical acceptability of foreign equipment and ensuring foreign firms a right to comment on the standards.
5. The final component is that international reform mirrors domestic reform. Countries internationalize domestic change. Given the fact that less than twenty industrialized nations constitute the overwhelming share of the world telecommunications equipment and service markets, they have clearly had the market power to ensure major changes in the regime.

The primary consequences of the "little bang" approach at the international level will be that the liberalized CPE market will have to operate under the traditional rules of GATT, "albeit with special measures to control non-tariff barriers (such as technical standards)" (page 190). Most importantly, though, and as Cowhey concludes this section, "to the shock of many, even the selective competitive provision of facilities is emerging. For example, West Germany will let US satellite firms compete for enhanced services

with INTELSAT, and many EC nations are permitting at least two competitors for the nation's cellular telephone services" (page 191).

Although Cowhey has identified these five components of the "little bang" approach to reform as relating only to advanced economies, it is striking to note that components two, three, and four, for example, are also at work in most reforming Third World countries. This may give an indication of the extent to which policy diffusion has created what Noam called "policy harmonization" between countries.

Concerning the "big bang" approach, this is seen as the result of "regulatory reformers [who] have gone farther in the three countries that constitute almost 60% of the world telecommunications markets: the US, [the] UK, and Japan."

Because of the special positions of these countries, as the "principal global financial centers" and as "the most important originators of multinational manufacturing enterprises," reformers "have preferred a "big bang" in reform that introduces competition in basic telephone services and the network facilities that provide them...Moreover, allowing competition in both enhanced communications and basic telephone services would obviate the need for creating two distinct sets of regulations and would allow for considerable experimentation on how to best combine the services."

This would appear to be a comprehensive description of the situation in the industrial nations, where leaders of telecommunications reform seem to be pushing every day for yet more audacious change. Obviously, such arguments make the reform debate going on in most African countries look archaic and primitive; however, Cowhey's description of the different stages, pace, and content of the process may be helpful to

African policymakers currently battling to achieve even the separation of postal and telecommunications operations.

Cowhey concludes by suggesting three criteria for an evaluation of "the impact of changes in a regime." The first criterion is to assess "whether there has been a significant shift in who wins and [who] loses." Unlike Noam, who clearly identifies the PTOs as the current winners of the reform process, Cowhey believes that "large users, computer and newer electronics firms, and services companies...have won at the expense of the traditional beneficiaries of the regime (including households, rural users, electronic firms associated closely with the PTTs, and the labor forces of the PTTs)."

The second criterion is "whether there has been a significant change in the manner in which governments delegate power to the regime." Cowhey here makes an interesting observation about the important shift in the composition of regime participants at the national and international level. This shift, he writes, is

> ...characterized by the growing role both of trade officials in telecommunications and trade ministries with multi-industry constituency, such as Japan's Ministry of International Trade and Industry, whose power comes in part from concluding trade deals successfully. Bringing trade ministries into telecommunications negotiations introduces a new set of influential players who are less dedicated to the traditional principles and norms of the regime (pages 195-196).

The third criterion important to this study, is "whether there has been a significant shift in the regime's epistemic community." Cowhey's answer is non-equivocal: "In telecommunications, there has been a clear and radical shift from a community favoring

domestic monopolies and bilateral cartel arrangements to a community favoring competition." This is why the new epistemic community, composed mainly of advocates of the "big bang," argue:

> ...that the transmission of communications and the manipulation of its contents will be inseparable in the future and that networks must therefore be fully flexible. Anyone should be able to do anything; hierarchic control over market entry or pricing makes little sense (page 196).

Overall, Cowhey's analysis presents competing approaches to the reform. Unfortunately, however, his contribution is weakened by some methodological problems – problems that might explain his opinion that "while global factors (such as the diffusion of new technology) may set the stage for widespread adoption of a broadly similar approach to public policies, it is a mistake to impute national change to the international system." He makes this extremely sweeping statement somewhat lightly, in my opinion, since national change may or may not be imputable to the international system. It is difficult, if not impossible, to set an "a-priori" universal approach to the interplay between domestic and non-domestic factors in national change when attempting to identify one or the other as the "driving force." To determine this, one needs to study each process on its own – one must identify the players, the stakes, and the internal dynamics of the process, and then one must analyze these real situations weighing local and non-local determinants. It seems to an impossible task, for instance, to prove that the Structural

Adjustment Programs underway in almost all African countries, and which have brought radical national change, are *not* imputable to the international system.

Two other significant contributions also appear worthy of our interest. The first is "Telecommunications Privatization and Liberalization", by Ben Petrazzini; the second, "Privatizing Telecoms: Is it Necessary or Sufficient?" is contributed by William Melody. While considering a central issue - privatization - William Melody proposes a different approach to the problem. He asserts that "private ownership is neither a necessary nor a sufficient condition. In certain circumstances, it may help establish effective separation between government and operating management functions...but whether it is necessary or makes a significant difference depends upon the circumstances and what other more important structural changes are made at the same time."

For Melody[9], who seems rooted in a political economy approach that examines both the structures and the agents who provide these structures with certain dynamics, the issue revolves around the separation of basic functions. He writes:

> In attempting to achieve reform, the fundamental underlying issue is effective separation of the basic functions of policy making, operational management and regulation. The inefficiency and unresponsiveness that have pervaded many government telecommunication administrations in both developed and developing countries derive from a mixing of macro and microeconomics, political, bureaucratic and commercial objectives in the same decision-making, (which provides the framework and guidelines for long-term industry development), and operational management (which must be able to plan for effective long-term

[9] William, Melody, "Privatising Telecommunications: Is it necessary or Sufficient?" CIRCIT Newsletter, 5 (2), April 1993, p. 3.

> allocation and use of resources, and be held accountable for its performance) (page 3).

A third separation is also necessary between the above two functions and the essential function of regulation, and on this point Melody argues that there must be effective separation between the ongoing regulation of the industry and both policy making and operational management. The regulator supplies detailed expertise with which to interpret and enforce policy, to monitor industry developments, and to address ongoing issues and problems that arise within the overall policy framework. Independent management and independent regulation are essential to effective structural adjustment and efficient industry development.

Melody's approach appears to be unique and original within the general reform literature. By zeroing in on the privatization debate, and then shifting the focus away from it, he is trying to redirect research efforts toward the more fundamental issue of a general philosophy of reform. Furthermore, his suggestion is particularly relevant in the developing world where, despite efforts to reform and redefine the roles of telecommunications operating entities, the national companies often perform all three functions. For example, GAMTEL, in The Gambia, participates in defining and setting policies, manages the operations, and is directly involved in the regulation of the sector – sometimes it is even responsible for bringing offenders who violate its monopoly of the telephone network to "justice."

This study strongly believe that adopting Melody's recommendations would have helped telecommunications reformers bring more clarity to the ongoing reform debate. I

share his view and will apply its methodological implications in my discussion of the relevance of these issues for African telecommunications in particular.

Although coming from a different "angle" than mine, Petrazzini's contribution attempts to develop a theoretical and methodological understanding of the institutional reform of telecommunications in Argentina, Mexico, Thailand, and Malaysia. His project, aimed at "unveiling some of the puzzles that underlie the various forms of telecom in developing nations," attempts to answer this one very interesting question: "Why do countries which shared telecom reform goals and similar patterns of development achieve such different outcomes?" For example, Petrazzini observed that Argentina has yielded to privatization but not liberalization; that Thailand has liberalized but not privatized; and that Malaysia and Mexico have achieved both liberalization *and* privatization. In an attempt to explain such fluctuations in policy outcomes, Petrazzini put forward an interesting hypothesis. He feels that countries with a high degree of state autonomy and higher levels of power concentration within the state apparatus are more likely to succeed in their privatization efforts than are those in which these elements are less important.

It is interesting to note that the State is put on the center stage – that it is viewed as a main player. I share such an approach, since it is difficult to envision such an important decision as the privatization of a telecommunications company being taken without the State being heavily involved in the decision-making process. The Gambia, which because of the openness of its political system was a pioneer in telecommunications reform in Africa, has been very slow even to enter the privatization debate. Conversely, Ghana, with a strong regime and with a higher concentration of power within the state apparatus,

and which reached the active phase of reforming its telecommunications as recently as 1992, has now privatized most of its telecommunications operations.

However, as Petrazzini himself points out, though his theoretical approach may explain the pace and course of the privatization process in different countries, it still does not account for the significantly different outcomes achieved by what would appear to be fairly similar countries. Consequently, he presents another hypothesis: namely, that liberalization is more likely to emerge in the context of an expanding domestic economy than in a stagnant or declining economy.

It is true that a stagnant or declining economy simply does not appeal to forces (domestic or international) pushing for liberalization. This is because the investment environment is not welcoming. However, it is also interesting to note that, at least in the developing world, the most liberal and open regimes are not necessarily the most successful telecommunications liberalizers and/or privatizers, as Petrazzini suggests. On the contrary, strong regimes, with the "presence of a strong, autonomous state," are most likely to achieve a successful privatization of their state-owned telecommunications.

Another relevant approach that I found important to this study is the contribution of the European Bank for Reconstruction and Development to dealing with telecommunications reform in the Eastern European countries. I believe that this analysis is relevant to Africa simply because of the numerous similarities, often unnoticed, between the political economies of African and Eastern European states. Both forms of states were overly centralized and possessed overly planned economies. They both experienced, at the end of a historical cycle, a collapse of their social and economic

systems and a general failure of their political model, which was generally marked by authoritarianism. In fact, such common characteristics might explain why the fall of the Berlin Wall had such an instantaneous effect upon African countries - daily protests, demonstrations, and even wars removed certain dictatorships (Mali, Liberia, Somalia, and Ethiopia), and forced other authoritarian regimes to open dialogues with their opposition (Benin, Niger, Zaire, Togo, Chad, etc.).

The European Bank's document, when viewed as a policy document with underlying assumptions about the need to reform the former Eastern European countries' telecommunications, does develop an approach which seems relevant to the African context. Before the dissolution of the bureaucratic system in Eastern Europe, nobody would have thought to identify some realities of this region as, in truth, belonging to the Third World. However, every telecommunications specialist, reading the prescriptions and remedies of the European Bank, will immediately perceive the similarities with the ills that beset African telecommunications. (Though one must not ignore, of course, the fact that no two patients show entirely the same symptoms for the same disease; and that they cannot, therefore, benefit equally from identical treatment.) The European Bank's document used the following criteria to form its diagnosis:

1. Rate of telephone penetration;
2. Level of unsatisfied demand; and
3. General state of the existing network and its equipment.

The mediocre responses to these three initial questions directed the Bank's attention to the causes of such a situation, which were as follows:

1. Chronic under-investment; and
2. Inadequate management practices in state enterprises.

The major consequences of the above were a high level of network saturation, insufficient revenue collection due to low tariffs, a flagrant lack of commercial spirit, and a lack of managerial competence in those in charge. The global inefficacy of the system, due to a lack of clearly formulated policy objectives, is reflected in the rate of penetration which, in general, ranges from five percent to ten percent (with the exception of Bulgaria, at 22 percent, and the Baltic areas, at 24 percent). It is noteworthy, though, that these figures, which are negligible in worldwide terms, will excite African specialists immensely. After all, their ultimate goal, for the past ten years and for the next ten years, is to turn a zero point rate of penetration into one percent.

Another measurement of inefficacy is the ratio of 30 to 50 lines per employee that is found in Eastern Europe, whereas the average for OECD states is 120 lines per employee. In Africa, meanwhile, Tanzania had 14.5 lines per employee, Mali 7.5 lines per employee, Ghana 10.1 lines, and Senegal 25 lines. Notwithstanding this discrepancy, however, the European Bank's analysis appears most suitable to the African experience when the Bank advances its prescription and recommendations. The Bank wishes, first of all, to implement the following:

1. Extension of networks;
2. Reinvestment; and
3. Improvement and diversification of services

The first phase of the Bank's operations in the sector will be aimed at reinforcing and rehabilitating the existing public infrastructures for the provision of basic services. It will also try to support the reconstruction effort conducted by the Postal and Telecommunications services, and it will encourage the introduction of value-added services by private operators. One important dimension of this phase, though, is the establishment of an organization responsible for regulating tariffs and operations in the sector, which will stipulate the terms and conditions for licensing private operators, and also be in charge of establishing a blueprint for the development of infrastructure and activities.

In the second phase, the Bank will promote competition and encourage privatization. To achieve the former, the Bank aims to first accelerate liberalization of value-added services (mainly cellular communications and data networks) and, after the completion of that process, then consider the introduction of competition in the provision of basic services.

The European Bank does not seem to systematically "impose" privatization. It states clearly that "privatization of the region's telecommunications entities should not be a panacea for reason of efficiency, as a direct causal relationship between ownership and effectiveness is hard to detect in most parts of the world." However, the Bank will support initiatives aimed at introducing new skills, methods, and capital into public networks through management contracts, concession financing, and joint ventures with other publicly-owned and private sector firms (e.g., foreign operators).

In an attachment to the main document, the Bank attempts to show its strong preference for competition over pure and simple privatization by arguing that, while there exists a strong causal relationship between competition and efficiency, such a relationship is hard to identify between private ownership and efficiency *without* competition. For example, Australia Telecom and Singapore Telecom are both fully owned by the state, yet they are known to be more efficient than other private (or privatized) operators are.

This philosophy has led the European Bank to announce that its top priority is to reinforce the public provision of basic telecommunications services. In addition, it is as well to note that, despite the commotion that tends to surround "new" services, basic services still represent the cornerstone of the infrastructure (such services make up 97 percent of telecommunications turnover in Western Europe).

Prioritizing public network improvement seems to have several advantages, and the Bank does not shy away from doing so. The following four-point analysis states that the Bank is permitted to:

1. Target profitable user segments showing the greatest need and willingness-to-pay for telephony;
2. Consolidate revenues from amortized plant via the better use of existing networks;
3. Align tariffs with the real costs of services and develop a pricing policy aimed at full cost-recovery; and
4. Standardize the network in order to ensure regional interconnection and the interoperability of networks.

Convinced of the important role it must play in the vast project of reforming telecommunications in Eastern Europe, the European Bank concludes its analysis with a projection that, in the future, the Bank is likely to evolve from being a lender and an investor to being the focus point and lead agent in the execution of project finance transactions.

Another bank has also played a significant part in telecommunications development across the world: namely, the World Bank. Interestingly enough, not only does the World Bank invest heavily in telecommunications, especially in the developing world, but it also encourages intellectual production from its community of experts in order to contribute to the policy debate. A long-time investment partner of African telecommunications, the World Bank has helped redefine the telecommunications agenda by involving itself heavily in the reform debate.

2.4 Telecommunications Reform: The Role of the World Bank

Not only is the World Bank a major player in African telecommunications, both in terms of financing infrastructure development and setting reform agenda, but its general contribution to the policy debate about the causes of general institutional reform in the sector is also significant. In several of its publications, the World Bank has unveiled a detailed set of "explanations" that attempt to make the worldwide reform of telecommunications understandable. Its diagnosis of the ills of the telecommunications

sector in the developing world, and its presentation of the underlying causes of the institutional changes, are reviewed in the following section.

In a recent analysis of the telecommunication sectoral reform[10], the World Bank presents some crucial information. For example, in order to meet the expressed need for basic services by the year 2000, countries in Asia, the Pacific, Latin America, and Africa will have to invest around 25 to 30 billion dollars per year – a difficult scenario to envisage taking place.

In addition to the significant role it plays in supporting the Structural Adjustment Programs, the World Bank has also proven itself to be an essential partner in telecommunications financing. Out of the Bank's budget for the fiscal years 1987-1991, US$ 1.8 billion was lent for a total of 23 telecommunications-related projects. In addition, recently, about 20 percent of all non-sector Bank lending has included support for telecommunications, mostly as part of "quick-disbursing public enterprise restructuring and policy adjustment loans." This support, insists the World Bank document, makes the Bank "the [single] largest source of multilateral telecommunications financing."

At a more theoretical and analytical level, though, and in trying to identify the driving forces behind the current changes in the telecommunications sector, the Bank proposes an explanation based on the simultaneous occurrence of changes in the market economy and in technological development. The first change factor is the increasing information intensity of economic activity, coupled with the globalization of capital

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[10] See Bjorn, wellenius et al, eds. Restructuring and Managing the Telecommunications Sector. Bjorn, Wellinius et al, Telecommunications: World Bank Experience and Strategy. World Bank Discussion Paper. Sanders et al, Telecommunications and Economic Development. (Baltimore:. The John Hopkins University Press, 1983). Telecommunications: World Bank Experience and Strategy (Washington, Dc. World Bank Discussion Paper, 1992).

flows, and of trade, industry, and other economic activities, resulting in a strong demand for more varied and less costly telecommunications services. The second factor is that these needs have developed in the context of rapid changes in telecommunications technology, fed by advances in microelectronics, software, and optics. These changes, say the Bank, "have greatly reduced the cost of information transmission and processing, changed the cost structures of telecommunications and many other industries and made possible new ways of meeting a wider range of communication needs at lower cost." These major changes in the industry have also revealed structural defects in Third World telecommunications systems. The Bank summarizes such defects as follows:

> These state telecommunications monopolies, however, generally fell far short of meeting needs, as evidenced by persistent large unmet demand for telephone connections, call traffic congestion, poor service quality and reliability, limited territorial coverage, demonstrated willingness of users to pay far higher prices to obtain service, the virtual absence of modern business services, and user pressures to bypass the system by building their own facilities (page 2).

This portrait of the reality of telecommunication in Third World countries represents an assessment of the failure of state monopolies, and a challenge to their continuation. Apart from their status as state monopolies, though, telecommunication in developing countries faces three other major constraints:

1. The first constraint is financial and is due to limited access to other sources of capital and to the scarcity of state capital and strong currencies thanks to the large number of competing projects submitted by different state departments or sectors. In addition, governments often spend profits generated by telecommunications operations instead of reinvesting them in network expansion and service improvement.
2. Despite the fact they are sometimes the best run of all public sector entities, "the internal organization [of telecommunications enterprises] often follows that of government departments rather than businesses. Weaknesses...found in organizational structure, financial management, accounting, and information systems, procurement practices, and human resources development...[resulted] in high costs of expansion and operation, poor maintenance, slow response to changing demands..."
3. The lack of adequate policies for setting prices (which hardly reflect the costs of services), the lack of incentives for workers, political interference, and the lack of administrative and financial autonomy also explain why the entities cannot function as commercial enterprises.

These three constraints identified by the World Bank (as well as other international institutions, such as the ITU and the UNDP) led many governments to accept the necessity of embarking upon institutional reform. The reform agenda, says the World Bank, will help address three major concerns; namely:

1. Mobilizing more capital for investment;
2. Improving the performance of telecommunications organizations; and

3. Responding to the rising demand for better and more varied telecommunications services.

These concerns coincide, insists the Bank, with the same factors that have revolutionized telecommunications systems in developed countries: i.e., technology and demand, amplified by six factors of which I will retain the three most salient:

1. Awareness of the failure of traditional approaches to telecommunications development based on state monopolies. Governments around the world have realized their inability to provide the huge amounts of capital necessary to catch up with demand;
2. The emergence of new economic strategies in developing countries with measures "to liberalize trade, promote competition, deregulate financial and capital markets, reduce restrictions on foreign investment, and restructure public enterprise"; and
3. The pressure of telecommunications operating companies in developed countries, which have aggressively started to expand beyond their national borders and to pursue new business opportunities in developing countries, while repositioning themselves in their own changing domestic and regional markets.

It is, therefore, the global impact of these combined factors that have, according to the Bank's analysis, imposed the reform agenda. This agenda, they argue, has generally been deployed in four major directions:

1. Commercializing telecommunications operations, and freeing them from direct government interference;
2. Weakening or softening monopolies and developing competition;
3. Opening up the market to private participation; and
4. Changing the role of government from one of direct control and management to one of defining policies and regulations.

Convinced that such reforms must, in principle, benefit less advanced countries, the Bank regrets that in Sub-Saharan Africa efforts to overcome telecommunications shortages have, so far, been largely confined to trying to improve the performance of state-owned telecommunications entities. Aware of the reticence shown by many African countries to consider privatization or even wider reforms, the Bank observed with satisfaction that telecommunications privatization is now underway in the Cote d'Ivoire and Guinea, that some other governments have expressed interest in the process, and that some countries are already reporting successful private ventures (e.g., cellular).

The only strong conviction emphasized in the Bank's analysis is the necessity of introducing competition. Competition (or any scenario in which serious choice is offered to the consumer) is an essential component of reform since it can spur "established operating enterprises to focus attention on customers, improve services, accelerate network expansion, reduce costs, and lower prices."

To summarize, then, it seems appropriate to characterize the Bank's global approach to telecommunication changes as technological and economic change driven. Perhaps because of its "institutional" method of analysis - a diagnosis followed by solutions (usually geared toward public authorities) - the Bank's analysis does not deal adequately with the issue of winners and losers. Rather, it concerns itself with identifying international and national players in the reform process, and tries to understand the driving forces behind the process of change and the complex interplay that is taking place between them. This latter point helps to explain the pace and scope of reform when it is implemented in any given country, and may even allow for some predictability (given that the radical pro-reformers, radical anti-reformers, and forces of consensus and compromise have been identified). This seems particularly relevant in the African context, where a commitment to serious reform can fade rapidly thanks to economic instability and political uncertainty.

2.5 Telecommunication Reform in Africa: The Perspectives of Akwule and Horwitz

Let us now conclude this review of the telecommunications reform literature by focusing on the very limited number of writings addressing the African experience, in particular those offered by Robert B. Horwitz and Raymond Akwule.

After the success of his 1989 book[11], concerning the process of reform and deregulation of the telecommunications sector in the United States and its underlying

[11] See Robert B Horwitz, The Irony of Regulatory Reform"

ideological, political, and economic implications, Horwitz then turned his attention to South Africa (1992). In his analysis he attempts to unravel the threads that tie South Africa to what he termed "the global move towards liberalization" of telecommunications, and my own analysis of his contribution will focus upon his "internationalization" argument, as put forward in both analyses.

As Horwitz points out, "the regulated monopoly arrangement [once] worked. Through a complex system of cross-subsidies, characterized most clearly by value-of-service pricing and cost averaging, the basic network was extended universally. As a general rule, business subsidized residential service, long distance subsidized local, and urban subsidized rural. Service was in general technically good and relatively cheap. By the 1970s, telephone penetration in the USA had grown to 92%." However, "AT&T's lack of capacity and inability to service new business needs (particularly data communications)," progressively forced liberalization, which took the particular form of "incremental entry liberalization in business services at the margins of the AT&T monopoly, first in private lines, later in terminal equipment."

In spite of AT&T's attempted counter-attack, by refusing "interconnection into its networked and by offering similar business services at predatory prices," the seed had been planted and the process was irreversible. As Horwitz observes: "These dynamics led to the lawsuit that eventuated in the break-up of AT&T and the deregulation, or perhaps more accurately the liberalization, of US telecommunications."

According to Horwitz, the American interest in reforming international telecommunications is simple to understand: Americans, in 1980, exported 25 billion

dollars worth of technology and information services products. The important pledge of American exports in telecommunications services would be reinforced if the closed national systems of telecommunications were opened. However, parallel to the internal American process described above, European transnational corporations, with their enormous demand for data and voice communication, "came to believe that liberalization was in their own interest. These large business users challenged their national PTTs to provide better services or permit self supply."

An important agent of change is the influence of technology in conjunction with the liberalizing US and UK telecommunications systems. PTTs had traditionally delivered voice services, and their analogue systems had limited capacities. Digitization increased both quality and network capacity and, at the same time, large corporate users of telecommunications equipment installed their own switching systems using the latest in digital technology and private satellite and underwater fiber optic lines. Horwitz explains that, once one key player had opted out of the national monopoly model, and its telecommunications system had become governed by market-oriented principles, the inherent flexibility of the technology permitted the liberalized "sector" to siphon off business traffic from the regulated "sector." Private or deregulated carriers could offer more sophisticated services at cheaper rates than could the PTTs, which were "saddled" with their complex cross-subsidies.

Notwithstanding the emphasis Horwitz places on the role of technology, though, his approach is more one of political economy than of technological determinism. Indeed, he not only manages to identify several players in the drive for reform, but he also

identifies the role of ideology, something ignored by *many* reform analysts. Concerning his interesting political economy of the South African reform processes, one should emphasize the original concept of "commercialization," viewed as an interim step toward privatization, as a further example of his "enveloping" approach.

Horwitz also introduces a two-speed approach to reform. Because of the huge differences between industrialized and developing nations, he does not believe that the processes involved can unfold identically. He argues that:

> ...the clear and altogether crucial difference between the First World and developing nations, with regard to telecommunications and the trends towards liberalization and privatization, is that in the First World the telecommunication infrastructure is already in place. The basic system has been built out. The traditional aim of extending basic telephone service to individual businesses and households is more or less accomplished – arguably (the point should be emphasized) as a direct function of the old, public service monopoly arrangement...The point is that policies that may work for mature capitalist democracies may not be appropriate for capital-starved, technology-deprived developing nations (page 306).

Although his point is reasonable, Horwitz may still run the risk of providing some partisans of absolutism in the Third World, whose defense system always includes accusations of short memory against the First World, with further ammunition. Due to the fact that the state and the power structure are among the major causes of stagnation or even regression in most developing countries, I think that almost any new policy (be it

liberalization or transfer of control into private hands) that effectively weakens the concentration of power in state monopolies should be welcomed.

Horwitz's analysis remains original and introduces a certain freshness into the debate insofar as it questions dynamics more than structures and concerns itself more with the interactions between structures than a simple description of their differing content. Unfortunately, however, Horwitz does not extend his analysis of policy diffusion and coordination so as to include the role played by national or international epistemic communities. Rather, he tends to limit his "driving forces" to those most visible and strong, such as the Reaganite and Thatcherite advocates of general economic reform, big international lending agencies (World Bank, IMF), and big corporate users. Their intellectual and theoretical predecessors - who inspire, accompany, diffuse, and legitimize their policies - are ignored.

Raymond Akwule, a Nigerian national, is one of the most vocal and committed African advocates of telecommunications infrastructure development and management practices reform. He published a book on the general issues concerning telecommunications development, and a series of articles, the most relevant of which to this study are reviewed.

In his "*Telecommunications in Nigeria*," and "*Telecommunications in Africa: Policy and Management Trends*," Akwule observes that many developing nations presently face the dual pressures of demand from within for basic telecommunications services, and demands from the international community to modernize national networks and reflect the global trends towards telecommunications deregulation. Over the years,

the West African nation of Nigeria has responded to these pressures by effecting institutional and regulatory reform in the telecommunications sector. Nevertheless, his designation of international forces and powerful interests as the "international community" seems a little too cautious (as demonstrated by Horwitz (1992) and/or Cowhey (1990)). Does this description *really* reflect the main actors in the international push for telecommunications reform?

In trying to build an explanation for the telecommunications infrastructure development that took place in Nigeria between 1970 and 1985, Akwule comes up with a political economy approach, which allows him to articulate four reasons:

1. The problems encountered by the military government in communicating both within and outside of the country during and after the civil war;
2. Rise of international theorization of the "usefulness of modern communications" in fostering "social transformation in the developing world;"
3. The positive effects on Nigeria, one of the world's leading oil producers, of the rise in oil prices in the mid-1970s; and
4. Economic prosperity and the size of the country made Nigerian officials aware of the necessity of "a strong telecommunications network - especially an international telecommunications network - as essential to the fulfillment of its leadership role." (page 89).

As mentioned above, Akwule, while examining the causes of institutional reform of telecommunications in Nigeria, refers to a combination of:

> ...mounting pressure from within for better telecommunications services along with pressure from the international community - to modernize the networks and to reflect the current global shift towards market-oriented telecommunications regimes - prompted the government to re-examine the administration and regulation of the sector in 1984 (page244).

Here, unfortunately, the explanation of just what "jump-started" the reform process in Nigeria is nowhere near profound enough. For instance, many telecommunications analysts would express some reservations regarding the importance of "pressure from within for better telecommunications" in the decision to embark on reforms. As we know, telephone waiting lists in Africa can sometimes challenge belief. Consequently, customers tend to adopt a "wait and see", somewhat fatalistic, attitude, or will simply try to sidestep the system using bribery and corruption. As for business customers, though they knew their way around the old telecommunication systems, they possessed only a very imprecise concept of what "better telecommunications" might mean. As they say in Africa, one cannot miss what one never had.

Concerning pressure from international forces, this was less "network modernization" oriented than it was about truly opening up the closed and inefficient African system to competition and, ultimately, privatization. This, as it is clear today, was just part of a bigger move toward structurally reforming and adjusting African economies

and their state-owned enterprises. However, Akwule, in a more recent publication, has come closer to agreeing with me in this regard, when he writes about moves made to restructure the telecommunications sector by several African countries since the mid-1980s:

> The change has been induced by two major factors: increased national and international pressures on telecommunications administrations to provide better telecommunications services, and a push towards austerity programs and economic reforms by the International Monetary Fund, and North American, European, and Japanese banks that hold billions of dollars in potentially unrecoverable debts to many of these African countries.[12]

The introduction of these international financial players and stakeholders into Africa is a move in the right direction since the African context is so singular that the dialectics of domestic and external factors need to be handled with great care. Of course, Akwule has the merit of being a pioneer, at least in North America, of African telecommunications studies and policy research. This will remain to his credit. Nevertheless, it seems important to me that African policy researchers be fully immersed in the *theoretical* battles of their fields and refuse any confinement to the periphery. That is to say that descriptive studies may not advance the telecommunications policy debate to any great extent, and that other forms of research are currently almost non-existent on the continent. It is my opinion, therefore, that more analytical, and methodologically rigorous,

[12] Akwule, Raymond. Telecommunications in Africa, p. 161.

approaches are needed in order to succeed in the difficult task of identifying the major issues facing African communications today.

Akwule seems fully aware of these important challenges when he concludes that:

> The changes in Africa's telecommunications policies and practices deserve special attention...because of the unique socioeconomic context within which telecommunications services are provided in the continent...[I]n Africa, where the countries have been severely afflicted by the problems of recent worldwide economic recession and where drought has taken its toll on much of the population, it should not be surprising if further attempts to deregulate and "commercialize" telecommunications regimes are greeted with strong public resistance and even social unrest. This is one risk that the already-fragile political entities in most of the region are reluctant to take. Perhaps it is the major reason some African telecommunications administrations are slow to embrace the worldwide trend toward deregulation, liberalization, and privatization (pages 168-169).

This latter point seems to contradict his earlier affirmation that changes were driven by internal pressure for better telecommunications. However, still I have doubts. I find it difficult to envision such a degree of commitment by the African masses or work force to telecommunications issues that they would engage in "social unrest" in order to prevent further reform. Not only has telecommunications in Africa not yet become a mass phenomenon - breaking away from its current elitist, urban, middle class status - but its overprotection as a "fat cow" ensures that policy changes are not rooted in popular consent but, rather, are purely bureaucratic and governmental. Nonetheless, it should be

noted that Akwule, once again, correctly insists upon the uniqueness of the African context and its adverse conditions.

As suggested by the above, there are numerous diversified and competing frameworks attempting to account for the wave of reform taking place in the telecommunications sector worldwide. It is interesting to contrast the enthusiasm of some policy analysts, such as Jussawala or Cowhey, to the moderate reactions of Noam and Melody. It is also a rich learning experience to see Samarajiva and Horwitz attempt to get to the heart of the complexity of the current process and try to identify numerous players and phenomena at work - some visible, others less so. Consequently, summarizing this body of literature and knowledge, without losing, in the process, any of its richness, is a tough challenge.

This literature review also suggests that sectoral policies in African countries, whether in the telecommunications sector or in any other sector of the economy, must be framed in the context of overall national development objectives, and that corresponding evaluating criteria need to be derived from these objectives. This requires, first of all, an understanding and explication of the goals and strategies of development.

Most explorations of the relationship between telecommunications and development rarely attempt a systematic definition, or even description, of the nature of development. For instance, in their influential review of the role of telecommunications in development, Saunders, Warford and Wellenius (1983) identify three perspectives regarding the relationship between telecommunications and development:

Firstly, they suggested that there are those who feel that telecommunications investments should be held well below the level indicated by the operation of normal market demand, particularly where such investments come at the expense of outlays in other more "vital" sectors, such as health and education. Secondly, there are those that argue that the growth of telecommunications should be tailored around the market, with operating entities behaving in most respects like commercial enterprises. This would involve giving them relatively unhindered access to capital markets for investment funds, subject to some governmental regulation to ensure wide access to basic services and to protect the public's interest. Finally, there is a technology-oriented group, which promotes rapidly advancing telecommunications technology as a prime means to achieve a wide range of social and economic goals. This group would not only implement the growth of telecommunications as called for by market forces, it would push the growth further even if supply outstripped demand and even if this called for government subsidies for some services.

In my opinion, this approach is ill conceived without first explaining what "development" really means. This is not merely a classificatory issue - the definition of development determines not only the strategies used to promote it, but also the roles various sectors, and policies within these sectors, can play in the developmental process. Even if researchers do have some operational definition of development, and relate telecommunications to that definition, they rarely provide a framework that links their definitions to the actual formulation of telecommunications policy. At least, not in such a way as to provide a set of criteria through which the objectives of those policies can be laid

down and their effectiveness in fostering development can be evaluated. As indicated in the introduction, commercial criteria for measuring telecommunications performance (e.g., profitability or national density measures) may be inadequate in the face of developmental objectives. The developmental perspective, which will be established in this chapter, requires the inclusion of distributional outcomes as critical components of policy evaluation. This position is established in this chapter through a review of the theoretical perspectives that have emerged from the two sub-disciplines, of development economics and development communications.

Dissatisfaction with the results of developmental efforts in the Third World over the past four decades have led, in recent years, to a refocusing upon, and redefinition of, the problems and strategies of development. It is clear that the manner in which the problem is defined has much to do with the suggested possible solutions.

In its earliest formulations, development economics viewed the problem of development as a problem of growth. The per capita gross national product (GNP/population) was considered the appropriate measure of the level of development and, consequently, the strategy behind promoting development aimed at boosting this growth rate (see, e.g., Henriot 1979). According to Adelman (1975), the strategy focussed upon the "creation of conditions for self-sustained growth in per capita GNP and the requisite modernization of economic, social and political structures implicit in the achievement of this goal". Influential accounts of development in the industrialized countries, such as Rostow's "Stages of Economic Growth" (1960), served to put the stamp of historical approval on the development-as-growth assumption.

Consequently, the United Nation's First Development Decade (1960-1970) set a quantitative target of an annual five percent GNP growth rate for developing countries. Heavy industrialization and capital accumulation through increased national savings were the chosen instruments for achieving this target. The industrial sector was given prime consideration in plans and programs, which were usually concentrated in or around cities. Consequently, many countries experienced rapid urbanization. This strategy by-passed the agricultural sector, which was considered as either a source for primary products for export (e.g. cash crops like cotton, sugar, and coffee) or a support sector for the needs of the industrial sector. It is important to note that, in this strategy for promoting development, the question of income distribution and equality were postponed - distributive effects were seen as entirely subservient to the rate of economic growth (GNP per capita). It was expected that an ever-increasing output of goods and services would lead to an increased national income, which would, in turn, "trickle down" to the masses.

The second important dimension of this approach was its treatment of developing countries in isolation. Their problems were seen to be primarily internal - the result of local structures that were not "up to" the task of increasing GNP per capita. Essentially, the impact of colonialism, and its present-day legacy of under-development, was largely ignored.

The information revolution magnified and accelerated economic transformations. New economic rules distinguish an information economy from an industrial one and blur the lines between industries. Work products of many industries and professions can be captured as digitized information, and information can be replicated at negligible cost.

Information can overcome time and distance constraints and can, in fact, substitute for other factors of production: such as land, labor, capital, and energy (Tolero & Gaudette, World Bank, 1996). Basically, information technology has and is changing how we work, play, learn, travel, and govern. Bangemann (1994) eloquently enunciates the relationship between information technology and economic growth by arguing that, throughout the world, information and communication technologies are generating a new industrial revolution already as significant and far-reaching as those of the past. It is a revolution based on information, itself the expression of human knowledge, and this revolution adds huge new capacities to human intelligence and constitutes a resource that will continue to change the ways we work together and the ways we live together.

The diffusion of products has become almost impossible without information technology. In 1991, information age capital spending by US companies exceeded, for the first time, industrial age spending (see Stewart, 1994). Worldwide annual sales of personal computers exceeded 50 million units, which compares favorably to 35 million passenger cars. An estimated 200 million personal computers (PCs) are now in use. Of course, less widely recognized, but even more significantly, key organizations, markets, products, and services from all sectors depend increasingly upon information technology. Companies can raise the efficiency of production and management with networks of facilities and markets. Sophisticated information processing capabilities are increasingly within reach of small and medium enterprises, communities, and private homes. Entire enterprises and industries could not exist at their present scale and complexity without information technology, including financial market transaction volumes, credit card charge volumes, mutual funds,

video games, travel reservations, international telephony, and discount retailing. The US services sector spent more than $750 billion on information technology hardware alone in the 1980s, virtually doubling the information technology endowment of the average white-collar worker (Quinn 1994).

Conversely, computer resources, adequate telecommunications infrastructures, and relevant information technology skills are very limited in Africa, central Asia, and parts of Latin America (see Odedra, Lawrie, Bennett and Goodman, 1993). Most African economies, therefore, are hugely disadvantaged as the global information economy comes into being. Due to the lack of an adequate telecommunications infrastructure, the scarcity of IT-skilled labor poses a serious challenge to the ability of African economies to be part of this evolving global economy(see Castells & Henderson, 1987). In fact, researchers are concerned that globalization trends may result in the further marginalization of African economies and will not only disrupt their economies, but also their socio-political fabrics (see Swamy, 1994).

The theories of economic change also acknowledge the significance of information and telecommunications technologies (Odera, 1996). Research regarding technical innovation, economic development, and social and institutional change - known in the literature as Neo-Schumpeterian theory – has built upon Kondratiev's classic perception of long waves of economic "boom and bust." Most of this work was carried out by Schumpeter (1939), addressing the role of innovative entrepreneurs in creating new technical paradigms for future growth. In his work, he indicated the pervasiveness of certain types of technologies in periods of economic development, and characterized a

technology as "pervasive" if its application affected all sectors of the economy. This suggests that information technology be singled out as the most pervasive technical innovation of the post-industrial revolution (see, OECD, 1988). It is important to note, at this stage, that economists are not suggesting direct causality between IT innovation and economic growth. Rather, they are highlighting IT's potential to *enable* economic growth. In essence, the economic effects of IT investment depend on the development of appropriate organizational and social structures capable of exploiting its technological potential.

It is also important to note that IT innovation and diffusion, when investigated macro-economically in 1980s using data from the United States, did not produce the productivity gains expected (see Baily, 1986 & Roach, 1987). In fact, *negative* correlations between productivity and the diffusion of computers were found in most of these studies. However, IS researchers found these findings threatening, and thus set out to explain and disprove this 'productivity paradox' (see Brynjolfsson, 1993; Brynjolfsson & Hitt, 1993; & Panco, 1991). According to this literature, the measures used to account for the economic effects of IT are inadequate; there may be lags between investment in IT and the occurrence of productivity results; IT may contribute to the redistribution of wealth rather than the creation of new wealth; and there may have been mismanagement and misuse of IT. Nevertheless, recent studies suggesting *positive* productivity results *do* indicate that the data sets in previous studies were inadequate and that there might be a lag between the introduction of IT and the achievement of productivity growth (see Brynjolfsson, 1993; Brynjolfsson & Hitt, 1993). Overall, however, a review of the literature suggests that

causality between IT diffusion and economic growth is still unproven. Kraemer and Dedrick used data from 1983 to 1990 for 11 Asia Pacific countries at different development levels and showed a significant positive *correlation* between investment in IT and growth in both GDP and productivity. These authors suggested that their findings supported IT-led growth, but also acknowledged that correlation does not mean causation. They also found that IT investment is positively related to a country's wealth, infrastructure, and wage rates, perhaps suggesting the existence of reverse causality (see Kraemer & Dedrick, 1994).

Numerous studies have used cross-country statistical comparisons in order to examine the theoretical and empirical aspects of the relationships between telecommunications infrastructure and economic growth. Aschauer (1989) assumed an aggregate Cobb-Douglas technology in which output is produced by the usual private-sector capital and labor inputs, plus public-sector capital, or infrastructure. His findings, upon an examination of US data, suggested that infrastructure had a very strong positive effect on private-sector total factor productivity (TFP). Though his findings have also been confirmed by recent studies, such as that by Munnel (1990a), he generated a degree of controversy amongst some economists, who suggested that the marginal productivity of infrastructure implied by Aschauer's estimates was very high. It is further suggested that, if spillovers are as important as suggested by Aschauer's findings, this has an important policy implication: namely, that governments can increase real output and base such a policy on empirical evidence that their country's productivity would be substantially enhanced.

An alternative way of interpreting Aschauer's findings is that causality not only flowed from infrastructure investment to output and productivity, but also in the reverse direction. In other words, when productivity growth is high and incomes are rising rapidly, governments are more inclined to invest in public works.

The neoclassical growth models of Solow (1956) and Denison (1961) postulate that it is investment in physical capital that is the engine of economic growth. According to this viewpoint, growth rates across different economies should converge on steady-state values. However, such a prediction has received little confirmation from the available empirical evidence. This neoclassical model further predicts that the initial capital-labor ratio has no effect on steady-state growth, and thus that poor countries with lower capital-labor ratios (or lower output) should grow more rapidly than can developed ones. The experience of recent decades has not confirmed this prediction, either. Observed heterogeneous growth rates in recent years have been provided by the "growth miracles" experienced by some Asian economies, averaging six percent growth per annum in the period 1950-80 compared to the less than two percent average for poorer countries (see Lucas, 1988). In addition, there seems to be a persistent variance in growth rates even among industrialized countries. With its restrictive assumption regarding the dominant role of technology, the neoclassical model appears completely unable to explain this observed diversity.

Neoclassical models of economic growth, which originated with Solow (1956), express a country's production function by limiting inputs to labor and capital. They further assume constant returns to scale and diminishing returns. This model, therefore, predicts that poor countries should grow faster than wealthier countries (i.e., convergence of per

capita income should occur). However, evidence from cross-country data indicates that poor countries, in general, have *not* grown faster than wealthier countries (see Barro, 1991), and the neoclassical response to this is that diminishing returns to capital in the relatively wealthier countries have been avoided due to advances in technology. Clearly, an understanding of how technological change has transpired, and how it has in turn allowed wealthier countries to grow faster than relatively poorer ones, is a pre-requisite if we are ever to understanding the disparities in economic growth evident across different countries.

In an attempt to respond to the shortcomings of the neoclassical models (where technological advance is accounted for as an unexplained residual term), theoretical models of endogenous growth have been developed. Romer's (1990) model of endogenous growth shifts the primary factor contributing to economic growth away from simple capital accumulation to the use and development of increased human capital. The model argues that the devotion of more human capital to research results in a greater number of innovations, and that this increase in innovation, in turn, suggests the existence of a greater stock of knowledge to draw upon. His arguments are based on the premise that innovation (and resulting technological improvements) occurs as a direct result of private sector responses to market incentives.

The neoclassical model does not assign any role in the growth process to governmental policies and investment in telecommunications, despite the potentially positive role that government policy and adequate infrastructure could play. In recent growth literature, however, government policy is shown to play a *key* role in determining economic activity. For example, it is often argued that private markets may fail to produce

the required public assets (see Barro, 1989), thus necessitating certain fiscal actions designed to create incentives for saving and investment. This is particularly true in cases where there are well functioning capital markets in which entrepreneurial assets can be exchanged in order to induce technological innovation. Governments may also provide the appropriate institutions and infrastructures needed for growth. The positive association between economic growth and government spending is based on the assumption that the private and the public (i.e., government) sectors are complementary rather than substitutable.

Of course, governmental policies may also create barriers to growth, as suggested by Landau 1983, 1986; Masden 1983; and Darrat and Conte, 1988. In particular, ambiguity exists as to the size of the public sector needed for promoting economic growth. Supply-side theories argue that higher taxes (needed to support government spending) may distort incentives and thus hamper investment and output. Moreover excessive government spending results in large budget deficits that require huge borrowing and/or escalating monetary expansions. Borrowing leads, typically, to higher interest rates along with domestic and foreign debt problems that, in turn, crowd out private investment. Monetary expansions are usually followed by inflation, currency appreciation, and the lost of world market shares. According to supply-side economics, therefore, countries with large government spending (and high taxes) will experience lower growth. In other words, government policy *can* have adverse effects on growth.

The theoretical links between technical innovation, industrialization, and economic growth have been established for many years, dating at least from Schumpeter (1935), and

argued forcefully ever since (Salter, 1960; Schmookler, 1972; David, 1975). Basically, the question of what gives rise to technological innovation, and thence economic growth, has been widely debated. Although the verdict is not yet in on the complete set of factors involved, it is clear that simple neoclassical economic theories of factor price differentials are insufficient to explain innovation, and also that social institutions play key roles in the process (see Rosenberg, 1982).

An alternative approach for studying economic growth is to view it as an endogenous process of several internal factors. The notion of economic growth explained by endogenous technological progress has already been presented in the work of the classical school (see Gourvitch 1940 for a detailed overview).

In Adam Smith's pin factory, technological change took the form of further and further divisions of labor, enabling an increase in productivity in the system as a whole. Ricardo, though, was more pessimistic when he first wrote the chapter on machinery in his "*Principle of Political Economy and Taxation.*" Dealing with the employment consequences of technological change, he assessed the innovations of his time as "employment-reducing." In Marx' work, of course, technological change was seen as the principal means with which capitalists search for more surplus value. In his view, technological change, through the "organic composition of capital" was the driving force behind the "tendential fall" of the profit rate and, eventually, the decline of the capitalist era.

Via Marx, endogenous technological change became prominent in the work of Schumpeter (for example, Schumpeter, 1934). In his long wave theory, Schumpeter

describes the disrupting effects of major technological breakthroughs on economic growth paths. In his view, major innovations are introduced in a process of *creative destruction*, drastically changing the structure of the capital stock in the economy. The major innovations, which are introduced in the depression phase of the long wave, are followed by a *bandwagon* of incremental innovations during the early upswing.

This shift in emphasis from exogenous technical innovation to endogenous factors as a catalyst for growth is a major theme of the recent economic development literature. The distinct role of human capital is justified by the assumption that knowledge (the embodied form of human capital) is valuable not just for the production of goods but, perhaps even more so, for the production of innovative knowledge, the advancement of technology, and the improvement of productivity. This suggests a close association between growth and human capital. Experience has shown that countries that invest more in education and telecommunications infrastructures usually achieve a higher per capita income for their citizens. Meanwhile, it is widely argued in endogenous growth literature that rates of return on human capital tend to be higher in developed countries, where jobs in technical fields require more advanced educational levels.

In the first growth models developed during the 1940s and 1950s technological change was reduced to an *exogenous* phenomenon, largely for analytical convenience. These early growth models did not specifically deal with the relationship between technological change and economic growth, but focused primarily on issues such as the influence of factor substitutability and the savings rate on the stability of macroeconomic

growth paths. Kaldor's growth model is an exception to this "rule" of exogenous technological change.

Intuitive support for the assumption of exogenous technological change in these models might be found in the "public good" characteristics of innovation. The user of technological change does not have to develop the innovation himself, but can (partly) rely upon other agents to develop the knowledge and then simply copy (or buy) it. Arrow (1962) formalized this notion in the (neoclassical) literature. However, the question remains why innovations would be 'produced' at all if public good characteristics were used as an explanation for the assumption of exogenous technological change. If technological change is purely a public good, there will be no incentive to produce and sell in the market. Possible answers to this are the following: firstly, Schumpeter argued that monopoly power is the principal means of appropriating an innovation; secondly, a patent system might create legal protection from imitation, and thirdly, a time-lead might give the innovator enough opportunities to recoup the innovation costs. All these possibilities have been developed, analytically, in the literature regarding industrial organization (for an overview see, amongst others, Kamien and Schwartz 1982; Scherer and Ross 1990).

Other neoclassical models of endogenous innovation have also been formulated. Most of these models are similar to that found in the literature on industrial organization, in so far as they deal primarily with the character and pace of innovation itself, rather than with economic growth. In contributions by, amongst others, Kennedy and Binswanger (for a survey and exact references, see Thirtle and Ruttan, 1987), the factor price ratio was identified as being one of the main endogenous determinants of the character of innovation

in models of endogenous innovation. In another approach, initiated by the seminal work of Schmookler (1966), effective demand was considered a major factor influencing the pace of innovation. The literature on endogenous technological change, however, then 'died out', though not before a few early contributions by Uzawa (1965), Phelps (1966), and Shell (1967). These papers specified models in which human capital formation is a major determinant.

Only recently has interest in endogenous technological change as a possible motor for economic growth revived. Firstly, the idea of endogenous innovation in a theory of economic growth was a major source of inspiration for evolutionary or neo-Schumpeterian literature, which was initiated in the 1980s by authors like Nelson and Winter (1982) and Dosi et al., (1988). As Romer (1986), Lucas (1988), and others have observed, an economy *can* achieve growth through internal factors, as in the case when a production technology may exhibit increasing returns in reproducible factors. These factors include, amongst others, human capital (effective human resources), population growth, and governmental policy (Rebelo & Rozenweig, 1990). Apart from allowing a greater role for policy in determining growth, modern theories of growth have also removed the constraint of belief in diminishing marginal returns to capital.

The important role of population in the endogenous growth model rests on the fact that it interacts closely with both the level and the growth rate of output, as well as with investment in human capital and telecommunications infrastructure. As Tamura (1988) has argued, the fertility of the present generation increases the discounted per capita future consumption and, consequently, discourages investment in both human and physical

capital. More generally, factors that may lead to higher population growth (i.e., the decreasing cost of raising children) tend to reduce the growth of per capita income. Thus, there seems to be a systematic relationship between declining fertility rates and per capita income growth, especially during periods of economic prosperity (Baker and Murphy 1990). Rosenzweig (1990) has also argued that low fertility and high levels of human capital characterize high-income nations, whereas low-income countries exhibit a *high* fertility rate and *low* levels of human capital. By the same token, in this information and global economy, high-income countries are characterized by low fertility, high levels of human capital, and high level investment in telecommunications, whereas high fertility rates, low levels of human capital, and *low* levels of telecommunications investment characterize low-income countries.

Finally, recent studies have shown that political and military disruptions may have significant economic consequences for African countries. An effective mass media and the freedom of expression could enhance the "checks and balances" applied to government policies and, consequently, encourage domestic reforms. Conversely, civil war and political instability may severely hamper a given country's economic development potential. It must be noted, however, that some countries known for their oppressive political regimes have *not* experienced depressed economic conditions, perhaps because of the illusion of stability. Clearly then, the effect of civil liberty on economic growth appears to be a largely empirical issue.

CHAPTER III

Macro-Economic Analysis of the Gambian Economy

3.1 Introduction

The Gambia occupies a narrow strip of land on the western coast of Africa, bordered on one side by the river Gambia and surrounded on three sides by Senegal. In terms of both size and population it is the smallest mainland country on the African continent, covering 10,700 km^2 and with a population of about 1 million that is growing at 4.1 percent per annum. It has an undeveloped human capital base with an illiteracy rate, in 1995, of about 65 percent (down from over 75 percent in 1985) (see figure 1 below). Its primary school enrollment level stands at 61 percent, and its infant mortality rate, according to 1990 data, is 136 per 1000.

Table 1 displays the overall performance of the Gambian economy when compared to selected African economies. The GNP per capita figures are calculated according to the World Bank Atlas method (see 1997 World Development Indicators for a description of the Atlas methodology), with the resulting estimate of Gross National Product (GNP) then divided by the midyear population in order to obtain per capita figures. Gross National Product (GNP) measures the total domestic and foreign value added worth claimed by residents. It comprises Gross Domestic Product (GDP) plus net factor income from abroad, i.e., the income residents receive from abroad for factor services (labor and capital) less similar payments made to non-residents who contribute to the domestic economy. Also note that the average annual growth of GNP per capita in The Gambia between 1965-1996 was at a low 0.40 percent.

Table 2: Performance of The Gambia's Economy Compared to Selected African Economies

Country	GNP per Capita (US$)-1996	Avg. Annual Growth of GNP per capita (%) 1965-96
Mauritius	$3710	3.90%
Botswana	$3020	9.20%
Cameroon	$610	1.40%
Senegal	$570	-0.50%
Ghana	$360	-0.90%
Gambia	**$320**	**0.40%**
Kenya	$320	1.50%

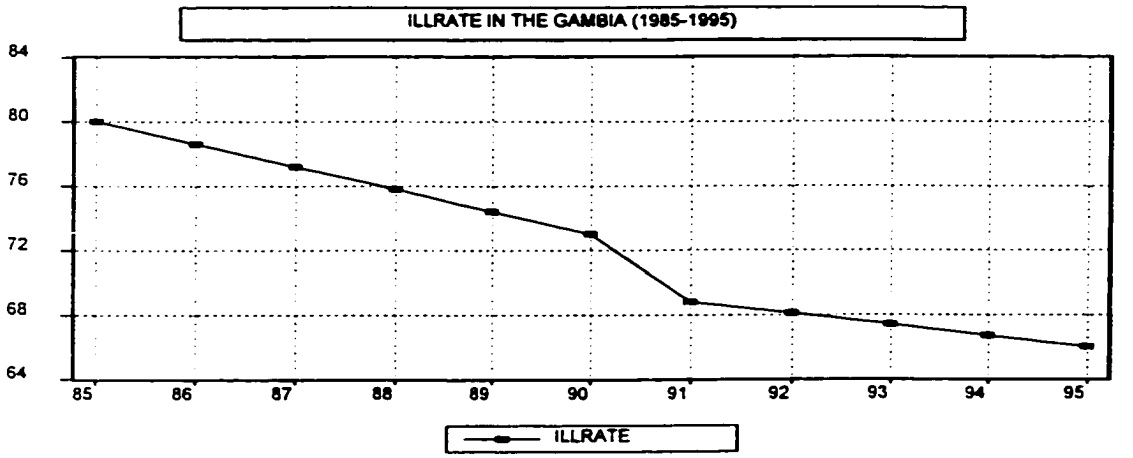
Source: World Development Indicators (WDI), World Bank, 1996 & Penn World Tables

Table 3: Human Capital: The Gambia Compared to Selected African Economies

Country	Literacy Rate (%) 1995	Prim. Sch. Enroll. (% of school-aged childre n) '95	Sec. Sch. Enroll. (% of school-aged children)' 95	Tertiary Sch. Enroll. (% of school-aged children)' 95	Sec.tech. Enroll. (% of school-aged children)	Life Expectancy at Birth (Yrs.)'96 Enroll. (% of school-aged children)	Growth in Life Expectancy (%) 1980-96
Mauritius	83%	107%	62%	6%	1.4%	71	7.58%
Botswana	70%	115%	56%	4%	4.6%	51	-12.07%
Cameroon	63%	88%	27%	2%	30%	56	12%
Senegal	33%	65%	16%	3%	3.3%	50	11.11%
Ghana	64%	76%	37%	N/A	2.5%	59	11.32%
Gambia	**39%**	**73%**	**22%**	**2%**	**N/A**	**53**	**32.5%**
Kenya	78%	85%	25%	N/A	32%	58	5.45%

Source: World Development Indicators (WDI), World Bank, 1996 & 1996 Human development Report

Figure 1: The Illiteracy Rate of The Gambia (1985-1995)



Source: World Bank

Table 3 displays human capital measures. The literacy rate (Table 2 and figure 1) represents the percentage of persons aged 15 and over who can read and write a short, simple statement regarding their everyday life. The Primary School Enrollment rate (Table 2) is the ratio of all ages enrolled in primary school to the country's population of primary school-age children (6-11). For countries with universal primary education, ratios may exceed 100% because some pupils are younger or older than the country's standard primary school age. The Secondary School Enrollment rate is the ratio of children of all ages enrolled in secondary school to the country's population of secondary school-age children (12-17). The life expectancy at birth measurement highlighted in table 2a indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of birth were to stay the same throughout its life. Finally, despite The Gambia's tiny size, there are five major ethnic groups (and several minor ones), each with its own distinct

language. Approximately 85 percent of the population are Muslims, 8 percent are Christians, and the rest follow traditional beliefs.

The Gambia's economy depends heavily on agriculture (small-scale farming, groundnut production, livestock, forestry, and fishing), a sector that employs three-quarters of the population and accounts for 30 percent of GDP. Most farmers rely on groundnut production for their cash income. Groundnut production, processing, and trade together account for approximately 15 percent of GDP, and groundnut products constitute about 75 percent of domestically-produced merchandise exports (McPherson and Radelet, 1995). Table 3 below displays elements of macro and market dynamism in The Gambia and selected African countries.

Gross Domestic Investment (GDI) as a percentage of Gross Domestic Product (GDP) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets cover land improvements (such as fences, ditches, drains, etc.), plant, machinery, and equipment purchases, and the construction of roads, railways, and the like (including commercial and industrial buildings, offices, schools, hospitals, and private residential dwellings). The Gambia's average annual growth rate of Gross Domestic Investment (GDI) for the period 1990-96 was three percent.

Private investment as percent of Gross Domestic Fixed Investment (GDFI) covers outlays by the private sector, including private non-profit agencies or additions to its fixed assets. The GDFI includes similar outlays by the public sector, and the Net Foreign Direct Investment (FDI), as a percentage of GDP, is the net change in foreign investment between The Gambia and the rest of the world. Foreign Domestic investments include all capital

transactions that are made in order to acquire a lasting interest (usually 10 percent or more of the voting stock) in an enterprise operating in a country other than that of the investor. FDI is the sum of equity capital, reinvestment of earnings, and other long-term and short-term capital as shown in the balance of payments.

Table 4: Investment and Productivity Growth: The Gambia Compared to Selected African Economies

Country	GDI (% of GDP) '96	Avg.Annual growth of GDI (%) 1990-96	Private Investment (% of GDFI) '96	Net FDI (%of GDP)'96	Avg.Annual growth of Real GDP per worker (%) 1980-90
Mauritius	26%	0.1%	64.8%	0.9%	3.5%
Botswana	24%	-170%	N/A	1.5%	2.5%
Cameroon	16%	-2.5%	95.5%	0.4%	-1.0%
Senegal	17%	4.8%	70.3%	0.9%	-0.1%
Ghana	19%	3%	26.3%	1.9%	-3.1%
Gambia	**21%**	**3%**	**63.1%**	**2.2%**	**-1.3%**
Kenya	20%	1.1%	44.5%	0.1%	-1.4%

Source: World Development Indicators (WDI), World Bank; 1996 & 1998 World Development Indicators

In addition to agriculture, trade is the other major activity in The Gambia. The Gambia imports about half of its food supplies, all of its fuel, and most of its capital and manufactured goods. Mainly because of the river, entrepot trade with other countries in the region has been an important activity for generations.

In the 1970s, re-export trade grew rapidly because The Gambia kept its tariffs low while neighboring countries increased their tariffs and introduced quotas in an attempt to protect domestic industries. Re-exports have, therefore, surpassed groundnuts as the largest

net foreign exchange earner. Manufacturing activities are, however, limited, accounting for only six percent of GDP (about half of which is groundnut processing). Tourism accounts for less than four percent of GDP.

Table 5 below displays the overall trade dimensions of The Gambia and selected African economies. The trade Surplus/Deficit as a percentage of GDP is also referred to as the resource balance, and equals exports of goods and non-factor services minus imports of goods and non-factor services. Table 5 displays the export competitiveness. The average annual nominal export growth is the compound annual rate of growth in the value of merchandise exports. Following a methodology developed by research staff of the General Agreement on Tariffs and Trade (GATT), the growth of nominal exports is decomposed into three multiplicative factors. The first one measures growth that is due to an expansion of the world market for the country's traditional exports. The second measures the growth due to an expansion of the country's market share for its traditional exports. The third, measured as a residual, captures the growth in exports due to diversification into non-traditional exports. By construction, nominal export growth is equal to the product of the three factors. Table 6 displays the export structure- manufactured exports as a percent of total exports. Manufactured exports are commodities in the Standard International Trade Classification (SITC), revision 1, section 5-9 (chemical and related products, basic manufactures, manufactured articles, machinery and transport equipment, and other manufactured articles and goods not elsewhere classified), excluding division 68 (nonferrous metals).

Table 5: Overall Trade Dimensions: The Gambia Compared to Selected African Economies

Country	Trade Surplus/Deficit (% of GDP)'95	Avg. Annual growth in Export Share (%) 1989-95
Mauritius	26%	0.1%
Botswana	24%	-170%
Cameroon	16%	-2.5%
Senegal	17%	4.8%
Ghana	19%	3%
Gambia	**21%**	**3%**
Kenya	20%	1.1%

Source: 1997 World Development Report

Table 6: Export Competitiveness: The Gambia Compared to Selected African Economies (1988-89 to 1993-95)

Country	Avg. Annual Nominal Export Growth	Export growth from World Demand (%)	Export Growth from Market Share (%)	Export Growth from Market Diversification (%)
Mauritius	4.8%	8.4%	-3.1%	-0.3%
Botswana	N/A	N/A	N/A	N/A
Cameroon	-0.4%	4.2%	-4.2%	-0.2%
Senegal	-8.3%	3.4%	-11.5%	0.2%
Ghana	5.8%	3.1%	1.6%	1%
Gambia	**2.4%**	**8.8%**	**-8%**	**2.3%**
Kenya	4.2%	4%	-1.3%	1.5%

Source: 1997 World Development Indicators –1988-89 to 1993-94

Table 7: Export Structure: The Gambia Compared to Selected African Economies

Country	Manufactured Exports (% of total exports)'93	% change in Share of Manufactured Exports (%) 1980-93	High-Tech. Exports (% of manufactured exports)'96
Mauritius	68%	233.33%	1%
Botswana	N/A	N/A	16%
Cameroon	8%	250%	3%
Senegal	50%	46.67%	55%
Ghana	24%	2300%	N/A
Gambia	**36%**	**300%**	**N/A**
Kenya	29%	141.67%	5%

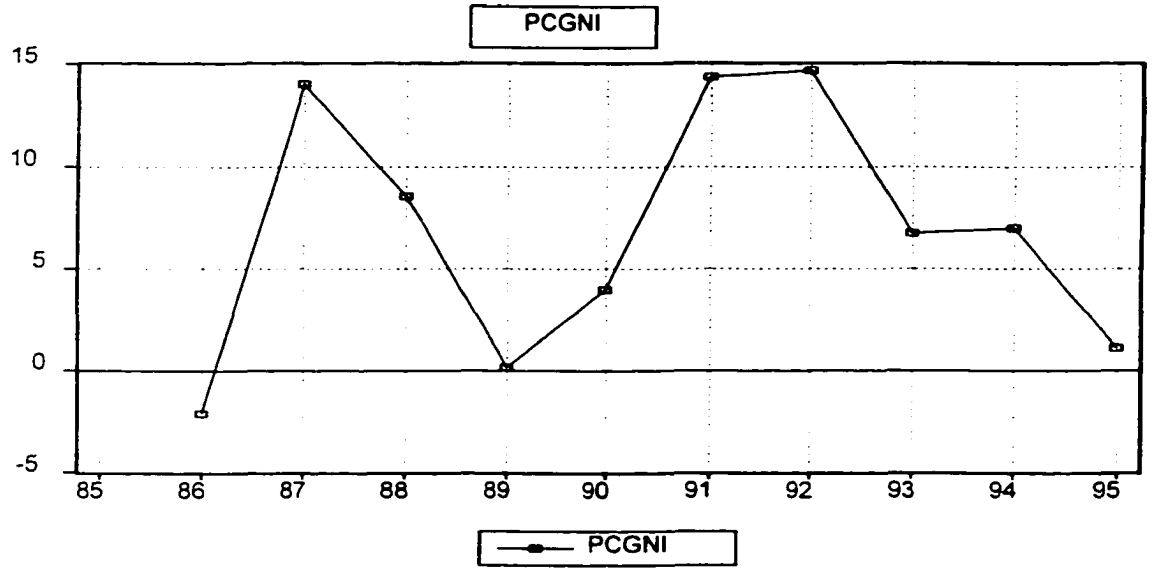
Source: World Bank; 1996

High population density on agricultural land - 207 inhabitants per square kilometer in 1991 - and very high rates of urban population growth are generating mounting environmental concerns. In addition, The Gambia's open, non-diversified economy is highly vulnerable to changes in the external environment: i.e., adverse weather, fluctuations in the world price of the main export crop (groundnuts), a less generous international aid climate, hard economic conditions in neighboring countries, and shifting demand in Western Europe for tourist services.

The Gambia's population is expected to reach 1.2 million by the end of this century; and the country has, over the past 15 years, experienced very rapid and uncontrolled urban growth without a commensurate level of investment in infrastructure and urban services. Average incomes vary immensely between urban and rural areas – according to the World Bank, the urban sector earned four times the average rural income in 1985.

In 1960, only 12 percent of the total population lived in urban areas. However, according to the recent (1993) census, approximately 40 percent of the population now do so. This considerable change in the living conditions of the people has been aggravated by severe environmental problems resulting from the interplay of two major factors. Figure 2, below, is an illustration of the percentage change in the gross national income(PCGNI) in The Gambia for the period 1985-1995.

Figure 2: Percentage Change in the Gross National Income (PCGNI) in The Gambia 1985-1995



Source: World Bank

Successive years of drought and rapid population growth, leading to undue pressure on the limited capacity of traditional agricultural and pastoral production, has had a dramatic effect upon urban concentration. Although rainfall has improved during the past two to

three years, it is not likely to reverse the trend of ongoing migration from most rural areas towards cities, and particularly the Greater Banjul Area (GBA).

The largest urban center is the GBA; which has two main municipalities - Kanifing Municipal Council (about 229,000 inhabitants) and Banjul City Council (about 43,000 inhabitants). The largest share of urban growth is concentrated in the GBA, which accounted for 15 percent of the total population and two-thirds of the urban population in 1982. By 1992, it represented 30 percent of the total population and three-quarters of the total urban population. The GBA is growing at an annual rate of 8 percent, while the total population is growing about 4.1 percent per annum. The population dynamic makes the demographic data even *more* alarming, though. Current estimates show that more than 50 percent of the population is less than 15 years old. In five to ten years, when this young population reaches childbearing age, a sharp increase in population can be expected.

The growth rate of the secondary cities is also very steady. Some cities, like Brikama and Farafenni, have witnessed high population growth rates. One hundred twenty-one thousand inhabitants live in 11 urban centers (one urban center accommodates about 5,000 inhabitants), and this urban growth has led to the rapid expansion of squatter communities around the peripheries of the capital city and the larger secondary towns. Finally, a large number of poor households live without access to clean drinking water and/or sanitation services.

Table 8, below, displays measures of government involvement in the economy. Government consumption as a percentage of GDP measures all current expenditure upon purchases of goods and services by all levels of government. Capital expenditure on

national defense and security are regarded as consumption expenditures. Excluded are the outlays of public financial and non-financial enterprises.

The economic activity, or value added, of state-owned enterprises as a percentage of GDP is estimated as their sales revenue minus the cost of their intermediate inputs, or as the sum of their operating surplus (balance) and wage payments.

The state-owned enterprises' (SOEs) level of investment as a percentage of Gross Domestic Fixed Investment refers to fixed capital formation by state enterprises. The government deficit/surplus as percentage of GDP is the sum of total government revenue plus all grants received, less total expenditure, government lending, and repayment.

Table 8: Government Involvement In The Economy: The Gambia Compared to Selected African Economies

Country	Government Consumption (% of GDP)'96	Avg. annual growth of Gov, Cons. (%)1990-96	Value added of state-owned enterprises SOE (% of GDP)1986-91	SOE's Investment (% of GDFI)-190-95	Gov. Surplus/Deficit (% of GDP) 1995
Mauritius	10%	4.4%	1.8%	N/A	-1.2%
Botswana	29%	9.7%	5.6%	23.2%	2.8%
Cameroon	8%	-7.6%	18%	N/A	0.2%
Senegal	10%	-4.3%	6.2%	22%	N/A
Ghana	12%	7.3%	8.4%	25%	-2.6%
Gambia	**18%**	**-10%**	**3.8%**	**N/A**	**3.7%**
Kenya	15%	0.4%	11.5%	20.8%	-3.4%

Source: World Bank, STARS, 1996; 1998 World Development Indicators.

Persistent declining economic prospects in many of The Gambia's rural areas explain this substantial migration to urban centers from all parts of the country. The problem of rural to urban drift has put considerable pressure on the urban environment, as

has the absence of physical planning, which has resulted in overcrowded and unhealthy living conditions for the majority of the urban population, and particularly the urban poor. This has also led to a severe lack of basic infrastructure, especially as regards the disposal of solid waste and sewerage system management.

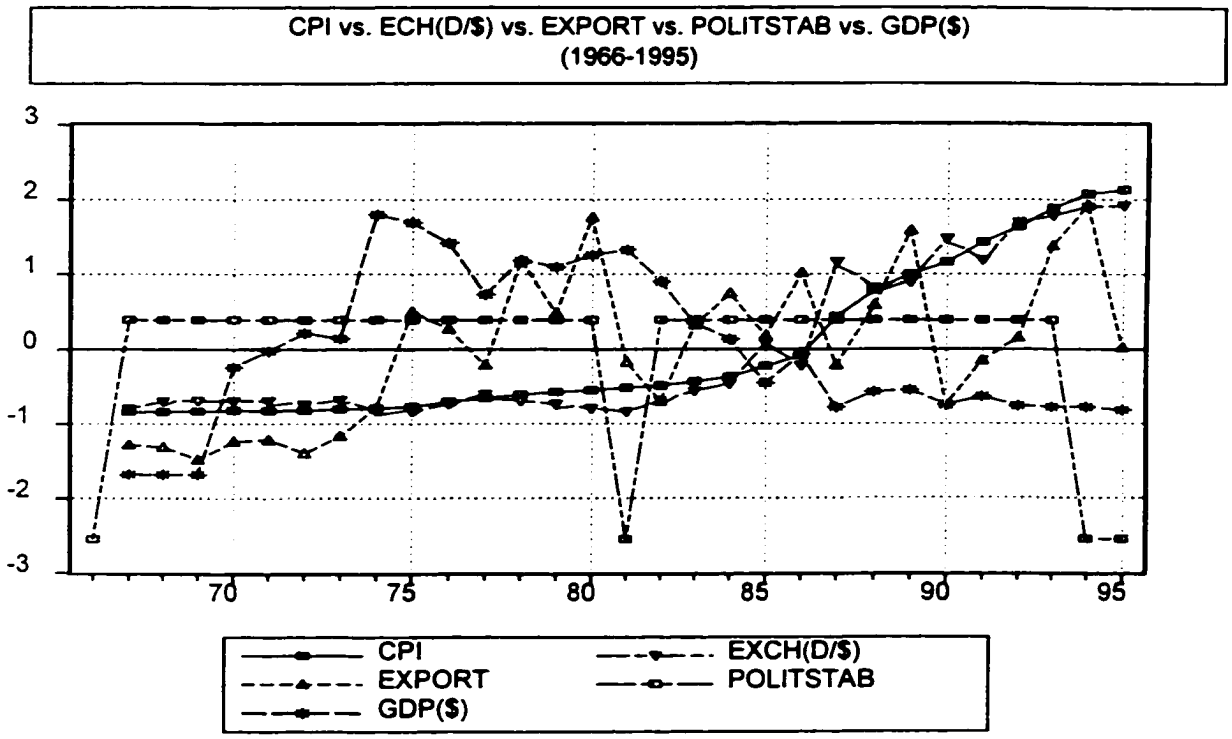
3.2 The Turbulent Economy of The Gambia

The first ten years following independence in 1964 saw broadly stable macro-economic conditions, with modest rates of economic growth. From 1970 until 1985-86, however, the economic and financial performance of The Gambia deteriorated markedly as a result of both external shocks and inappropriate domestic policies. During the same period, the involvement of the public sector in the economy increased sharply through the creation of several public enterprises, particularly in the industrial and trade sectors. As a consequence of expansion in current government expenditure, output growth in the productive sectors of the economy remained low. At the same time, however, price distortions and regulated markets for agricultural and industrial products discouraged the development of viable small-scale activities in the secondary sector, and hampered agricultural development as well.

Figure 3 is an illustration of the consumer price index (CPI), the exchange rate (the Dalasi in relation to the US$) versus export (EXP), political stability, and Gross Domestic Product in US$ (GDP($)) for the period 1966-1995. Under the Economic Recovery Program (ERP) of 1985 and the Program for Sustained Development of 1990,

strong policies and a broad range of economic reforms were put in place, including: (1) a tight fiscal policy involving improved expenditure control and a broadening of the tax base; (2) a restrictive monetary policy; (3) the strengthening of economic incentives, including the lifting of most price controls and the introduction of a market-determined exchange rate in the context of a liberalized trade and payment system; and (4) the divestiture of a number of public enterprises and the strengthening of the financial position and operations of those enterprises that remained in the public domain. The implementation of these policies was supported by the International Monetary Fund (IMF) via a three-year arrangement under the Enhanced Structural Adjustment Facility (ESAF), which expired in November 1991, and by the World Bank, through structural and sectoral lending, including the second structural adjustment loan (SAL II), completed in 1992.

Figure 3: Illustration of the Consumer Price Index (CPI), The Exchange Rate (Dalasi in relation to the US$) vs. Export (EXP), Political Stability, and Gross Domestic Product in US$ (GDP ($)) for the Period 1966-1995



Source: World bank

The economic strategies pursued under ERP and PSD have been primarily aimed at restoring economic growth, lowering domestic and external imbalances, reducing the public sector's role in the economy, and promoting the development of the private sector. Between 1985 and 1990, real GDP growth averaged 3.5 percent, reflecting continued growth in the private sector, and particularly in tourism and construction. Real GDP growth in 1991-92 was estimated at four percent due to a quick recovery in trade and tourism that succeeded in outweighing the slow recovery in agricultural production. The

inflation rate was cut to four percent by the end of 1992, down from about seventy percent in 1985. These results are certainly impressive; however, they remain fragile and need to be sustained.

One of the main accomplishments of the reform program was the restructuring of the public enterprise sector, which has dramatically improved the efficiency of enterprises and resource allocation. The government has recently signed a ten-year management contract with the National Water and Electricity Company (NAWEC), as well as performance contracts with about five wholly-owned and ten mixed-ownership companies in order to ensure their managerial autonomy, including tariff setting and the meeting of efficiency targets.

The way has been cleared, with the privatization of the Gambia Commercial and Development Bank (GCDB), in June of 1992, to phase out public sector involvement with, and increase private sector competition in, the financial sector. The government has also revised legislation that enhances the Central Bank's supervisory role. Monetary policy is now implemented through open-market operations and credit ceilings have been abolished. Moreover, market forces are allowed to play a significant role in determining key interest rates, on the basis of bi-weekly tender systems for Treasury bills.

Following the reinforcement of border and transit trade controls by Senegal in 1993, The Gambia's re-export trade shrank appreciably. The cumulative decline in re-exports from 1992/93 to 1995/96 was of the order of 32 percent, and recovery since then has been slow. In addition, the military coup d'etat in July 1994 prompted the suspension or cancellation of assistance by most traditional donors, while receipts from tourism

dropped by 60 percent in 1994/95 compared to the previous fiscal year. Although the tourism industry recovered in subsequent years, the record earnings level of 1993/94 was only slightly surpassed in 1997.

Until mid-1993, The Gambia had made significant progress in reducing financial imbalances, liberalizing the economy, and strengthening the basis for durable economic growth. However, the Gambian economy has suffered from a series of adverse shocks, an unduly expansionary fiscal stance, increasing structural weaknesses, and diminished private sector confidence. Moreover, and as mentioned above, the military take-over of the government in July 1994 prompted the suspension of new project aid and the cancellation of a significant amount of budgetary assistance. Real GDP fell by 3.5 percent in 1994/95 (July-June) and, although the economy recovered in 1995/96, economic growth has remained low ever since. Nevertheless, the monetary authorities managed to maintain a tight monetary policy, thereby containing inflation and preserving a large measure of exchange rate stability.

To finance its fiscal policies from 1994/95 onward, the government has borrowed heavily from the domestic banking and public enterprise sectors by utilizing the proceeds of the issuance of treasury bills. Faced with the mounting fiscal imbalances, the Central Bank of the Gambia sold large amounts of treasury bills to absorb part of the excess reserves of the commercial banks. As a result, the total outstanding stock of domestic debt increased from 13.25 percent of GDP at end-1994, to 22.5 percent by the end of1997. As the treasury bill rate remained at the high level of 16 percent, domestic interest payments rose steeply from 11.5 percent of total government revenue in 1994/95, to 19.5 percent in

1997. As a result, expenditure in the priority areas of education, health, and infrastructure came under considerable pressure. Moreover, the resulting high real interest rates led to a severe crowding out of private sector investments, which further contributed to low economic growth.

Table 9 displays measures of financial dynamism. The net present value of external debt as a percentage of GDP is the ratio of the discounted value of future debt service to GDP. The average outstanding money (M2) as a percentage of GDP is the ratio of M2 (sum of currency outside banks as well as demand, time, and savings deposits other than those with the central government) to GDP. Inflation is measured by the average annual growth rate of the GDP deflator displayed below, and is defined as the value of GDP in current value divided by the value of GDP in constant value, both expressed in the national currency. The credit to the private sector as a percentage of GDP refers to financial resources provided to the private sector such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment. The real interest rate is the deposit interest rate (e.g., the rate paid by commercial or similar banks for demand, time, or savings deposits) adjusted for inflation as measured by the GDP deflator.

Table 9: Financial Dynamism: The Gambia Compared to Selected African Economies

Country	Net Present Value of External Debt (% of GDP)'96	Growth in total External Debt. (%)1980-94	Average Outstanding Money M2 (% of GDP)1996	Avg. Annual growth rate of GDP deflator (%)1990-96	Credit to Private Sector (% of GDP)	Real Interest Rate (%)
Mauritius	45%	-3.13%	73%	6.5%	44.7%	14%
Botswana	11%	6.75%	26%	9.7%	11.1%	4.2%
Cameroon	106%	190.76%	13%	6.4%	8.3%	-0.9%
Senegal	53%	96.24%	20%	8.4%	15.8%	N/A
Ghana	56%	221.20%	15%	26.9%	6.6%	-8%
Gambia	**64%**	**90.73%**	**23%**	**5.4%**	**10.6%**	**18.1%**
Kenya	64%	133.68%	38%	16.6%	34.6%	22%

Source: World Bank, STARS, 1996; 1998 World Development Indicators.

Until 1996, broad monetary growth had remained broadly in line with the increase in nominal GDP. In 1997, however, the growth rate of broad money accelerated sharply - to 22.25 percent from 6.25 percent. Credit to the private sector, notably in the trade and tourism sectors and crop credit, expanded by 27 percent, which does suggest that confidence has begun to return following the elections. At the same time, however, there was a further increase of net bank credit to the government as the fiscal situation remained weak. The net foreign assets position of the banking system improved by almost 6.5 percent of the period's broad money stock, owing partly to higher receipts from tourism. Interest rates changed little over 1994-97 and continue to be significantly positive in real terms. The spread between deposit and lending rates also remain quite large, with interest rates in the range of 9-15 percent for deposits and 19-25.5 percent for loans. This large spread is the result of a number of factors, including the oligopolistic structure of the banking sector and the narrowness of the domestic money market; the weakness of the

commercial banks' loan portfolio; the lengthy legal process facing banks when liquidating loan collateral; and the resulting risk-averse attitude of the banks.

Thus, with the population growing at some three percent, real per capita income declined by approximately six percent over the period. Preliminary information for the calendar year 1997 indicates that real GDP growth rebounded to almost 5.5 percent from less than one percent per year in the fiscal period 1996/97, reflecting a weather-related recovery of groundnut production from the record-low crop in 1996, and a further strong expansion in the tourism and related services sectors. The tight monetary policy stance maintained over the last four years helped to contain the inflation rate to below five percent and preserve a large measure of exchange rate stability, but at the cost of very high real interest rates. Average inflation in 1997, as measured by the Consumer Price Index (CPI), remained low at 2.75 percent.

During 1997, which marked the transition from a fiscal year to a calendar year budget cycle that began in 1998, fiscal policy was tightened appreciably, and the budget deficit (excluding grants) was reduced to 7.75 percent of GDP. Although there were slippages during the last quarter of the year, total government expenditure and net lending was brought down from 30.75 percent of GDP in 1996/97 to 27 percent in 1997. Total government revenue remained at 19.25 percent of GDP, despite efforts to strengthen the tax administration and further improve taxpayer compliance.

The soundness of the commercial banking system improved during 1997 but still remained relatively weak, as non-performing loans, in particular to the groundnut and tourism sectors, amounted, on average, to 27 percent of the banks' loan portfolio.

Meanwhile, actual provisions covered, on average, only 46 percent of provisions required against the outstanding amount of non-performing loans. At the same time, all the commercial banks were in compliance with the liquid asset and capital adequacy requirements, except for two small banks. The authorities are aware of the need to strengthen the soundness of the banking system, however, including stricter enforcement of the provisioning requirements relating to non-performing loans.

The volume of domestic exports fell by almost 11 percent in 1997, owing mainly to a drop in groundnut shipments following the disappointing 1996 crop year. At the same time, the terms of trade improved significantly, and the services account turned positive as tourism receipts continued to rise. All external debt service obligations were met in a timely fashion. However, the overall balance of payments position weakened in 1997 from 1995/96, because of substantially lower disbursements of project-related loans. As a result, gross official reserves stabilized at end-1997 at about SDR 70 million, equivalent to 5.25 months of import cover.

The CPI-based real effective exchange rate of the Dalasi has remained relatively stable in recent years, and is estimated to have appreciated by about 4.5 percent in 1997. Between December 1996 and February 1998, the Dalasi depreciated by 6.75 percent against the US Dollar and 8 percent against Sterling, but it appreciated by 6 percent vis-à-vis the CFA franc. The spread between the interbank and the parallel market exchange rates remained low, i.e., at about 2 percentage points.

On the structural front, serious weaknesses have contributed to the deterioration of the economic situation. Governmental controls over the operations of public enterprises

have slipped, and the public enterprise sector's involvement in the financing of some government investments has hampered the efficiency of resource allocation. The Gambia Telecommunications Company (GAMTEL) has undertaken a television project that is financed by an external loan, for which the debt service constitutes a considerable financial burden. The National Water and Electricity Company (NAWEC) continued to experience difficulties in providing an adequate and regular supply of low-cost electricity. However, an increase in capacity was recently realized with private sector participation. Finally, the groundnut sector is facing serious difficulties, as the Gambia Cooperative Union (GCU) is crippled by non-repayment of agricultural loans as a result of past mismanagement, and the provision of seeds, fertilizers, and extension services has been inadequate.

Following the completion of presidential and legislative elections in early 1997, the government took a number of corrective measures to restore economic stability and began to normalize relations with donors. In particular, the overall budget deficit (excluding grants) was brought down from 11.5 percent of GDP in fiscal 1996/97 to 7.75 percent in calendar year 1997.

3.3 Projected Economic Activities

In 1998-2000, the authorities are determined to take the necessary steps to achieve macroeconomic stability and to establish conditions for strong and durable economic growth. They have promised to bring the unsustainable budget deficit down further, thereby reducing the domestic public debt, and to adhere to strict demand management in order to keep inflation low. Furthermore, to create an environment conducive to outward-

oriented private sector activities, the authorities have also promised to implement structural reforms, including an ambitious reform of external tariffs; a significant improvement of the banking system and a deepening of financial intermediation; the modernization of the legal and regulatory framework for economic activities; a strengthening of public resource management; and a resumption of public enterprise reform.

This new economic program will also try to empower the most disadvantaged social groups. The Gambia is currently seeking donor-support to implement this new program of macroeconomic stabilization, accelerated growth, and sustainable development.

Chapter IV

Socio-Economic Implications of the Telecommunications Sector in The Gambia: A Case Study

4.1 Introduction

Telecommunications infrastructure is at the core of the information economy, and an economy lacking a modern telecommunications infrastructure cannot compete effectively in this global information economy. In Sub-Saharan Africa, the telecommunications sector is under-represented, even when measured in relation to gross domestic product. However, awareness of the economic payoffs from successful reform strategies is growing and, for countries in Sub-Saharan Africa, with an average per capita income of around $350, the economic and financial returns from expansion in telecommunications are substantial and well-documented (see World Bank, 1997). Economic studies for the International Telecommunication Union (ITU) indicate that each new telephone line added in the region contributes approximately $4,500 to gross national product - a much higher contribution than in developed markets.

The history of the telephone in The Gambia dates as far back as 1885, as the nation was among the first countries in Africa and the world to be connected to the first international submarine telegraph cable, laid by the African Direct Telegraph Cable Corporation. The system extended from London and Portcurno in England, to St. Vincent on Cape Verde Island. This formed the final section of the then South Atlantic Brazilian Submarine cable (Kebbeh, 1995). By 1965, the telephone network was obsolete and limited

exclusively to the city of Banjul – i.e., to the capital and its surrounding area. As a colony of Great Britain, the provision of telecommunication services in The Gambia was more a necessity for the colonial establishment and the elite, than designed to aid the local populace or act as an economic stimulant.

4.2 Chronology of Telecommunications Development

At the time of independence in 1965, telecommunication services in The Gambia were provided by two entities: Cable and Wireless Ltd., a private, UK-based company responsible for the international services under a licensing agreement with the Gambian government, and the Post and Telecommunications Department under the Ministry of Works and Communications, which was responsible for the postal services and national telephone and telegram services within The Gambia and her neighbor, Senegal.

Cable & Wireless was granted the exclusive right to provide international telephony and other services such as telegram and telex. However, the objective of Cable & Wireless was simply to maximize profits. It charged high tariffs to please its shareholders in Great Britain, and did not invest in the development of the local telecommunications infrastructure. This precipitated the government to buy out its operations in The Gambia, which resulted in the creation of the Gambia Telecommunication Company Ltd. (GAMTEL), in 1984.

During this period, the diminutive and under-developed telecommunications infrastructure was capable of meeting neither the government's needs nor those of the

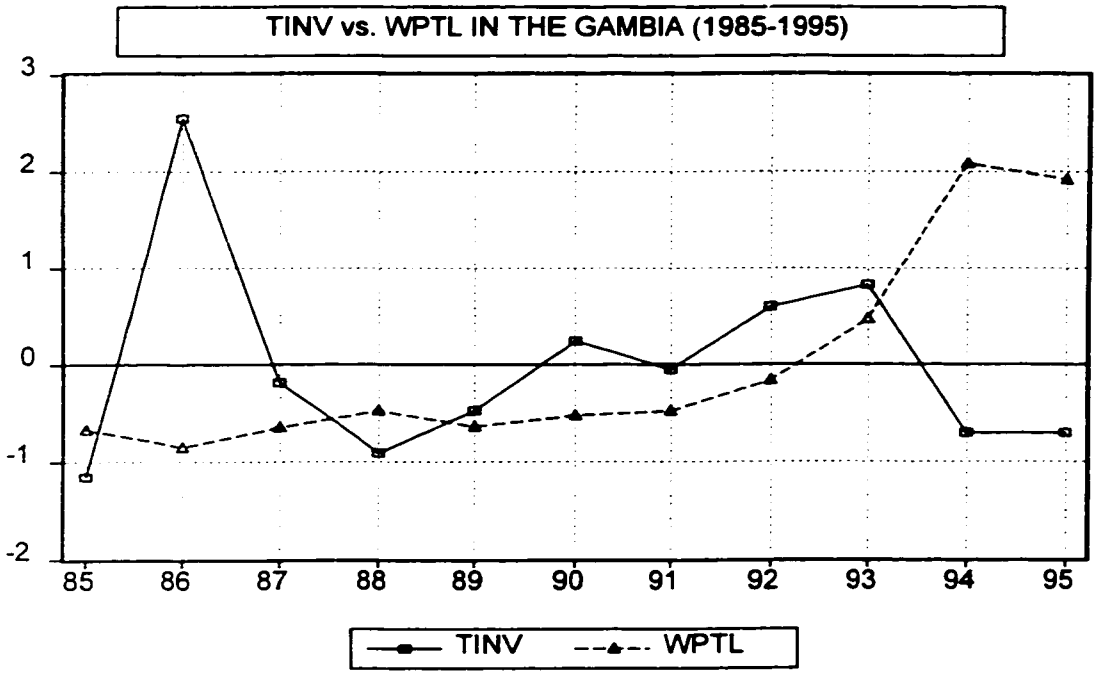
public and private sectors. The performance, reliability, and efficiency of the network were very poor. High maintenance costs, poor service standards, and low revenue were common problems experienced because of the obsolescence of both the electro-mechanical exchanges and the local outside plants. In 1976, the government of The Gambia broke telecommunications services away from the postal services, thus creating two independent entities.

From 1960 to 1970, the "Winds of Change" blew through Africa as countries started attaining self-government. Most newly- independent states took hasty, and so-called "patriotic," steps to nationalize most of their public utilities sectors in order to satisfy nationalistic aspirations of state or monopoly control. The forces responsible for exerting pressures on the traditional telecommunications systems have induced the process of change in the functioning and the nature of entities that provide telecommunications products and services. These pressures have caused profound changes in the policy and the structure of the telecommunications sector. Hence, in an effort to respond to these pressures effectively, many developing countries followed the processes adopted by some of the industrialized nations in their attempts at reform.

Recognizing the fact that a modern and reliable telecommunications infrastructure stimulates economic activity, growth, and development, The Gambia embarked on major policy reform in order to expand and improve the efficiency and cost effectiveness of telecommunications services, respond to customer and economic demands, attract investors, further business opportunities, and leapfrog from an analog to a digital network.

The government mapped out a plan to modernize her existing telecommunication infrastructure – both local *and* international networks.

Figure. 4: Investments in Telecommunications and Demand for Services



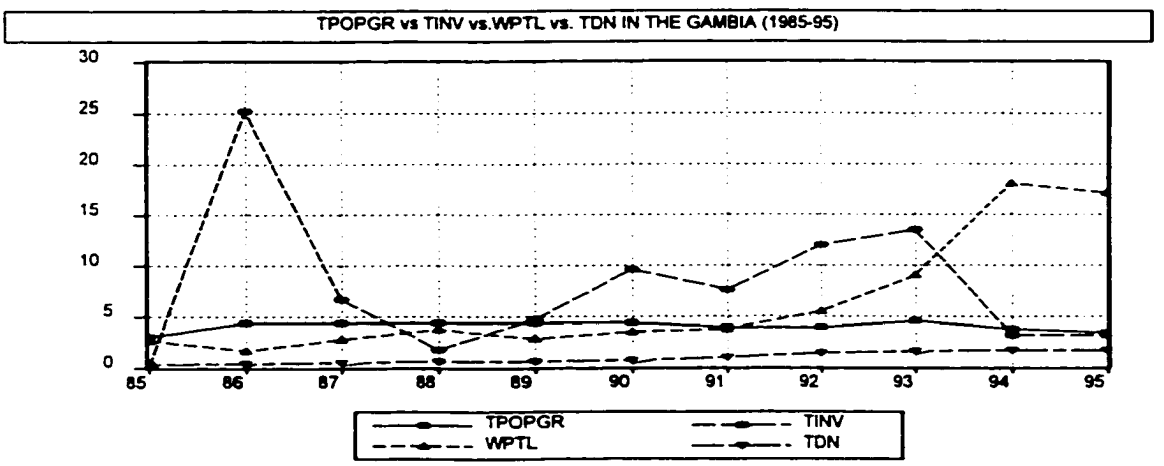
Source: ITU

In 1984, the Gambian government restructured the management and the organization of the old telecommunication system, establishing GAMTEL as a limited liability company that would take over, operate, and further develop the country's telecommunications sector. The name was later changed to Gambia Telecommunications Company Limited. Prior to the establishment of GAMTEL, what was in place was an obsolete telephone network of approximately 2,400 lines operated by the then Telecommunications Department and Cable and Wireless PLC (Gambia). GAMTEL attained 90 percent digital network outlay nationwide, and the current network consists of two main digital public switch telephone exchanges with almost a dozen Remote Line

(RLU) providing a global capacity of over 50,000 lines. Relevantly, figure 4 illustrates the relationship between investments in telecommunication (TINV) and the demand for services (WPTL).

Considerable developments have taken place since then, with major expansion projects including International Dialing Facility (IDD), and an impressive performance record, making GAMTEL one of the leading telecommunications companies in the region. The Phase I, II, and III projects made this impressive performance possible and, presently, there are 23,809 connectable lines with the existence of 24,112 connectable lines envisaged by the end of 1998. The telephone density is at a level of 2.4 per 100 inhabitants nationwide, and 6.83 per 100 inhabitants in the Greater Banjul Area. The company operates 11 urban branches and 12 provincial stations, and has provided 233 privately-operated tele-centers. Figure 5, below, illustrates the relationship between population growth(TPOPGR), demand for services (WPTL), investment in telecommunications(TINV), and tele-density (TDN).

Figure 5: Population Growth and Demand for Services

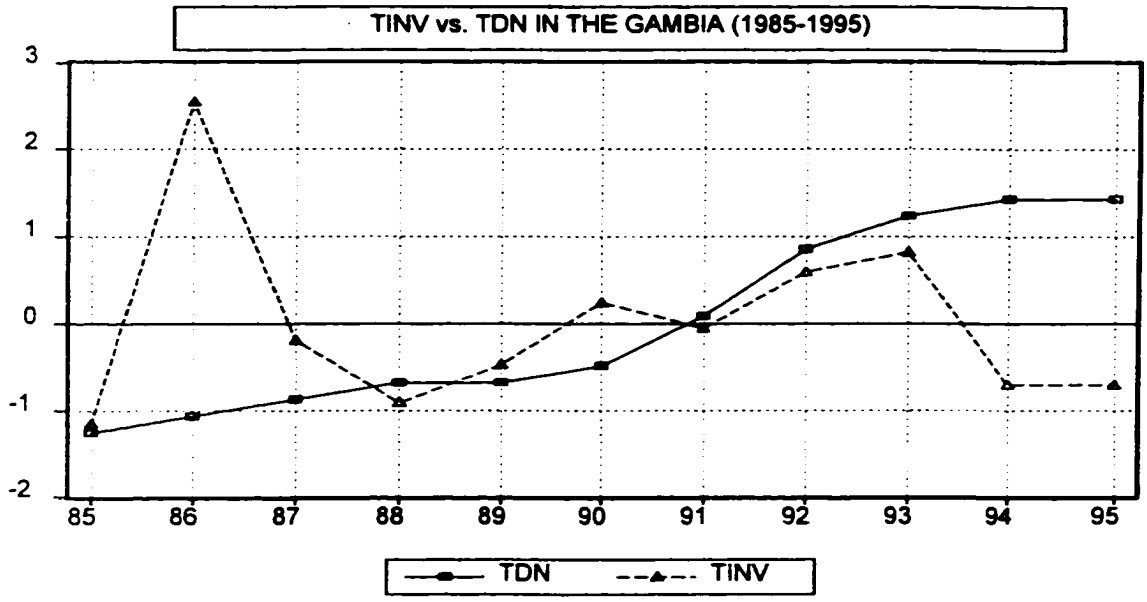


Source: ITU

GAMTEL was established under a decree of an Act of Parliament and is incorporated as a state-owned private limited liability company operating on a sound commercial basis under the memorandum and Articles of Association (management by the Board of Directors). The act of commercializing and separating GAMTEL's operations from the government, and shifting the government's responsibility from ownership and management to policy and regulation, is intended to make GAMTEL semi-autonomous. This was also carried out in order to help the company attain operational efficiency, be more responsive to customer demands, and better able to attract investment capital. GAMTEL is the sole telecommunications company in The Gambia licensed to establish, install, and operate a telecommunications network. It therefore monopolies the provision of all forms of telecommunications services.

Universal telecommunication services, such as telephone access for all Gambians, remain a top priority of the government. Figure 6, below, illustrates the relationship between tele-density (TDN) and investments in telecommunication (TINV) and, despite a slowdown in investment, The Gambia still has one of the highest tele-densities in Africa. In order to achieve the priority outlined above, though, a restructuring of GAMTEL's set-up was required, resulting in a performance contract. Thus, in 1990, the Gambian government signed the first three-year performance contract, to give greater managerial autonomy to GAMTEL's managers. Currently, GAMTEL operates under the Companies and Public Enterprise Acts.

Figure 6: Tele-density and Investments in Telecommunications



Source: ITU

The performance contract led to a change in the make-up of the Board of Directors. The President of The Gambia, from GAMTEL's management, appointed four executive directors to become members of the Board. This was done so that management could be held accountable for the success of the company, since targets are set and rewards, in the form of incentives, are given when the targets are met or surpassed, and sanctions are applied when they are not.

Regulatory issues, such as those concerning telecommunications and the management of the frequency spectrum, are still under the control of GAMTEL. This has created a situation where GAMTEL is both the operator and regulator of the services she provides - a situation that must, in this day and age of independent regulatory agencies, be rectified. Changes should address significant policy and regulatory issues, and these issues

should be evaluated as a package, rather than on piecemeal basis, with a view to formulating a coherent policy that avoids inconsistency and which could result in inefficiency and conflicts. Likewise, there is a need for regulating technical specifications, recommendations, and standards so that they are in compliance with those set by the International Telecommunication Union (ITU), since these are subject to continual change as a result of rapid development and a succession of major technological changes in the telecommunications environment.

In 1993 the reform process in The Gambia took on another dimension - the "liberalization" of Customer Premises Equipment (CPE) took place. This allowed customers to purchase and connect approved terminal equipment ranging from telephone sets to PBX, PABX, and Fax machines. GAMTEL and some selected private businessmen are now providing the sale of terminal equipment and the provision of national, regional, and international calls, and Fax and Telex services, through tele-centers (Bureaux Fax).

Telecommunications investment is a very capital-intensive endeavor and The Gambia, like many developing countries, does not have the resources to modernize her entire telecommunications infrastructure. GAMTEL's mission is not to provide a *telephone* for every Gambian, but efficient and quality telephone access to every Gambian. The Gambian government, in pursuance of its policy to transform and modernize the telecommunications infrastructure, procured loans from external sources, on behalf of GAMTEL, for the development of projects aimed at achieving this modernization.

A two-phase program of development was devised for a period of five years (1984-91). The third phase ensued after the successful completion of the earlier phases. The

government, on behalf of GAMTEL, was able to acquire long term financing from Caisse Central De Cooperation Economique (CCCE), now known as Caisse' Francaise' Development (CFD), a French funding agency.

The initial strategy and plan for the two-phase program of investment in the urban area (the Greater Banjul Area, or GBA) was to progressively reduce the waiting list of potential subscribers in diplomatic, commercial, business, and administrative domains so as to ensure the profitable operation of the new company.

It should be noted, at this stage, that GAMTEL has two shareholders - the Gambian government, which has the majority share of 99 percent, and the Gambia National Insurance Corporation (GNIC) with a one-percent share. At the inception of GAMTEL, in 1984, GNIC was the only corporation that provided GAMTEL with start-up funds. Consequently, they were compensated for this kind gesture by being permitted to acquire a share.

4.3 The Rural Telecommunications Development Project

The rural areas are served by electro-mechanical exchanges and an UHF radio link. This equipment has served its useful life, and is now proving impossible to maintain due to obsolete equipment, the unavailability of spare parts, and their inadequate capacity. With the assistance of the French government, the Phase III Rural Telecommunications Development project was launched. By this time, the FF 117 million of the Phase 1 Project Loan had been written off by the French government and given to the Gambian

government as a grant. In addition, the French government gave FF 42 Million as a grant towards Phase III. These donations put both the Gambian government and GAMTEL in a position to be able to provide the rest of the FF 53 million needed to complete the total FF 95 million for the phase III project.

The scope of the project includes the laying of optical fiber cable from Serrekunda to Basse, on the south bank of the river Gambia. The capacity of the fiber is 140 Mbits/sec and it is fully secured. Because of the technology applied, the rural network was well planned, more reliable, and sufficiently flexible to be able to meet user's needs. Thus, it permits not only telephone services but also the provision of TV transmission from the studios in Banjul to TV stations in the rural areas. In addition, the project was designed to create drop insert stations along the fiber route at key villages; and to provide the same type of digital switching exchanges (E10B). Another objective was to install medium capacity microwave links on the north bank of the river; and yet another was to develop local outside plants in the exchange areas. The aim was also to provide solar energy for the powering of all the stations and, finally, to upgrade Serrekunda RLU to an autonomous exchange with the same facilities as the Banjul exchange.

Wireless technologies, such as communication satellites and cellular, now make it possible to extend basic telephony, as well as radio and TV broadcasting services, throughout the country, even to the most remote of locations. These technologies make it possible to serve rural communities without putting up any terrestrial infrastructure at all. In The Gambia and most African countries, one might well argue that wireless

communication is the best alternative given the fact that there will then be no need to develop the costly infrastructure.

However, considering the earning capacity of the rural people, the initial cost of the wireless set is about ten times the ordinary telephone set. In addition, the tariff is three times higher because only outgoing calls from the cellular phone are charged. The dilemma, therefore, was to weigh the social benefits against the return on the investment. GAMTEL opted to integrate a Time Division Multiple Access (TDMA) system with the optical fiber backbone network in order to serve the distant key villages.

4.4 Telecommunications Infrastructure Investments

Table 10 shows that the bulk of foreign financing (90 percent) for both phases was provided by Caisse Francaise de Development (CFD), at total cost of 163 million French Francs (FF). Societe Generale, a French private bank, provided the balance of the Phase I funding at a commercial interest rate of 9.5 percent. The co-financing by both GAMTEL and Caisse Francaise de Development (CFD) showed the company's increased financial contribution (50 percent compared to previous phases), and the CFD contribution is in the form of a grant to the Gambian government and a loan to GAMTEL at a 1.5 percent interest rate with and a grace period of 10 years (repayable in 30 years).

Table 10: Telecommunications Investment (FF Million)

	Phase I (1984-86)	Phase II (1989-90)	Phase III (1992-93)
CFD (plus feasibility study –FF 2.0 million)	107	43	43 42
Societe Generale	10	-	-
French mission Cooperation	-	1	-
GAMTEL	-	6	53
Total	FF 117	FF 50	FF 95

Table 11: Switching Capacity

	Phase I (1986)	Phase II(1990)	1st Quarter (1991)
Banjul	3000	5000	5000
Serrekunda	2000	4000	5000
Bakau/Fajara	750	1250	2000
Yundum	100	500	1000
Brikama	150	500	1000
Total	6000	11,250	14,500

Source: Gambia Telecommunications Company

The CFD first phase, and half of phase II investment, attracted an interest rate of 5.0 percent per annum each, and the other half of phase II carried an interest rate of 2.5 percent, with different maturity dates. Phases I and II attracted grace periods of five and ten years and repayment schedules of 10 and 20 years, respectively. The total cost of the Phase I project was FF 117 million, 90 percent of which was funded by CFD and the remaining

10% by Societe Generale. This was a tied loan, which meant that all the equipment had to be purchased from French firms.

An interesting development, referred to above, is the fact that the total amount of the Phase I loan was written-off by the French government in 1989. GAMTEL, however, has to pay about half of the loan to the government, the balance being the government's contribution to Phase III of the project. This has had a major impact on the evolution of telecommunications in The Gambia.

The Phase I project was commissioned on November 29th, 1986, and an E10B digital exchange, manufactured by CIT ALCATEL of France, was installed in Banjul, the capital. The exchange is a compact type of E10B and integrates the Banjul local exchange, the National Transit Exchange (NTE), and the International Gateway Exchange (CT3).

As shown in Table 11, the Banjul local exchange had an initial capacity of 6000 lines, including the two Remote Line Units (RLUs) installed at Serekunda and Bakau-Fajara, respectively. A 34 Mbits/sec digital microwave was installed as a backhaul link between the CT3 exchange and Abuko Earth Station. Another (1+1) 34 Mbits/sec digital microwave link was installed between Banjul and Serekunda, in order to connect the RLUs to the parent exchange. This equipment was supplied by SAT. The outside plants in all the exchange areas were rehabilitated, new cabinets distribution points (Dps) were created, new primary pair cables in ducts were laid, and secondary overhead suspended (aerial) cables were installed. The realization of the benefits of Phase I were immense and, in order to satisfy growing demand from the urban area, Phase II was implemented.

The scope of the Phase II project was to expand the switching capacity of E10b to 14000 exchange lines, with an additional two RLUs installed at Yundum and Brikama, respectively. The capacity of the 34 Mbits/sec microwave link between Banjul and Serrekunda was increased to a 2+1 configuration fully equipped (i.e., equivalent of 32 T1 as main and 16 T1 on standby). The outside plants for each exchange area were expanded to meet the growing demand.

In 1984, when GAMTEL was established, there were only 24 international circuits on Single Channel per Carrier (SCPC) mode, operating mainly with British Telecommunications PLC (BT) of the United Kingdom. In 1987, the retrofit of Abuko Earth Station was carried out, thus providing 60 channels on Compounded Frequency Division Multiplexing (CFDM) mode and facilitating the opening of additional direct routes with AT&T (USA) and French Telecom. As a result of the increase in the number of subscribers, coupled with the increase in traffic, heavy congestion was realized on all routes. To alleviate this problem, a contract was awarded, in the middle of 1992, to Telespace of France in order to expand and modernize the Earth Station equipment with the latest intermediate data rate (IDR) technology. IDR further increased the international circuits, enabling additional new routes to be opened with Germany, MCI (USA), Sweden, and Denmark.

Concurrently, the regional link (PANAFTEL) between The Gambia and Senegal was also rehabilitated and a new 960-channel microwave link was installed linking the three neighboring countries - Senegal, The Gambia, and Guinea-Bissau. This link was funded by the ECOWAS fund, as part of the development of the Panaftel links among the

West African states, and all traffic between The Gambia and these two countries is carried via this link so as to reduce congestion on the international circuits. In addition, but there is a tariff differential because the satellite is a much more expensive option.

After the successful implementation of Phases I and II, and with consequential multiple increases in both urban line capacity and revenue generated, GAMTEL embarked upon its third phase of telecommunications modernization and expansion into the rural areas in the last quarter of 1992. The Phase III expansion comprises three parts: rural network development, the Serrekunda autonomous exchange, and Earth Station upgrading.

The rural project is the principal part of this phase and is aimed at providing a telecommunications backbone for the provinces and a quality of service in main provincial centers that is equivalent to that found in the urban area. It is a basic infrastructure investment of about FF 95.0 million, the financial benefits of which will be realized in the long-term. A fiber optic cable system, 370 km in length, was laid on the south bank of the River Gambia, representing "the backbone" of the rural network; digital microwave trunks were installed on the north bank; and drop insert stations linked the two systems, coupled with a network of digital exchanges. The investment in Serrekunda made it autonomous from the Banjul main exchange, and increased its capacity by 3000 lines.

The primary challenge facing GAMTEL is to maintain its position as the best telecommunications provider in Africa; to improve the quality and the reliability of its network until it is comparable to those of major carriers abroad; to be the core of a national information infrastructure; and to help facilitate the diffusion of information technology across The Gambia. However, since GAMTEL is a commercial entity, the generation of

revenue in order to maximize its profits is always a top priority. In light of this, at the end of 1992, GAMTEL introduced two new services - the packet switched data network (GAMNET) and cellular services (GAMCEL). GAMNET is part of TYMNET's Global Network Services (GSN). There are two nodes - one installed in Serrekunda and the other in Banjul - and the objective is to provide data communications services within and outside of the Gambia. The GAMCEL system presently consists of two subscriber mobile (cell) sites and an Electronic Mobile Exchange (EMX) interfaced to the PSTN for the land phones. The EMX 100 +, supplied by Motorola, is configured for 7500 subscribers and can be expanded to an ultimate capacity of 15,000 users. The EMX has all the features of a digital switch and provides charging, routing, and statistics for the efficient operation and maintenance of the system. The two cell sites currently operating are linked to the EMX switch by PCM (T1), meaning that the system provides mobile to mobile, mobile to land, and land to mobile communications. There are, at the moment, some 800 subscribers.

GAMCEL operates on the Universal Total Access Communications System (UTACS), which is an integrated version of Total Access Communications System (TACS) and Expanded Total Access Communication System (ETACS). The frequency range of both systems is as follows: ETACS: Mobile 872-890 MHz, Base 917-935 MHz; TACS: Mobile 890-905 MHz, Base 935-950 MHz. The UTACS system was chosen so that the whole frequency band for Mobile (872-905 MHz) and for the Base station (917-950 MHz) could be used in order to cater to tourists and other visitors from Europe by providing a roaming facility through which they could still use their mobile sets. GAMTEL also provides value-added services and facilities including Paging, Cellular, Pay Phones,

Telex and Facsimile, Internet Services, Tele-centers, Gambia Radio and Television Services, and Exchange facilities (wake-up calls, conference calls, etc.).

In line with its provision of international access, and the Memorandum of Understanding signed with the Government, the company has introduced projects such as Internet Services (in conjunction with UNDP), and will be introducing tile GSM (Global Mobile Systems) satellite telephony, with roaming facilities and pre-paid calling cards, to further reinforce the standard of services it can offer.

Finally, the Company has in the past two years upgraded the National Radio as well as developed the National Television and is merging the two organizations into a national broadcasting institution known as Gambia Radio and Television Services (GRTS) in order to fulfill its national advocacy needs. These activities are still ongoing and are part of the Company's contribution towards national developmental goals.

The telephone service remains the basis and the backbone of all telecommunications services, which is why one of GAMTEL's priorities is to improve the quality and broaden the range of the facilities it provides. Presently, there are 23,809 connectable lines with a projection of 24,112 connectable lines by the end of 1998. The telephone density is at a level, nationwide, of 2.4 per 100 inhabitants, and 6.83 per 100 inhabitants for the Greater Banjul Area. The Company operates 11 urban branches and 12 provincial stations and has provided 233 privately-run tele-centers. In order to provide services to subscribers who live in areas where there is no developed line network, GAMTEL provides radio links through which they can provide telephone services.

Over the past four years there has been a rapid rise in the development of mobile phones. - their cost effectiveness and convenience making them popular in the business and consumer sectors alike. In 1994, the number of subscribers to the mobile phone service, which is constructed of analogue technology, was 2,654. In order to cope with soaring demand, and to improve the quality of the service, GAMTEL is planning to install additional channels and to introduce GSM, which is expected to come into operation in December 1998.

In 1995, exactly ten years after the conception of GAMTEL, The Gambia witnessed yet another revolution in its telecommunications services, with the convergence of a two-year-old X.25 data network with worldwide data communications ONLINE services: namely, CompuServe and Delphi. This marked the beginning of another giant leap into the information revolution and, at the forefront of this information revolution is GAMTEL's Data Communications Services Unit, set up in 1995 to manage the process of joining the information superhighway. As part of a joint project with the UNDP Internet Initiative Project for Africa, a steering committee was set up, in 1996, to design an "Internet Backbone" for the entire country. This will enable users to access Internet services from anywhere in the country at the same access cost (i.e., the same rates will apply countrywide). The implementation of the backbone design and the gateway was awarded to Cable and Wireless OMNES, and was completed in August 1998.

The global economy, thanks to the highly dynamic markets of the developed countries, is becoming more and more knowledge-based and information-driven. It is,

therefore, essential for business enterprises to have access to contemporary, computer-based business tools, most notably web technology, and to information services worldwide. Many companies now distribute information regarding their products and services via the Internet and, consequently, one can now access the World Wide Web from The Gambia via GAMTEL's Datacom Services Public Data Network and/or two recently set up Internet Service Providers (ISP's), Quantum Associates and Commit Associates.

GAMTEL Datacom Services provide a cost-effective solution for Wide Area Networking (WAN) of both computers in the Gambia and host computers connected to public data networks anywhere in the world. X.400 MHS and mission-critical database access calls are transmitted more securely on its PDN than on any other network, and at a lower cost. In addition, Gamnet supports almost all standard networking protocols, including IBM and CCITT.

Finally, GAMTEL is organized into departments including Customer Care & Commercial Services, Operations & Engineering Services, Personnel & Administration, Finance, Technical Cooperation, and the Gambia Telecommunications and Multimedia Institute.

4.5 The Gambia Telecommunications and Multimedia Institute

Training is an immediate priority area in which the company has steadily made increasing investments with significant results. The training of telecommunications personnel and of government and private sector technicians began in 1963 with ITU

assistance under the then Post and Telecommunications Department. More formal training, mainly of technicians, was commissioned in 1965 and run by the ITU in collaboration with UNDP.

Following the establishment of GAMTEL in 1984, however, the facilities then available became grossly inadequate and most of the technical staff had to receive overseas training in the implementation and maintenance of new equipment. With management's commitment to continuous development and employee training, a critical factor in every business, the Gambia Telecommunications Training Center (GTC) was constructed in 1990/91 to facilitate the centralization and upgrading of local training. Built at a cost of D2.6 million, the Center became operational in February 1992, with training expertise developed through Training-Trainers programs supported by CCCA, BT, UNDP/ITU, and similar organizations.

The training plans, developed through needs-based assessments, form three categories: namely, (1) Local, (2) Foreign (Short-term), and (3) Foreign (Long-term) courses. The local programs focus on: (a) Basic accounting, office management, and supervisory skills; (b) Basic telephone operation/customer care, and AAT/CIMA; (c) Basic electrical & general engineering; and (d) Security procedures and orientation programs. In addition, computer literacy courses are offered to the public, on a fee-paying basis, which lead to a Royal Society of Arts (RSA) external examination. Plans are underway for new equipment training, management development, adult literacy, and refresher courses. The basic electrical and engineering training courses are offered to newly-recruited high school graduates for a period of two years, following which they are engaged as technicians.

There remained the need to develop training programs in information technology to effectively cater for the private sector - a factor behind the recent transformation, in 1996, of the GTC into the Gambia Telecommunications and Multimedia Institute (GMTI). The GMTI aims not only to provide training in media and related services, but also to become a sub-regional center of excellence in the provision of training in new technologies. To this end, there has been a major rehabilitation of its main facility in order to provide lecture and seminar rooms. In addition, the GMTI facilities are also open to the public and can be hired for meetings and seminars. The audio/visual equipment available meets the requirements of any international seminars or workshops.

The most valuable asset of any organization is its employees. The development and welfare of the employees should, therefore, be a top priority. Efficient telecommunications depend on skilled human resources with which to plan, construct, maintain, and operate the network and to carry out all administrative, financial, and commercial (marketing) functions. GAMTEL trains its staff to keep pace with changing technologies by sponsoring undergraduate and graduate programs, on-the-job training, seminars, and conferences.

4.6 Analysis of Telecommunications Development in The Gambia

Interconnectivity between main exchanges is provided by a 400 kilometer, 140 Megabits per second, fiber optic network, and 20 drop/insert stations located in key towns and villages on the south bank of the river. This is complemented by a 34 Megabits per second digital microwave link providing trunk connection to towns and villages along the

north bank. A TDMA (multiple access radio system) is also installed at the eastern end of the country to serve outlying villages of considerable commercial importance. Table 11 illustrates the rapid expansion and growth of telephony in The Gambia.

Table 12: Telephone Traffic in The Gambia (1988-1994)

Source	1989	1990	1991	1992	1993	1994
Int'l Telephone (Pulses)	1,355	105,312	112,898	129,773	138,425	164,033
Int'l Telex	230	176	119	105	74	69
National Telephone (Pulses)	33,000	33,383	44,596	60,969	66, 401	130,016

Source: Gambia Telecommunication Company, Banjul

Furthermore, a recent upgrade of the fiber network provides a 622 Megabits per second Synchronous Digital Hierarchy (SDH) between important areas in the Greater Banjul Area. The fiber optic link, in addition to telecommunication services, now carries TV signals from the studio to the transmitter stations located at key places, ensuring nationwide coverage. The International Gateway is provided by a standard B satellite Earth Station working on Digital Circuit Multiplication (DCME) with direct links to nine carriers: British Telecommunications PLC (BT), France Telecom, AT&T, MCI, ITALY, SPAIN, UNISOURCE GROUP, and GERMANY. In addition, a terrestrial microwave link provides for communication with Senegal and Guinea-Bissau.

GAMTEL also provides value-added services such as Cellular Mobile Services, using a Motorola EMX 100 TACS system in 1993 with two cell sites located within the

Greater Banjul Area. The subscriber base has increased to over 3,000, which translates into annual growth of about 14 percent. Plans are underway to augment the current analog system to a digital system in the cellular service, specifically Global Systems for Mobile Communications (GSM).

Data communication is not fully utilized, due to a lack of expertise and commitment from management. However, an X.25 network provided by TYMNET CXT engines was implemented in 1992 and is located in Banjul and Serrekunda. Access is provided through shared, dedicated leased lines, and modems in order to provide connectivity for the banks and Internet access via service providers in Europe and the US. Unfortunately, however, this was poorly planned and proved somewhat expensive. It is expected that, with the current Internet gateway in place, prices will decrease and sufficient capacity will be built with which to fully explore data communication. Also, Paging services were implemented in 1997, complementing the telephone and cellular services and operating tone only, numeric, and alphanumeric modes at 1200 bauds in the VHF band. Table 12 displays the distribution of telecommunication services in The Gambia by geographical area.

Table 13: Communication Services in The Gambia (as at December, 1994)

Particulars	Banjul	S/Kunda	Bakau	Kotu	Brikama	Provinces	Total
Telephone Lines	5,176	6,846	2,065	1,061	1,203	1,037	17,388
Telex	86	24	4	3	6	6	129
Telefax	488	392	152	9	33	19	1,093
Coin Box	38	51	19	8	13	12	141
Desktop Coin Box	11	41	10	0	5	0	67
Cardphone	11	28	7	0	5	0	51
Waiting List	1,148	4,997	904	724	905	5,576	14,254

Source: Gambia Telecommunication Company, Banjul

The Gambian economy has experienced positive growth after successfully implementing the World Bank's and the International Monetary Fund's (IMF) Economic Recovery Program (ERP, from 1985–1990). Its excellent telecommunications infrastructure, coupled with its relative political stability, has been attracting many foreign investors. There are many joint-venture businesses in the tourism industry (tour operators and hotels), in horticulture (vegetables and flower growing), in fishing and seafood (cold storage facilities), in light manufacturing (cement), and in other merchandise businesses. In addition, the telephone culture is now well established in the urban areas, with both business and residential customers realizing the benefits and the importance of reliable telecommunication services. The ever-increasing demand for services, as well as the revenues earnt since telecommunications were developed in the urban area, are evidence of this. The demand (waiting list) cannot be met due to limited exchange capacities and constraints in the outside plant. Although the government's priorities do, inevitably, primarily concern agricultural development, education, and the health services - in order to eradicate hunger, mass illiteracy, and contagious disease - telecommunication clearly has an important role to play in the development of *these* sectors, too.

Table 14: Information and Telecommunication Network: The Gambia Compared to Selected African Economies

Country	Phone Lines (# per 1000 people)'96	Phone Faults (# per 100 lines) 1992	Waiting Time for a Line (Yrs) 1996	Avg. Price per Call (US$ per 3 minutes call)
Mauritius	162	67	1.4	5.85
Botswana	48	55	1.0	6.06
Cameroon	5	74	9.4	12.02
Senegal	11	36	1.7	7.93
Ghana	4	159	2.9	4.7
Gambia	**19**	**120**	**10**	**6.34**
Kenya	8	N/A	4.5	11.17

Source: World Bank, STARS, 1996; 1996 World Telecommunication Development Report ITU' 1996

Table 15: Information & Telecommunication Network: The Gambia Compared to Selected African Economies

Country	Televisions (# per 1000 people)'96	Internet Hosts (# per 1000 people)'96	Personal Computers (# per 1000 people)'96	Fax Machines (# per 1000 people)'95	Newspaper Circulation (# of newspapers per 1000 people)
Mauritius	219	1.84	31.9	17.7	68
Botswana	27	1.58	6.7	2.1	24
Cameroon	75	0.05	N/A	N/A	4.00
Senegal	38	0.31	7.2	N/A	6.49
Ghana	41	0.15	1.2	0.3	17.56
Gambia	**N/A**	**<.5**	**< 0.5**	**0.9**	**2.01**
Kenya	19	0.16	1.6	0.1	13

Source: World Bank, STARS,1996; 1996 World Telecommunication Development ReportITU' 1996

Tables 14 and 15 display selected facts concerning the information and telecommunication network in The Gambia. The number of phone lines per 1000 people is the number of telephone exchange main lines per 1000 persons. A telephone main line

connects the subscriber's equipment to the switched network and has a dedicated port in the telephone exchange. In most countries, the main lines also include public payphones.

The number of phone faults per 100 main lines is the number of reported faults per 100 main telephone lines for the year. The waiting time for phone lines is the number of years applicants for connection to a main line must wait because of a lack of technical availability. The figure is calculated by dividing the number of applicants on the waiting list by the average number of main lines added per year over the past three years. The average price per telephone call is the cost of a three-minute peak-rate call from any country to the United States.

Information is a vital resource in a country's social and economic development; hence the fact that timely dissemination of information will enhance the development processes. Since over 70 percent of the population of The Gambia live in rural areas, served with poor communication facilities, it is judicious to attempt to provide them with efficient and reliable telecommunications services so that a broad cross section of the population can enjoy the benefits. GAMTEL cannot be a solely urban operator, providing easy access to the outside world, while its customers cannot communicate with their families and relatives in rural areas.

Telecommunications services are used in connection with a wide range of economic development, distribution activities, and government administration – the government being the largest single customer of GAMTEL. It is no longer perceived as a symbol of prestige to own a telephone, but as a necessity. Such services also play an important role in facilitating the delivery of social services, particularly to rural and isolated

populations, and in the achievement of the political and security objectives of the nation. Telecommunications services, therefore, constitute the core of the information economy and, as such, facilitate entry into markets, improve customer services, reduce costs, and increase the productivity levels of *all* sectors.

In general terms, then, telecommunication technologies contribute to the development process by stimulating the economy. In addition, besides being one of the entities that exhibits a high rate of return on investment, it has several indirect benefits, a few of which have been realized in The Gambia following the extension of services to the rural population. These will be discussed below.

In the agricultural sector, which is the government's number one priority, telecommunication has provided many improvements. Farmers throughout the country can now be in contact with agricultural officers and extension workers who would advise and support them on crop protection, and the supply and application of fertilizers, seeds, and plants. Most farmers have instant access to meteorological information and severe weather warnings so as to take necessary preventive measures in protecting their crops and assets. Similar improvements have affected the lives of fishermen. Previously, because of the lack of communication facilities, many fishermen lost most of their catches as they could neither inform the distant cool stores of the quantity and types of fishes they had caught, nor transport them. In many instances, their catches perished and ended up being dried.

Furthermore, the availability of telecommunications services in The Gambia has reduced the need, expense, and difficulties associated with travelling. The Gambian government, and other entities, used to have to pay substantial amounts, in the form of

transportation costs and night allowances, to officers on frequent treks. With poor road conditions in certain parts of the country, travelling frequently was often both risky and time-consuming.

After the commission of the Phase III project, though, the constant communication this has facilitated between district offices and their headquarters has resulted in significant savings in both personnel time and travel costs. In addition, entrepreneurs in rural areas, who were once forced to travel long distances to cities such as Banjul, the capital, and central business districts such as Serrekunda, Bakau, Farafenni, Brikama, and Basse to buy goods, can now place their orders via the telephone and have them delivered. The inland transportation of goods and cargoes is generally carried out by river tugboats and trucks, the coordination of which is vital to the effective running of a business. Rescheduling trucks or boats to pick up additional goods or cargoes is easy when there is communication, and impossible when there is not. With the presence of communication facilities, breakdowns can be reported quickly to avoid delays in the repair of trucks or theft when broken-down trucks are left unattended. Without communication, however, this cannot happen.

When information flows within a region, there will be an increase in the volume of business because customers will constantly be aware of product availability and businessmen will know the demand for certain types of commodities. Business people may obtain increased sales and profits simply because they can have their goods delivered by placing orders on the telephone, and customers will not travel to other regions in search of similar commodities. When certain essential commodities become scarce in the urban area,

people travel to neighboring Senegal to buy them, resulting in a drain of foreign currency. This would be unnecessary were an abundant supply to be available in rural Gambia, and people knew of it.

Previously, urban migration was on the rise as people left the rural areas in search of jobs. Reliable communication has made it possible to decentralize certain projects and, in addition, to monitor those projects or programs without requiring constant field visits by officials.

At the district level, the barge messenger carried messages from the head chief to the village heads and there used to be delays all the time. The availability of a reliable telephone service now enables the head chief to communicate directly with the village heads within the district. The Gambia is predominantly a Muslim country and, therefore, it is customary to send obituaries and announcements regarding religious occasions to neighbors and relatives. Previously, it took a week or more before some relatives learned about the death of a family member – consequently, they could not attend funerals, as burials are carried out the same day. In addition, without communication, religious occasions are often celebrated on different dates because people cannot *talk* to each other. Thanks to the improvements in the telecommunications and broadcasting services, however, families have become more united *despite* distance.

Tourism is a viable industry and a major source of foreign exchange and employment. The infrastructure for tourism is well built, but the return on investment will not be realized without adequate telecommunications facilities. Tourists, businessmen, airlines, travel agents, and hotels all depend on telecommunications for their businesses.

In the not too distant future, distance learning at Gambian schools and colleges will be a reality. Similarly, but regarding banks, plans are underway to expand the Packet Switched Data Services throughout the country so as to provide interconnectivity between banks in order to facilitate quick banking services and enable customers to cash their checks at any branch. At the moment, all documents must be transported to the bank's head office for processing.

In general, then, developed telecommunications infrastructure will increase employment opportunities, decrease migration to urban centers, reduce transportation and fuel costs, open doors to new investments, provide more efficient marketing, improve emergency services, reduce the sense of isolation of the rural people, and improve the quality of life and valuable family ties.

4.7 Liberalization of the Telecommunications Sector in The Gambia

The old model of telecommunication was that of a centralized, state-owned monopoly simply because basic telecommunication service was thought to be a "natural" monopoly – it was felt that economies of scale and scope made it more efficient for *one* company to provide the service. However, as we approach the information economy, demand patterns are changing, and transmission and switching costs are falling, making the telecommunications sector a competitive industry. In the info-economy, the most efficient structure for the sector is one that is competitive and plural, with a mixture of participants (service providers, private and public) using numerous technologies and offering

heterogeneous services to meet the differing needs of users. Where demand for service is not being satisfied, and the existing supplier is unresponsive, the economic cost to users and the national economy from continuing to put up with the status quo is predicted to be greater than the loss of economies of scale and scope that ensue from franchising new producers.

The traditional argument that the telephone industry is a natural monopoly remains controversial, though, as highlighted in the literature review. Moreover, the existence of economies of scale and scope, per se, has limited significance for policies concerning the entry of new service providers. If entrants do not impose congestion costs on incumbents, and interconnection is not foreclosed, either by the exercise of market power or by relatively high transaction costs, it can be argued that a laissez-faire attitude toward entrants on the part of government policy makers is warranted, especially as regards economies such as that of The Gambia, which suffers capacity shortages and other inefficiencies because of protected incumbent suppliers.

Arguments that network externalities or other external economies mitigate against the benefits of competitive entry implicitly assume that interconnection among competing networks is either not possible or that would-be subscribers discount the possibility of interconnection. If, for one reason or another, the market cannot efficiently promote interconnection *within* both the long-distance and local sectors, as well as *between* long-distance and local, then there is a case for public policy intervention. Examples of policies to promote competitive entry in the United States include the mandatory unbundling of basic exchange services, and mandatory interconnection.

Arguments against allowing competitive entry also tend to minimize the existence of users with diverse needs and priorities. Heterogeneous demands on the part of telephone users accentuate the advantages of having a number of rival suppliers, since it is unlikely that any single supplier could satisfy a broad range of heterogeneous customers. Even in the case of "plain old telephone service" (POTS), the speed with which installations are made and the commitment to maintaining quality are relevant factors to be taken into account. Given the limited experience of operators in The Gambia when compared to that of operators in the US, there is likely to be greater heterogeneity among suppliers of POTS in the Gambia than in the US. This strengthens the argument for allowing diversity in the supply of telephone services in both The Gambia and Africa in general.

Fostering more private investment in the telecommunications sector is an important part of sector reform. However, the privatization or divestiture of the state-owned carrier is only one measure among many and, given the very low tele-density in The Gambia, may not be the most effective way to boost private investment. Of great import may be the fostering of bottom-up schemes for private sector entry into the market, in order to promote construction of new telecommunications facilities by a mix of independent enterprises.

The need for sector reform is now recognized in The Gambia. A growing number of African countries are at some stage of designing or implementing reforms that seek to attract private investment and open their markets to some degree of competition and, in this section, we will examine the Gambian case in some detail.

The government of the Gambia has recently taken a policy decision to launch a private sector-led economy. This has necessitated the Department of State for Works, Communication and Information to initiate the formulation of a National Communications and Information Policy (NACIP). The objective of the NACIP, amongst other things, is to create an environment conducive to effective public/private partnership in the provision of communication and information services for the period 1999-2008.

The aim of the NACIP is to set out details of the objectives, strategies, and regulatory framework required to ensure a coherent and orderly development of broadcasting (i.e., radio & television), telecommunication, print media, posts and courier services, and effective information technology (IT) policies in The Gambia. This is designed to help turn The Gambia into a technologically-advanced and information-rich society by the year 2020.

The macro objectives of NACIP are as follows: to provide basic universal services of broadcasting and telecommunication through an obligation by all licensed service providers; to create a window of opportunity for private sector participation in the provision of communication and information services; to create wider consumer choice in the provision of communication and information services; to guarantee the freedom and independence of the press and other information media services, and uphold its professionalism and responsibility to civil society; to facilitate the development of the national information infrastructure and its connectivity to the global information infrastructure and society; and to foster greater cohesiveness and understanding between

The Gambia's diverse peoples and cultures through information, education, and communication processes.

The Government hopes to achieve this through a meaningful partnership between public and private sector service providers in the provision of communication and information services. They aim to set up a transparent legal and regulatory framework that promotes a partnership, based on equity and mutual cooperation, between the government on one hand, and public and private service providers on the other. The government is also looking to achieve: 1) a commitment to affordable rates and the construction of a modern infrastructure for both telecommunication and broadcasting; 2) the establishment of an independent regulatory body with sufficient latitude to establish its own rules and procedures; 3) the exemption from regulatory oversight of vital public agencies such as the Police, emergency services, the Armed Forces, and the National Security agencies; 4) the establishment of a framework whereby policy and rule making are delegated to the regulatory agency, as consistent with the law; 5) the enactment of procedures for public participation in rule making and adjudicatory processes; 6) the establishment of fees for licenses issued to telecommunication and broadcast service providers, and the laying down of procedures for revision of license fees; and 7) the setting up of penalties for violations of the rules of the regulatory agency, including penalties expressed in monetary terms, suspension of operations, revocation of licenses, and criminal prosecution.

The telecommunication sector in the Gambia is governed by three major pieces of legislation. The first of these was the Telegraph (Message Protection) Act, which was enacted in 1887. Its purpose is to protect telegraph messages from being improperly

published or divulged and telegraphs from being forged. There is no subsidiary enactment under this legislation.

The Telegraph Stations Act was initially enacted in 1913, and subsequently amended in 1963. The Act provides for the regulation and licensing of telegraph stations and the operation of apparatus for wireless telegraph (or radio communication). The act vests in the Secretary of State responsible for communications the authority to grant licenses for the establishment of telegraph stations and wireless telegraphy for commercial and private purposes (including radio and TV). The Secretary of State is given wide-ranging powers to make regulations for a variety of purposes, including the conditions for granting licenses, the obligations of license-holders, and the form and manner of making an application. A number of regulations have been promulgated under the Telegraphy Stations Act recently in an attempt to accommodate changes in de facto government policies and advances in telecommunication technology. The most important of these regulations are known as the Wireless Telegraphy (Transmission Licensing and Control) Regulations.

These regulations empowered the Secretary of State to issue a special and exclusive license for the purpose of operating external telecommunication services, but restricted him to issuing only one such license. An amendment was subsequently added, in 1969, to remove the element of exclusiveness from special licenses, and the significance of this change was that, for the first time, an element of deregulation in the supply of telecommunication services had been introduced (although the sector continues to operate as a monopoly at the moment).

The Telephone Act was enacted in 1950 and amended in 1963. It regulates the establishment and operation of telephone services, created the "Telephone Authority," (which it defines as a person so appointed by the Secretary of State) and grants to that authority exclusive rights, on behalf of the government, to establish and operate telephone services within The Gambia.

The broadcasting sector has no specific legislation directly relating to radio or television broadcasting. Nevertheless, since broadcasting is part of the wider spectrum of telecommunications, the regulatory enactment under the Telegraphy Stations Act governs this sector. In view of the recent advancements in telecommunications technology, and the importance of broadcasting in the manifestation of cultural values and societal norms, it is recommended that modern broadcasting legislation be promulgated.

Postal Services in The Gambia are governed by one piece of legislation, the Post Office Act (cap 73:01). This Act, passed in 1912, grants exclusive privilege to the Post Office for the conveyance, from place to place, of all letters, as well as the incidental services of receiving, collecting, conveying, sending, dispatching, and delivering letters:

> ...letters sent by a friend in his way, journey or travel, to be delivered to the person(s) whom the letter is addressed to; letters sent by a messenger concerning the private affairs or business of the sender or receiver thereof; commissions or returns thereof, and affidavits, writs, process or proceedings of a Court of justice; letters sent out to The Gambia by a vessel, not being packet vessel; letters of merchants, owners of vessels of merchandise; or the cargo or loading therein; and letters concerning goods or merchandise sent by common carriers, without profit or

gain being realized for receiving or delivering such letters. (Post Office Act (cap73:01), 1912)

The Act empowers the Secretary of State and the Director of Posts to enter into contracts for the conveyance of postal matters. Where deemed necessary, they may revoke such contracts. In addition, the Act vests in the Secretary of State the powers to establish Post Offices wherever he considers them to be in the public convenience.

The government of the Gambia envisages a regulatory framework that sets out the policy guidelines for the effective implementation of the National Communications and Information Policy. In order to regulate the communication and information sectors, the government plans to set up two regulatory agencies: namely, the Public Utilities Regulatory Commission (PURC), and the National Media Commission (NMC).

The PURC will be charged with the technical and economic regulation of the telecommunication, broadcasting, and postal sectors - including information technology. It will be an independent body under the Department of State for Works, Communications, and Information, and it will be headed by a Director-General, who will act as the chief executive of the Commission. The President shall appoint five independent professional members, and their terms of office shall be five years, with the possibility of renewal for a further five-year term. A chairman shall be appointed among the membership with the Director-General acting as an ex-officio member of the Commission. The envisioned functions of PURC shall be: 1) to issue, suspend, and revoke the operating licenses or franchises of communication service providers; 2) to manage, control, and allocate radio frequencies; 3) to regulate and monitor communication service providers, through set

license conditions; 4) to assist the Department of State in policy formulation; 5) to ensure fair and just competition between public and private communication/information service providers; and 6) to set technical standards, monitor compliance, and analyze the quality of services, tariffs, and rate settings. While PURC is envisioned to be the regulator for the broadcasting, telecommunication, and postal sectors, however, the Department of State will continue to be the policy maker.

The NMC will be charged with oversight and content regulation of broadcasting (i.e., journalists and other print media, radio, and television) and other information services. It is also envisioned that the NMC will be an independent and autonomous body under the Department of State for Works, Communications, and Information. The NMC will be responsible for the development of Codes of Practice for programming, advertising, and broadcasting sponsorship.

The NMC will be composed of nine members: a chairman, a representative of The Gambia Bar Association, a representative of The Gambia Press Union, two representatives of the major religious bodies (one each from the Islamic Council and the Gambian Christian Council), one representative from the Women's Bureau, a representative of the Association of Broadcasters, a representative of The Gambia Teachers' Union, and the Permanent Secretary of the Department of State for Works, Communications, and Information. The chair of the commission shall be appointed by the President with a three-year term renewable only once.

In conclusion, I have above summed up the current thinking concerning reform of the telecommunications sector in The Gambia. There is a need for The Gambia to optimize the performance of its telecommunications sector as, if managed properly, it will facilitate socio-economic development. Most of the "boundaries" between sectors are rapidly disappearing – there is already convergence between telecommunications, broadcasting, and information technology – and, with a degree of innovation, new services will expand the information sector yet further and provide even more opportunities for employment and economic growth. With the Internet Gateway in place, with Gambia's modern telecommunications infrastructure, and with a comprehensive and integrated strategic approach, the Gambia is fully equipped to be a major player in the info-economy.

Globally, the number of internet users is estimated to be about 150 million, with the USA and Canada alone boasting over 60 million users. This provides The Gambia with an opportunity to be a part of that market. The challenge is to build the capability and skill set to make it happen. The existing Internet Gateway could be used as a platform for the development of The Gambia's national information infrastructure. There is the potential for the Gambia to leapfrog to Internet telephony in order to increase its reach cheaply and to access tele-medicine, distance education, and electronic commerce. In fact, the Gambia has already "leapfrogged" to a certain extent. Given that the infrastructure was constructed within 14 years (between 1984 and 1998), the Gambia could offer the same services as the developed countries, and use and access the same information, *without* the cost of innovation, research, and development.

The main challenge is for policy makers to rapidly plan for an IT human capital stock to reap the highlighted benefits. The issue for The Gambia is not one of finance, but one of human capital. In the global information-based economy, there are no boundaries, and with a favorable political environment, a transparent legal framework, and Gambia's current infrastructure, she stands to benefit hugely. Thus, it is important for policy makers to embrace market liberalization and openness and to inject competition into the Gambian economy. Competition leads to the best technical solutions, better delivery of services, and lower prices. Trends such as corporatization, privatization, liberalization, globalization, and technological convergence are redefining market structures the world over.

Although the Gambia's market size seems small - with its geography and its modern telecommunications infrastructure and Internet gateway in place, its market size and reach can be as large as the global market. Thus, telecommunications is a strategic element for economic growth and development. The challenges faced by The Gambia, however, include its shortage of capital and technological know-how. Consequently, it must realign its telecommunications sector in order to attract investment. There is also a need for active shareholder management by establishing a licensing regime, establishing an independent regulatory authority with competent non-political personnel, and liberalizing the sector as a whole.

The regulatory restructuring should include the creation of a stable and transparent environment to attract investment, facilitate access of service providers, ensure provision of universal service, and safeguard the rights of users, operators, and investors. It is important for policy makers to create an environment to harness private sector investment through

partnerships with the public sector, including strategic equity partnerships, joint operating schemes, and business co-operation contracts.

Chapter V

Significance of Information Technology to the Economy of The Gambia

5.1 Introduction

The growth of information technology use in The Gambia will depend on a number of factors, such as effective economic policies, the IT human capital stock, and an adequate telecommunications infrastructure. However, it is difficult to say which aspects will play the most significant roles. The definition of a new economic sector has emerged (the information or the knowledge sector/economy) as economies of the world witness the growth of the information industry. The fading of the industrial revolution into the dawn of the information revolution has transformed the world economy into a truly global one. However, the emergence of this new sector has started to create a wider gap between the information-rich and the information-poor, thus creating a wider gap between African economies and the more developed examples. Developing countries, including those in Africa, have become more detached from the global economy, largely due to poor telecommunications infrastructures, resulting in inadequate information technology resources.

While the information technology sector could be viewed as a source of productivity growth in all sectors of the economy, this is a significant infrastructure and an

industry in its own right. The Gambian government can play a catalytic role in developing this infrastructure and in piloting and demonstrating various services to utilize it and to stimulate the effective use of these services in support of economy-wide competitiveness.

Whether information technology can be a catalyst to economic development in Africa is a moot point in many African economies, where the telecommunication infrastructure is extremely poor or not widely available, and where computers are a rarity. Plagued by barriers of poverty, poor health, low life expectancy, military governments, civil unrest, illiteracy, and little access to tertiary education, African economies must compete with advanced countries in a highly competitive global economy.

So just what does the information revolution mean to African economies? Economic growth in these economies has stagnated or has been increasing very slowly. The gap between African economies and other economies continue to widen yearly. Can they ever take advantage of the economic benefits that the information revolution *could* bring to them? Well, policy makers in most African countries, such as The Gambia, are renewing their attitudes, strategies, and perception towards the role of telecommunications and information technology in economic growth and development.

The role of IT in The Gambia is already significant, but among the many issues that restrict the further diffusion of IT in The Gambia, one must focus on the low literacy rate, at about 40 percent of the population. Among those who are literate, most cannot gather information for problem solving or decision making. Consequently, for IT to be of significance to the economic well being of The Gambia, aggressive educational activities are required. I would argue that IT education is the main solution for building indigenous

capacity in The Gambia, and that the government has a major role to play in the diffusion of information technology into the entire educational sector. Appropriate use of the existing Internet Gateway is crucial. The existence of Internet connectivity in The Gambia gives the country a tantalizing glimpse of the global knowledge resource just waiting to tapped.

Thus, telecommunications infrastructures and services play an essential role in both the modernization and social development of a nation. They have become indispensable as they enable countries to compete on equitable terms in an international community governed by interdependence and a global economy.

Africa is a continent with enormous potential for development. African policy makers are setting objectives, with the aid of the World Bank, to address the needs of this area – an area characterized by sharp contrasts in its telecommunications development. Factors such as the state of the national economy, education, technology, culture, demography, and geography are all interrelated with telecommunications development. Nevertheless, studies such as those by Kaplinksky (1987), Bhatnagar (1992), and the World Bank (1992) have argued that telecommunications infrastructure is an essential element in the future economic and social development of African economies. Information technology is clearly diffusing rapidly into all industrial and service sectors and must now be seen as one of the most crucial technologies affecting economic growth in developing countries.

Despite this, no evidence, whether empirical or otherwise, has been put forward regarding the telecommunications sectors in most of these African economies. In particular, not much has been done to investigate the restructuring, reforms, and policy shifts that have taken place in African countries with relatively modern telecommunications infrastructures,

such as The Gambia. If this were to take place, however, the following questions would surely be raised:

- Is there a relationship between investments in telecommunications and economic growth in The Gambia?
- What is the political economy of the Gambian telecommunication reforms and policies? Is there a relationship between international telecommunications and international movements of factors such as exports, imports, and tourists in The Gambia?

These are some of the fundamental research questions I have investigated. Both qualitative and quantitative analyses are presented herein - based on data from different international sources - coupled with a case study approach, which used interviews and document reviews in order to provide further answers.

In particular, it is the goal of this section to contribute to the issues and questions raised earlier by indicating whether telecommunication investments do indeed positively and significantly affect economic output and productivity. Furthermore, I intend to explore whether there are conditions under which these investments might bring even greater economic benefit to African economies.

5.2.1 Information Technology and Economic Growth: The Connections

The global gap between the rich and poor widens every day, says the Human Development Report 1996, published for the United Nations Development Program (UNDP). According to an administrator of the UNDP "the world has become more economically polarized, both between countries and within countries and if present trends continue, economic disparities between industrial and developing nations will move from inequitable to inhuman." The report shows that, despite a dramatic surge in economic growth in 15 countries over the past three decades, 1.6 billion people have been left behind and are *worse* off than they were 15 years ago. In those countries where people are better off than they were 10 years ago, governments have stressed not just the degree of growth (the quantity), but also its quality. They have provided some measure of equity - improved health, education, and employment opportunities for their citizens. Early investment in building people's capabilities creates a climate, as in East and Southeast Asia, for the forging of strong links between growth and human development. The above-mentioned findings show that more economic growth will be needed to advance human development, particularly for those countries that have not achieved much growth thus far. The report's look at uneven growth and poverty, however, clearly shows that there are no simple links between economic growth and human development and employment.

According to an adviser to the administrator of the UNDP, Mr. Richard Jolly, "short-term advances in human development are possible - but they will not be

sustainable without further growth. Conversely, economic growth is not sustainable without human development. A strategy for economic growth that emphasizes people and their productive potential is the only way to open opportunities. It is increasingly clear that new international measures are needed to encourage and support national strategies for employment creation and human development, especially in the poorer countries." Finally, the report suggests that there is no *one* formula through which all countries will succeed. Former Socialist countries now in transition need to combine the most rapid economic growth possible with human development, if they are not to slide back on both fronts. Countries exhibiting fast growth, such as the tiger economies of Asia, need to take care to combine their concern for growth with an attack on poverty and a "boosting" of human development policies if they wish to ensure future gains. Industrial countries, too, will have to find new approaches to employment, equity, and energy-consuming lifestyles, as well as improving social services for mothers and children, the working poor, and the growing post-retirement population.

In Sub-Saharan Africa and the less developed countries (LDCs), the emphasis must be on building a solid platform of human development while accelerating growth in order to sustain that development. The report estimates that at the current slow rates of improvement, countries like Cote d'Ivoire, which is losing ground in education, may require 65 years to reach the Human Development Index level of industrial countries, and that those further behind, such as Mozambique and Niger, will take more than two centuries to achieve this, without changes in policy and/or much more help from the

outside. Such priorities call for debt relief, access to foreign markets, and well-targeted development assistance

The changes discussed above dictate a major adjustment - the information adjustment - to achieve macroeconomic and political balance in an environment of uncontrolled information flows and global competition, trade, and investment. Societies all over the world correctly see major challenges and opportunities from advances in information technology. National strategies that recognize the importance of information for development have appeared in Turkey, Mauritius, Singapore, Vietnam, South Korea, the United States, the Netherlands, Canada, and elsewhere. In the best-known example, Singapore's Tradenet system was implemented as a key component of the country's export-oriented economic strategy. The Asian Tigers, without exception, treat information as a strategic priority. Europe has an urgent strategy to make the European Union into an information society, and the United States, despite its aversion to industrial planning, formulated a national strategy for deploying an information infrastructure. Also, the United Nations Economic Commission for Africa (UNECA) formulated an African information society.

It is vital for African countries to adjust or suffer exclusion from the global economy and severe disadvantages in the competitiveness of their goods and services. They are threatened with a new and dangerous form of information poverty that could further widen the gap in economic status and competitiveness.

Allaire (1994) argues further that "those nations that establish (their information) infrastructure can develop a broader range of applications first and will have a

tremendous competitive advantage over those that lag behind. This advantage will accrue not only to the telecommunications industry, but also to such industries as manufacturing, banking, and entertainment and to such activities as education and healthcare."

Bangemann (1994) argues that the first countries to enter the information society will reap the greatest rewards. They will set the agenda for all that must follow. By contrast, countries that temporize, or favor half-hearted solutions, could, in less than a decade, face disastrous declines in investment and a squeeze on jobs.

Hudson (1995) makes this same argument a little differently. She says that information is critical to the social and economic activities that comprise the development process. Basically, telecommunications, as a means of sharing information, is not simply a connection between people, but a link in the chain of the development process itself.

5.2.1 Information Technology and Economic Development: the International Experience

Knowledge and information are critical in determining a nation's international competitiveness. According to Lopez and Vilaseca (1996), nations with infrastructures that facilitate the gathering and analysis of information on international markets, trends, consumer needs, production costs, and competitors, are transformed into "knowledge hubs," from which they can determine how to best adapt to changes in international economic and technological conditions.

They also contend that most African countries face huge external debts, information poverty, obsolete infrastructures, trade barriers, and poor commercial development. This

hinders efforts to develop their information technology base and tests their abilities to cope with global changes and trends. In addition, they contend that the level of economic development in these African countries mirrors the level of information technology application in these economies. However, it is to be noted that they too feel that IT and a modern telecommunications infrastructure could help Africa to "leapfrog" onto a par with the developed countries at a far lower cost. This is because, as mentioned earlier, the initial research and development costs have already been borne by the developed nations.

Lopez and Vilaseca, then, argue that for African economies to rectify the failure of current national, social, and economic development plans and programs and be a part of the global economy, they must utilize appropriate information technology - a process that cannot be undertaken without improvements in their telecommunication infrastructures. This is because the telecommunications component of information technology (IT) serves as a foundation for infrastructure development and is a key factor in generating exports and attracting foreign investments. In their research, Lopez and Vilaseca found that several studies show that exports of products characterized by seasonal demands such as apparel, or requiring close contact with customers such as auto parts, are particularly dependent on reliable and abundant telecommunications infrastructures.

This new attitude has stimulated an increase in investment in the telecommunications infrastructure and has precipitated and rejuvenated sectoral reform in African economies. Telecommunications reform is a prerequisite for African economies to be effective players and partners in the information economy and the global economy at large. The entire worldwide telecommunications sector is experiencing a dynamic

transformation - a transformation manifested in the convergence of telecommunications and computers, the participation of local companies in the long-distance market, the development of multimedia, and the advent of wireless, mobile, and cellular communications.

However, policies in support of economic development cannot be reduced to pure technological issues with which the primary objective is to increase the efficiency and productivity of certain sectors. Rather, it requires a broad base of infrastructure and support in education transfer, technical services of all kinds, research and development, technology transfer, linkage with the manufacturing sector, marketing, and management. This should be done within the overall context of maintaining macroeconomic stability and within an economic development plan that promotes the productive use of labor, and provides basic social services, education, and protection of the environment and natural resources, especially water and land. Once these policies are developed, governments should be committed to following them through.

The emergence of this new society, with its pervasive information capabilities, makes it substantially different from an industrial society. This information society is much more competitive, more democratic, less centralized, less stable, better able to address individual needs, and friendlier to the environment. For African countries, these changes dictate the need for a major adjustment in order to harness information for economic and social development. Such an adjustment requires urgent new policies, regulatory and institutional reforms, and investments.

5.2.2 Information Technology and the Global Labor Market

The effect of information technology on employment patterns is complex and shifting. Because of lower wages, developing countries are gaining skilled jobs from industrial countries largely due to telecommunications. However, according to Tolero & Gaudette (1996), this advantage is only temporary for any particular country, because wages for skilled service jobs in developing countries will rise with demand, the knowledge content of these jobs will increase, and the advantage might shift to other countries that are more effective in building knowledge and skills. This argument is well enunciated by Peter Drucker (1994b) when he says that developing countries can no longer expect to base their development on their comparative labor advantage - that is, on cheap industrial labor. The comparative advantage that now counts is in the application of knowledge (Drucker 1994a). Drucker explains why the application of knowledge has become more important than cheap labor by saying that the segments that comprise the world economy - the flows of money and information on the one hand, and trade and investment on the other - are rapidly merging into one "transaction." They increasingly represent different dimensions of cross-border alliances, the strongest integrating force of the world economy, and both of these segments are growing fast. These two significant economic phenomena - money flows and information flows - are not even transactional; they are non-national.

Most countries of the world are moving toward progressive forms of market economies. African economies, however, are lagging behind - in part because most of her

telecommunication sectors are state-owned and controlled while in the developed world and Latin America the shift toward markets (privatized PTT's) is likely to continue and even accelerate. Thus, the private sector has become the primary engine of growth worldwide, substantially changing the role of government. According to de Soto (1993), those countries that have market economies have prospered so much more than those that have not that, today, nobody dares propose a solution to underdevelopment that disregards the market.

International trade in goods has increased to the point where global production and outsourcing prevail. International trade in services is increasing as a share of total trade, and developing countries are catching up by exporting high-skill and low-skill services. Investments and money flow globally through an increasingly integrated, and volatile, financial market. Information systems built on telecommunications are essential for this expanded global market (Tolero & Gaudette, the World Bank, 1996). Tolero and Gaudette expound on this by using Drucker's arguments (1994b) that money flows in the London Interbank Market and trades on the main currency markets exceed by several orders of magnitude what would be needed to finance the international transactions of the real economy. An unambiguous lesson of the last 40 years is that increased participation in the world economy has become the key to domestic economic growth and prosperity (for industrial economies). Integration is the only basis for an international trade policy that can work, and the only way to rapidly revive a domestic economy in turbulence and chronic recession.

According to Richardson (1994), software production from "tele-ports" in Bangalore, India, yields annual exports worth $300 million (as of mid 1994). Around 150 of 600 firms operate on global contracts only, mainly from the USA and Europe. Conversely, before 1989, few firms worked internationally. Citicorp, Microsoft, Oracle, and others have software operations inside India, and most firms have leapfrogged traditional development approaches straight to the latest programming technologies, such as object-oriented development and client server systems.

Competition increases through the globalization of trade and investments and the entry of developing countries into markets formerly dominated by industrial nations. Markets for industrial countries expand as incomes rise in developing countries. Competition between low-value-added goods and services intensifies with new entrants, technological progress, and skill-based efficiencies. As profits erode, developing countries with low labor costs can exploit this advantage only temporarily. Without flexible labor markets, countries cannot base development strategies on these products. Investment in training to develop a skilled labor force, pursued with the elimination of barriers to entry and exit, can propel the whole economy into a dynamic growth pattern., and fast growth is extremely common in developing countries. According to a World Bank (1994a) study, nine out of ten countries achieving export growth rates of over ten percent, from 1980-92, were developing countries, among them China, Colombia, the Republic of Korea, and Botswana. During this period, China and Korea were the fastest growing economies with average per capita GNP growth rates of 7.6 and 8.5 percent, respectively.

Drucker (1994a) argues that knowledge, the new resource for economic performance, is not in itself economic. It cannot be bought or sold. The acquisition of knowledge has a cost, as has the acquisition of anything. However, the acquisition of knowledge has no price. Economic interests can therefore no longer integrate all other concerns and interests.

5.2.3 Reorganizing Society: The Role of Information Technology

The changes brought on by the information revolution go far beyond economics and technology and affect society in broader ways. As a great social leveler, information technology ranks second only to death. It can raze cultural barriers, overwhelm economic inequalities, and even compensate for intellectual disparities. According to Pitroda (1993), high technology can put unequal human beings on an equal footing, and that makes it the most potent democratizing tool ever devised. Society is being reorganized as, when information is ubiquitous and inexpensive, social and organizational control based on closely held information is no longer possible. Democracy and decentralization rise, and hierarchical organizations flatten. Travel, work, and consumption patterns change as electronic networks replace stores, factories, and workplaces that exist largely to facilitate information exchanges. Products and services of all kinds become information-intensive, and uncontrolled flows of information increase, creating opportunities for social reorganization.

Tolero & Gaudette (1996) explain how IT reduces information and income inequalities. The relationship between access to information and level of income is strong and becoming stronger at both the national and international levels. The information revolution threatens to increase inequity, but it also provides tools to reduce poverty. An agenda of technology-improved access to education, health care, and information is increasingly possible for developing countries. Rural and poor urban communities can be integrated into economic life, and thereby have their income levels raised, through information services. Appropriate regulatory incentives can be designed to encourage the provision of rural telecommunications on a commercial basis. Satellite networks, wireless communications, public telephones, and community information centers are effective arrangements. Intellectual and artistic products of national cultures can be preserved and disseminated with information technology.

Drucker (1994a) further argues that neither governments nor employing organizations should take care of the social challenges of the knowledge society. A separate and new social sector - the non-governmental organization (NGO) - rises to prominence as it slowly replaces government in the social agenda. In the early 1990s, about a million organizations were registered in the United States as non-profit or charitable organizations involved in social sector work. Government demands compliance; it makes rules and enforces them. Business expects to be paid; it supplies. Conversely, social sector institutions aim at changing the human being. The 'product' of a school is the student who has learned something. The 'product' of a church is a churchgoer whose life is being changed. The task of social sector organizations is to

create human health and well being. Increasingly, these organizations of the social sector serve a second and equally important task, though - they create citizenship.

5.2.4 Information Technology and Public Administration

Human development and poverty alleviation - long established goals of economic and social development - are increasingly a prerequisite for international competitiveness. Communities everywhere, informed through television about how others live, aspire to higher standards of living and place increasing demands on their leaders. Victims of disease and malnutrition recognize their plight mainly as economic and political problems, creating pressures for change that reverberates internationally. Consequently, the demand for institutional accountability increases. Spurred on by the increasing availability of international information, the public is ever more unwilling to allow public and private organizations to operate in secrecy. At the same time, the spread of democracy creates new opportunities for people to participate in public decisions. Institutions of all kinds, but chiefly government, must promptly change their roles and must operate under conditions of permanent scrutiny by their stakeholders

Successive changes in the governments of Ghana, Congo, Brazil, Venezuela, India, The Gambia, and elsewhere in the last few years have been spurred by investigations into the conduct of government and the propriety of the personal transactions of ousted leaders. The increased accountability of private enterprises through financial market disclosure requirements is worth taking note of in this regard: capital

flows worldwide on portfolio investments generate a demand for credible financial reports, corporate audits, and credit ratings.

Information technology makes governments more efficient, accountable, and transparent. Large productivity increases in government services are possible with information systems, which simultaneously increase speed, volume, quality, transparency, and the accountability of transactions. According to Tolero & Gaudette (1996), well-designed information systems can become major instruments of public policy - powerful tools with which to implement, enforce, and evaluate policy reforms. Moussa (1995) enunciates this point well. He argues that public administration is, by its very nature, highly information-intensive. Government business can be considered as a series of systems, such as education, health, defense, public revenue and expenditures, natural resources management, social security, etc., and public administration relies heavily on the use of information and communication technologies to gather, process, and diffuse information within both public and private domains. For example, each night, Gambia can determine its cash and foreign exchange positions. Every fiscal transaction is validated every day against budget and public liquidity. This system eliminated the need to maintain a substantial no-interest float and created many secondary capabilities. According to Hanna (1993), successful reaping of the benefits of information technology by governments depends on many factors, including strictly centralized transaction controls, compatible public policies, a highly-skilled work force, and substantial long-term investment.

According to Moussa (1995), in Morocco, the Ministry of Finance computerized tax administration, auditing, and control, and information systems are used for public investment planning and public debt management. Computer-based modeling is also use in macroeconomic monitoring, external trade management, and industrial promotion.

Information technology increases the effectiveness of economic reforms. Economic reforms often fail in implementation due to weak compliance. Good monitoring mechanisms can help here, and information systems designed in conjunction with reforms are most likely to be effective. Through information systems, it is possible to embed policy reforms into institutional processes and transactions, which can then be readily monitored and audited.

This point is well illustrated by Singapore's Tradenet system, which is a key component of an open, export-oriented, market economy. Though strategic decisions and policy reforms related to trade were fundamental to Singapore's success, information systems were the vehicle for the implementation and enforcement of these strategic decisions and policy reforms. The combination of trade policy changes and computer support was rapidly and widely accepted by the trade industry.

Information technology can be used to better monitor and protect the environment in The Gambia, too. Environmental monitoring, inherently data-intensive, is more effective using information technology, and primarily geographic information systems. These systems are already practical and are becoming increasingly inexpensive and, with The Gambia already facing an environmental hazard (as the sea moves inland – ever

closer to Banjul), IT could help in the monitoring, forecasting, and solving of this potential environmental threat.

5.2.5 Information Technology and Education

In the 1996 Human Development Report prepared by the World Bank, education is recognized as a basic human right and the path to higher incomes. According to a study by the UN, economic growth has failed a quarter of the world's population and 89 countries are worse off, economically, than they were 10 years ago.

The influence of telecommunications on education has already been observed through grassroots connections in the region. In Western Africa, the Economic Organization of West African States (ECOWAS) is involved in developing regional networks. Similar organizations also exist in North Africa. All of these organizations should be interconnected, appropriately, in order to maximize their value and utilization throughout the continent. Internet connectivity could improve the efficiency and value of these regional base organizations in Africa and, more importantly, their effectiveness and value to member states. The Organization of African Unity (OAU) could benefit tremendously from an appropriately "wired" Africa. Currently, most of these regional organizations are *not* enjoying the benefits of networks.

Too narrow a definition of "appropriate technology", of course, ignores the profound social implications of technology and risks consigning the world's poor to a life of third-rate capacity and opportunity. Information technology, when designed for the

right job, can be deployed even in regions that lack adequate water, food, and power. This technology can be effective for many tasks, including human and economic development. In fact, this technology is often indispensable in meeting basic needs. For example, information technology makes it possible to educate more people, and support lifelong learning, because it plays primary and supporting roles in the delivery of education. Information systems can provide efficient administration, low-cost delivery, and the production of appropriate educational materials; while computer-based training is an effective tool for the sort of lifelong learning outlined above.

In a study conducted by Wooldridge (1992), education correlates with employment, income, and opportunity. His study suggests that, in industrial countries, the well educated are more likely to be employed. He also showed that in the US, in 1989, the unemployment rate was 9.1 percent for those with less than or equal to a high school education, and 2.2 percent for those with college degrees. In Japan these figures were 7 percent and 2.3 percent, respectively. The well educated earn more, and the gap is widening. In the US, in 1980, the earnings gap was 31 percent; in 1988 it was 86 percent. The well educated land jobs that provide them with more training; the uneducated are locked out from opportunities to improve their skills.

Distance education in Africa (defined to include print, broadcasting, and limited face-to-face education) has been used to pursue entirely unconventional educational ends. This could be a very valuable, cost-effective option that Gambian policy makers could include as they conceptualize the first University of The Gambia, anticipated to open its doors in 1999. The Gambia is not well endowed with qualified personnel to teach

University level courses. Therefore, for her University to achieve some degree of stature, it must have qualified faculty and administrators. In addition, it would not want to repeat the mistakes of most African universities, i.e., find itself short of adequate resources, and thereby provoke the students and faculty into striking. It is my view, given the adequate telecommunications infrastructure in place, that the opportunity exists for the Gambia to model her higher education using information technology as a catalyst with which to build capacity. Alliances with major universities could be forged via long distance learning for appropriate and sustainable course offerings. With the Internet Gateway in place in the country, The Gambia stands to have a competitive edge in higher education compared to most African economies, by appropriately using the internet not only in the universities, but throughout the educational system. However, this is an enormous challenge for Gambian policy makers from a cost and knowledge point of view. Most Gambian policy makers, of course, have inadequate knowledge of, and exposure to, information technology. Consequently, they may find it difficult to appreciate that which IT can achieve, and thus effectively align it with economic agents such as education. Nevertheless, it is crucial that policy makers attempt this for, though the initial investment may be costly, the payoffs are likely, in the long run, to be great, particularly for a developing economy such as The Gambia. As Perraton (1992) puts it, the main advantages of using information technology in education is that it is cheaper, more flexible, and suitable for widely scattered student bodies.

5.2.6 Information Technology and Agriculture

Much of Africa still depends heavily on agriculture, and The Gambia is no exception. Though agriculture is the largest employer, this sector has faced very difficult challenges in the past, ranging from old-fashioned and inefficient farming methods to drought, which can in turn cause social, political, and economic instability. Such instability has sometimes resulted in competition springing up between local groups for resources, which often results in civil wars. International assistance to Africa continues to dress the wounds of hunger and civil war, culminating in a stage of donor "fatigue." Given this scenario, it is evident that innovative ways to achieve better food security, and new ways to interact among African countries and local citizens, can become bases from which we can break this vicious cycle.

Internet connectivity has a vital role to play in improving interaction by delivering critical information to farmers, extension workers, and researchers fighting poverty. According to Benzine and Gerland, electronic networking in colleges, where people of diverse backgrounds and expertise share resources, knowledge, and experience is of particular relevance here. Their implication for research in Africa is bi-directional. Networking breaks the isolation of researchers and African research from the global community; it empowers local researchers by making them both recipients and generators of global information; and stimulates researchers to upgrade the standard of African higher

education. In addition, long-distance learning provides access to resources from the developed countries at a cheaper cost and thus enhances access at all levels.

Satellites are increasingly being used to provide early warnings regarding infestations of insects, such as desert locusts and tsetse flies, by combining satellite data about vegetation patterns, moisture levels, and weather, with ground-based data. The images are expensive, and interpretation requires deep technical expertise. However, dependable, timely predictions of pest infestations can help to prevent serious damage to health and agriculture[13].

Hudson (1995) also argues that, in many parts of the developing world, women do much of the agricultural work. They may take crops to market or negotiate prices for their crops or livestock. In such cases, the benefits of telecommunications in getting information about prices and markets and in getting expert advice from extension agents would be very helpful to women. A steadily increasing body of evidence suggests that girls' education is probably the single most effective investment that a developing country can make. According to Sandstrom (1994), educating women: (1) reduces child mortality, (2) reduces maternal mortality, (3) reduces fertility, (4) improves family health, (5) increases the educational attainment of their children, (6) has important environmental benefits, and (7) increases productivity (Sandstrom 1994).

[13] This was illustrated in an article in The Economist (August 12, 1993)

5.2.7 Information Technology and Manufacturing

Information technology increases diversity in information-intensive industries. Markets for information goods and services are young, growing, and exceptionally mobile. In this dynamic situation there are many opportunities and successful models for creating new industries in developing countries. These industries can provide information products, such as components and equipment, custom software, or export provision of services. They can also help to improve the information components of traditional products, a fast-growing aspect of many industries. According to Hanna (1993b), the software industry in India has been able to take advantage of its low-cost, highly skilled work force and with the benefit of international communications links has become a major producer of software. India ranks second among competing countries in software/services exports. India's software exports have grown from $24 million in 1986-87 to $225 million in 1993-94.

The ability to disseminate, widely and cheaply, very detailed design information is changing the traditional manufacturing process. Making an original design for a product can account for half of its life-cycle cost. Computer-aided design can dramatically cut cost and time requirements and improve accuracy. Developing countries may be able to skip entire stages of industrialization if they are able to incorporate computer-aided design, information systems, and flexible manufacturing into their nascent industries.

5.3 Managing Information Technology for Economic Growth: Challenges in The Gambia

Though the impact of technology could be substantial, implementation issues would be a challenge for The Gambia. Obstacles would include delays, conversion problems, cost overruns, lack of local skilled labor and technical support, and a lack of acceptance by end users. In fact, obstacles such as changing from the "old way " of doing things/processes, end-user training, and poor power supply warrant consideration in the early adoption phases of new technologies. Active participation at different levels of government and society is very important if any tangible impacts and positive returns on investment are to be seen. It is particularly important to note that the acceptance of information technology has a "generation gap" component in developing countries. The younger the generation, the more exposure they have had to technology.

According to Hanna (1994), though information technology can have positive effects on the economic development of a country, it can fail to fulfill the high expectations placed on it if the process is not adequately managed from its inception. He further suggested that information technology's impact on the labor force is an aspect of IT integration that warrants maximum attention. Automation has decreased the direct labor share of production costs but requires a highly skilled labor force - often a scarce resource in less-developed countries. Nevertheless, information technology provides developing countries with automated alternatives, which lessen the need for highly-skilled personnel in professional applications, such as computer-aided design in engineering and architecture etc., thus relieving these countries of handicapping constraints.

Hanna (1994), cautions that African economies will be challenged by the political implications of the existence of these infrastructures (telecommunications and IT). They would have to wrestle with issues such as "foreign ownership" of these important infrastructures, which are high revenue earners and will be the nerve of their economies. The need for better skills and education, and less labor-intensive human involvement, will also represent an enormous challenge for The Gambia, with its excess labor and low skills base. In order to combat this, the Gambian government must ensure that unrealistically high expectations are not developed and that, over the long-term, the education and training needs for full participation in their country's information technology platform are available to all. There will be a need to re-tool the educational system, too, especially if they are to facilitate the education and training of information technology.

Trends in recent years show a reduction in the costs of information technology. This is the driving force behind the increased popularity and use of information technology; however, African countries should avoid the temptation to buy older technology in order to compensate for rising peripheral costs without first ensuring that the selected technology can evolve within its planned technology platform. It is very important to identify the information technology platform at an early stage, as this will protect the users of these technologies against premature obsolescence. In determining which platform to select, it is important to evaluate the benefits of new technology versus costs over its projected life cycle. These costs include maintaining and upgrading technology as it approaches maturity. Upgrading technology in The Gambia does not imply leapfrogging from obsolescence to a state-of-the-art technology platform. Two approaches that could be adopted are: (1) to

utilize the existing technology and to continue technological development by integrating new technologies; and (2) to totally replace the technology they currently possess.

Through IT-led economic development, The Gambia could achieve macroeconomic balance, political stability, and growth amidst global information flows, competition, trade, and investment. Developed countries and the NICs are rapidly adjusting their economies to remain competitive in the global economy. Therefore, the Gambian government must also adjust or risk exclusion from the global economy and suffer severe competitive disadvantages in the sale of goods and services.[14]

Telecommunications has been described in the literature as both the core and infrastructure of the information economy. It's described as the core since major economic activities, such as financial services, are themselves mostly information processing and transmission and other services such as transportation, traveling, and publishing also depend on these facilities. Telecommunications itself has become a large and rapidly growing business - telecommunications operating revenues worldwide exceeds $500 billion, which is roughly equal to the GNP of Canada or two to three times that of Africa. Telecommunications systems have been effectively deployed in the extension of social services and regional development:

- to support human resource development through distance education and training and to facilitate health services in rural areas through linkages to interactive medical information networks;
- to extend and consolidate government administration to regions;

[14] (see, Talero and Gaudette- World Bank, 1996).

- to enhance agricultural development and resource management by enabling farmers to access such information as market trends, weather reports, and modern crop growing techniques; and
- to support the mobilization of aid for disaster relief operations, amongst other things.

Since new technologies such as wireless local loops and satellites are promising cost-effective capabilities with which to access remote areas, the use of telecommunications systems for promoting regional and economic development is likely to intensify in the future and help in the alleviation of poverty in The Gambia. This is because telecommunication facilitates market entry, improves customer service, reduces costs, and increases productivity in *all* sectors of the economy. It has become a strategic investment to maintain and develop a competitive advantage at all levels - the firm, the region, the country, and the continent.

Despite Africa's poor telecommunication infrastructure, Africa's policy makers and donor agencies are realizing the impact of Internet connectivity on economic development. A recent study by Rorissa (1996), funded by the International Development Research Council (IDRC), surveyed the African countries of Senegal, Zambia, Uganda, and Ethiopia regarding the impact of electronic communication. It suggested that users are realizing the potential of a full Internet connection. In another study, by the National Research Council (1996), it was found that academic and research institutions have been able to conduct effective collaborative projects. This suggests that wider connectivity would improve the

overall knowledge bases of many countries and promote positive changes in their economic development processes.

In order for this to be effective, the Gambian government must cooperate and interact with users, private entities, non-governmental organizations (NGOs), and donor agencies. The government needs to create the environment for Internet connectivity by improving its telecommunications infrastructure. NGOs, donor agencies, and interested multinational corporations (MNC's), should recognize the diversity of technological levels, policies, and national settings, and come up with different solutions and support strategies. International organizations such as the International Telecommunication Union (ITU) and the United Nations (UN) already play a significant role exerting pressure on African governments to liberalize their telecommunications infrastructure to allow competition. As noted earlier, training will be crucial, as will be sensitizing Gambian policy makers to the fact that improvement of telecommunications infrastructure, and investment in internet connectivity, is vital for the economic viability of The Gambia.

There is a proliferation of low-cost communication networks instituted by donor agencies such as the UN, World Bank, IDRC and NGOs, paving the way for the development of Africa's national information infrastructures. There is no doubt that for Africa to compete and be viable in this global economy, and to attract investment and spur economic activity, it needs to be "wired."

This section tackles a number of issues revolving around one major question: namely, why is it necessary to "wire" the Gambian economy given Gambia's rising and pressing economic and social problems?

- Is improved telecommunication infrastructures and Internet connectivity a solution to the recurrent socio-economic problems?
- What are the implications of the information superhighway and the approaching global information economy to The Gambia?
- What are the challenges in attempting to "wire" The Gambia?

The current advancement in telecommunications and information technology has transformed and elevated developed and East Asian economies. According to Bangemann et al, (1994) technological progress now enables us to process, store, retrieve, and communicate information in whatever form it may take, unconstrained by distance, time, and volume. In this global economy, information is an asset to - a very vital ingredient in - the information economy; and its proper management, and efficient use, enhances economic development and activity. Information technology has transformed the traditional ways in which we work, organize, and govern, and has reduced cycle times and transaction costs, all aspects that The Gambia has not yet fully enjoyed.

Internet connectivity will be of great value in assisting in the management of the economic and social crisis confronting The Gambia and the alleviation of poverty that is stifling Gambia's economic growth. Numerous projects funded by international agencies such as USAID, UN, the World Bank, and IDRC provide for the exchange of crisis-related information. Internet connectivity could improve regional collaboration and competitiveness and research efforts. The Common Market for Eastern and Southern

Africa (COMESA) and the United Nations Conference on Trade and Development (UNCTAD) have realized the impact of trade information networks on inter-regional and intra-regional trade. UNCTAD is setting up trade information focal points called "trade points," in many African countries. COMESA is developing regional trade networks between its member states.

Chapter VI

The Evolution of an Information Economy in West Africa: A Framework for Building Gambia's Information Infrastructure

6.1 Introduction

This section discusses the current IT and telecommunications capacity in The Gambia, and highlights the problems that the country needs to overcome, particularly as regards its increasing disparity with the developed countries, the difficulty of achieving value from the utilization of IT, and the exacerbation of social problems caused by under-development. I argue that these problems are unlikely to be resolved by the globalization process alone, and discuss further policy actions that The Gambia needs to undertake. Since the relationship between telecommunications and economic development is not uni-dimensional, it is useful to examine how the dimensions of telecommunication are affected by the various dimensions of information technology, and how various dimensions of economic development impact information technology. To do this requires an appropriate framework, both conceptual and practical, for understanding linkages between telecommunications, information technology, and economic development.

Conceptual notions facilitate discussion and the development of theoretical models; whereas practical concerns are geared towards somewhat more "realistic" options that can be implemented by policy makers. This chapter uses a conceptual *and* practical framework

to look at linkages between telecommunications, information technology, and economic development.

This section introduces a conceptual model of an Information Based Economy (IBE). The illustration in Figure 7 shows how Telecommunications fits into a general economic development model. Essentially, I am hypothesizing that some specific features of telecommunications can impact information technology *and* economic growth. I also hypothesize that some other features of *information technology* can also impact economic growth. These, in turn, both directly and transitively, impact several other economic variables such as decision-making, economic and organizational performance, national information infrastructures, and the information based economy (IBE). The dotted lines in the model presented in figure 7 illustrate my point of interest, i.e., I am concerned with the relationship between telecommunications, IT, and economic development features. Though I recognize the importance of the rest of the model, further research is left to other efforts. In essence, figure 7, which follows in the next few pages, is a recommended IT strategy for The Gambia.

6.2 Telecommunications Policy Analysis of The Gambia, 1964-1998

The Gambia offers a case of a rapid series of policy transitions in a small, well-controlled environment. The young nation's infrastructure policy after attaining independence in 1965 focused on building basic facilities for economic development, and not on what would attract needed capital, technology, and jobs. The PTT, along with

schools, roads, and air and sea ports, were not major policy issues. This neglect in the economic development agenda proved disastrous. By mid-1970s, services were inadequate to support a transition to a strategy of economic growth. However, by 1984, the PTT had developed its network and could offer modern telecommunications services, well above most African countries. This remarkable transition from laggard to leader required not only heavy investment, but also a series of rapid transitions in the policy approach.

The economic role played by telecommunications shifted following the takeover from Cable & Wireless in 1984, which resulted in a complete upgrading of the telecommunications infrastructure in The Gambia. While computer use in The Gambia is continuing to expand, few are interconnected. The Government is beginning to establish a formal information technology policy since the current economic strategies, goals, and plans did not explicitly link the two elements – telecommunications and economic development.

Currently, a visible link is emerging. This section strongly suggests the development of a national IT strategy in which information infrastructure is a key area of investment. Contrary to most studies of economic development in Africa, it is the position of this study that there is a need for advanced services such as telemetry and integrated services digital networks (ISDN) to provide access to data and information, and for international telephone and facsimile services. GAMTEL should continue to provide basic infrastructure and manage service delivery, but the provision of telecom services should be privatized.

There is also a need for improved connectivity in the national telecommunications network infrastructure. This will shift the future role of information technology from a productivity tool to a competitive weapon and an economic growth and development stimulant. This might well require further investment so as to upgrade the current network, implement a Gambia-wide ISDN network, and accelerate development of strategic value-added applications such as a TradeNet documentation system.

6.3 Information Technology and Telecommunications Capacity of The Gambia

A number of developing economies, such as India, South Korea, and Singapore are successfully exploiting the opportunities offered by IT to overcome economic under-development and to achieve significant competitive advantages in key sectors of their economies. Singapore is similar to The Gambia as regards its limited natural resources and strategic geographic location. In the early 1980s, its government implemented a policy for the development of a highly-advanced telecommunications and IT infrastructure to improve its position in transport services, and to attract foreign investment.

Case studies of the implementation and impact of IT development programs are rare, in contrast to the large number of publications reporting ambitious initiatives and innovative applications of computers and networks.[15]

[15] See Chapters in Bhatnagar and Odedra, 1992; Harasim, 1994

The Gambia's information technology infrastructure serves the broad public interest and commercial and industrial interests. The basic national infrastructure system includes roads, ports and airports, water, sewer, electric power, and telecommunications utilities, plus activities for designing, constructing, and regulating the use of such facilities. Advanced infrastructure systems include those that add value to the basic infrastructure: research and development, the establishment and monitoring of industrial standards, and information-based support activities such as trade facilitation. Because the economic behavior underlying investment in and operation of infrastructure allows non-users to enjoy many of the benefits without participating in the costs, markets providing capital for infrastructure investments tend to be inefficient[16]. Thus, The Gambia's government must initiate, fund, and operate nearly all basic infrastructure through subsidies, market protection, or other interventions

This pattern is dynamic - as an economy develops, demands upon its infrastructure tend to become more differentiated and capital-intensive, trends which motivate many governments to intervene; e.g., by deregulating or privatizing certain activities.

However, the main elements of a national telecommunications infrastructure include lines linking local subscribers to switching systems, overseas lines providing two-way access to subscribers in foreign countries, and customer premise equipment such as telephones, PBX switches, and facsimile machines providing an interface between the user and the system. Advanced elements include high capacity (ISDN, broadcast television, or CATV) channels distributing information such as data, pictures, or video, and mobile voice

[16] see Gotlieb, 1995 and King, J. et al, 1994.

and data services, machine-readable data resources, and intelligent terminal equipment such as workstations and personal computers (see, Wellenius, 1977). Strong public interest and inherently high fixed costs for wire-based systems lead to public provision of basic services in most countries, and to extensive regulation virtually everywhere.

6.4 Rethinking Vision 2020: The Need to Integrate Information Technology into The Gambia's Economic Strategy

The Gambia's Vision 2020, which is an economic strategy predicated on liberal, neoclassical assumptions, seeks to improve primary production, especially small-holder agriculture. Vision 2020 has begun a national debate on The Gambia's development strategy in the next millennium. As discussed by Saine (1997) in "Vision 2020: The Gambia's neo-liberal strategy for social and economic development: A critique", opening up the Gambian economy for investment in primary production, especially small-holder agriculture, will most likely not have the economic impact envisioned. According to Todaro (1997), economies such as The Gambia will have to function and compete in an imperfect and highly unequal real world of commerce. Saine (1997) insinuates that demand patterns for primary products have been relatively unstable, leading to unfavorable terms of trade and export earnings instability. Vision 2020 fails to pay attention to historical trade experience and the growing dependency theory or neo-Marxist arguments regarding the often unequal and sometimes exploitative terms of trade between the more and less industrialized countries. Conditions for export-led growth are less promising in the 1990s given that industrial economies have been mired in slow growth and commodity prices

have been low for several years. Trade blocs will restrict access to European and North American markets for Gambian exports and, in addition, investors are more attracted to other regions, like Asia and Eastern Europe, than they are to Africa[17]. The poorest economies, such as The Gambia's, are not likely to benefit *despite* arrangements for preferential treatment. Instead, she will continue to strive to service her external debt, valued at $423 M in 1994, or 112 percent of GNP, and meet the basic needs of her people. Only developing countries such as South Africa, which are somewhat important in supplying required raw materials, are likely to benefit from trade and attract foreign investments.

The Vision 2020 relegated a minimal role to information technology as a vehicle for economic growth. Only one-half of one page of the report was spent discussing IT. Information technology as a vehicle for economic growth is not mired with historical failures like the agriculture sector. Since independence, over thirty years ago, the agriculture sector has been the focus of economic strategies. Given the track record of information technology and the arguments made in this dissertation of it being a catalyst for economic growth, the Gambian government should rethink the 2020 vision with greater emphasis on IT.

Furthermore, Vision 2020 also advocates a marginal role for government consistent with its neoclassical underpinnings. However, the Gambian government needs to be involved in developing domestic capital accumulation. The Gambian government cannot abandon its role as an agent of social development – an efficient, effective, and selectively

[17] See Lindauer and Roemer (1994) and Saine (1997).

interventionist state. If an IT–led economic development strategy finally gets adopted in The Gambia, the government would still need to selectively intervene to put the information technology infrastructure in place and create a stable political and legal environment with which to attract foreign investments. In the same vein, the government will have to wean itself from being a monopolist operator and regulator, allowing the private sector to grow and, ultimately, become somewhat more involved in IT investment and service provision.

6.5 Information Based Economic Development Model for The Gambian Government: A Conceptual Framework

The starting point of the information-based economic development strategy for the Gambian government involves taking the decision to use information technology to harness economic growth. This should be done by moving beyond rhetoric to strategizing and implementing key policy changes in the telecommunications regulatory framework, nurturing a stable political environment (which impacts greatly on attracting foreign investment), and creating solid fiscal and monetary policies. Privatization of the public sector has already been started in the agricultural and tourism sectors. Through a national information and technology policy, privatization should be initiated and implemented in the telecommunications sector, too. The national information infrastructure is instrumental in determining viable policies, as discussed in this model (figure 7).

Investment in information technology includes not only telecommunications infrastructure, but also electric utilities/energy upgrades to meet the demand. Appropriate

technology diffusion will emanate from appropriate government policy and information technology investments. Investments in information technology cannot be considered in a vacuum without assessing the national wealth of the country and how to create or have access to investment dollars. National wealth is largely impacted by governmental policies which create the environment with which to accumulate investment dollars at home, and attract foreign investment and joint ventures. Once the above-mentioned information technology investments and concerted policy changes are in place, wage levels and employment growth rates will rise. The government's investment in human capital, by creating more opportunities for people to train in information technology, will help to boost the country's information technology capability.

This enhanced information capability will impact upon cultural and social structures, changing people's expectations and demands of their government. This, in turn, will impact upon government policies. Productivity and economic growth should be achieved once all the different components depicted in figure 7 start working synergistically. This will feed back in human capital and information technology investments, thereby bringing about improved quality of life and economic development in The Gambia.

Figure 7, below, schematically shows an information-based economic development model for developing countries. The government's role is central to the development of IT in developing countries by providing political stability and the regulatory and legal framework to allow IT to flourish. The government's role in ensuring that education policy takes into account the human capital needs of an information economy is also highlighted in this diagram. Governments in developing countries can develop and

implement IT policies through a National Information Infrastructure (NII) board. The diagram shows how appropriate IT policies are linked to wealth creation, which can translate into economic growth.

FIGURE 7: INFORMATION BASED ECONOMIC DEVELOPMENT MODEL FOR THE GAMBIA

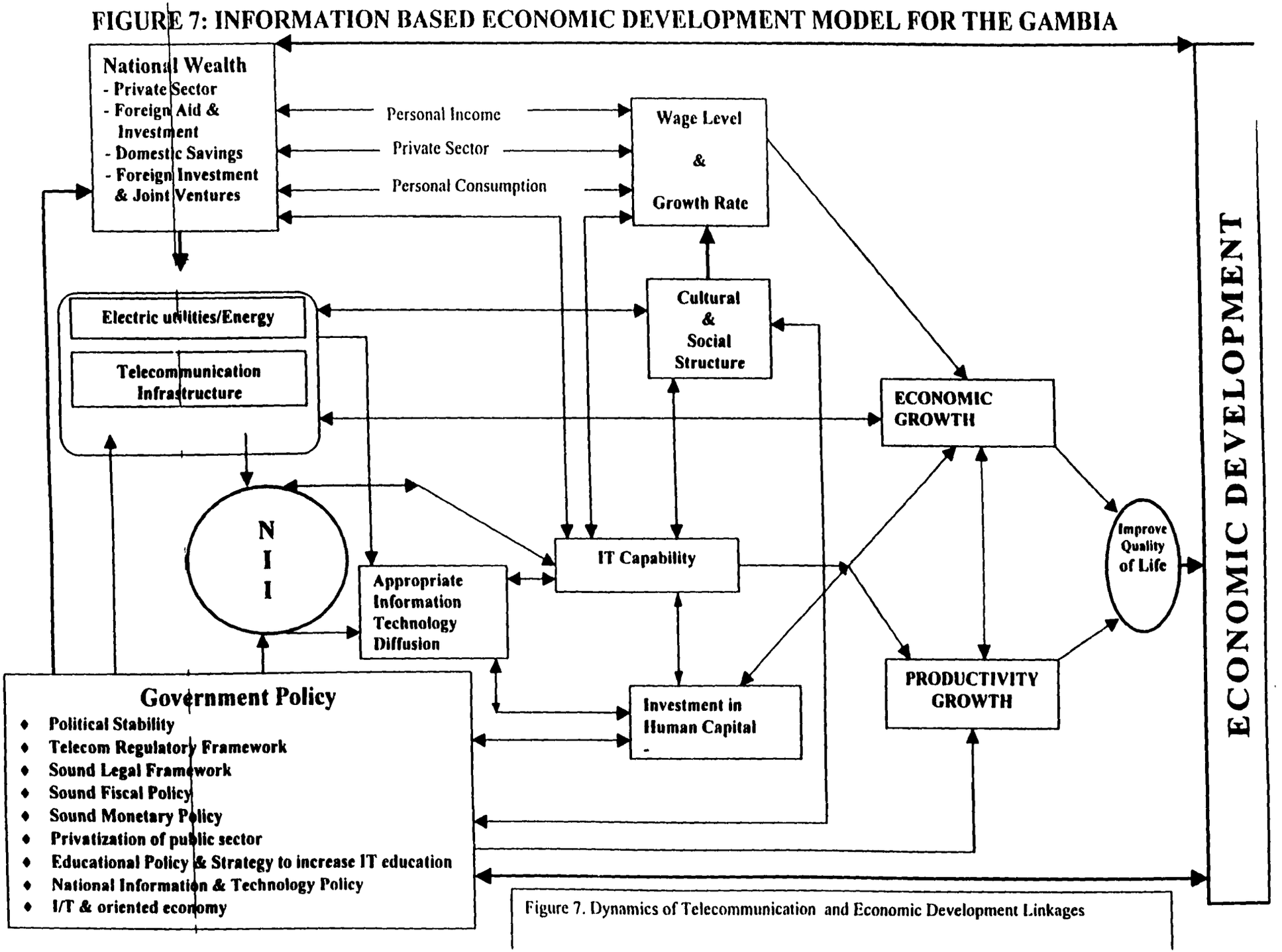


Figure 7. Dynamics of Telecommunication and Economic Development Linkages

6.6 Integrating The Gambia into the Global Economy: Information Technology as an Enabler

Hall (1992) defines globalization in its most general meaning as a process that cuts across national boundaries, integrating and connecting communities in new space-time combinations. The term takes a variety of more specific meanings according to the different discipline studying it. The most relevant of them for the purposes of this section are discussed below.

One widely-accepted perspective on globalization highlights the trend towards freer trade, and the flow of finance, labor, and commodities among countries. It also refers to the flow of data, which are critical for the operations of organizations today, allowing the connection of activities taking place in distant localities. According to Castells (1989), and Lash and Ury (1994), flowing capital, technologies, people, ideas, and images constitute the restructuring process of the contemporary economy.

Another meaning of globalization refers to the increasingly significant role attributed to multinational corporations in the current economic regime. Numerous studies consider the activities of multinationals, analyze their performances, and speculate on their impact on the socio-economic systems of individual countries and regions. Many authors in various disciplines have studied different types of corporations, and although no consistent terminology is established, Bartlett and Ghoshal's (1989) analysis is frequently cited. Bartlett and Ghoshal distinguish among three types of firms operating across national borders: multinational firms, operating their foreign subsidiaries as loose federations or

nearly autonomously in order to be able to respond to local needs and national opportunities; global firms, applying strict control in order to co-ordinate world-wide activities and gain from standardized products, manufacturing processes, and operations; and international firms, pursuing rapid diffusion of innovations from parent company to subsidiaries world-wide while allowing for local adaptation. A fourth type, transnational firms, are identified as those organized as integrated networks and seeking to retain local flexibility as well as global integration and diffusion of innovations.

A third meaning of globalization refers to increasing partnerships, among companies around the world, irrespective of distance. The most frequently cited example is the subcontracting of software production by American and European companies to Indian software companies in Bangalore.

Furthermore, in the domains of communication, politics, and culture, globalization refers to trends manifested in mass media and institutional patterns of behavior. Often, this notion of globalization has negative connotations, implying the spreading of a mass culture dominated by American influences, and a disintegrating effect on personal identity. It is usually considered a manifestation of the homogenization brought about by the modernization process. Most studies, though, present a complex process of tension between the particular and the communal, on the one hand, and the universal and the impersonal, on the other[18]. According to Hall (1991), universalizing tendencies lead ethnic groups to reaffirm their differences and become attached to their locality, rather than resolving national or other local or regional identities.

All these forms of globalization, heavily relying on IT, have direct impacts on The Gambia. Increasing flows of trade and capital, new and more sophisticated strategies of multinational corporations for the expansion of their business, often seeking to subcontract parts of the production process to partners in distant locations, and increasing exposure among diverse cultures create a new economic and social structure in the world.

But what opportunities for economic growth do these trends provide to The Gambia, and how can The Gambia be helped to achieve socio-economic development within the new and dynamic world regime? The literature does not provide a clear answer to this question. Geographical circumstances, such as the local availability of material resources of special quality or at lower costs, appear to matter a great deal. Also, differences in entrepreneurial ability, scientific and technical know-how, and social attitudes appear to play an increasingly significant role as factors determining the structures of production. However, there is still uncertainty about how globalization favors certain places over others, and only limited policy guidance can be derived from the analytical studies of the current globalization phenomenon.

A number of cases of local policy for the development of technical infrastructure and institutional forms are discussed in the literature, such as the cases of the newly industrialized countries of the Far East. Such studies indicate the significance of social and institutional factors in addition to economic and technological measures, without, however, leading to a uniform theory of effective institutional intervention, organizational forms, and business management practices.

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[18] See Robertson, 1992; Larrain, 1994; Friedman 1994; Appadurai, 1990

A different combination of socio-economic and cultural factors seems to be responsible for each of the successful cases. For example, some cases indicate the significance of small and medium enterprises as possessing the necessary flexibility to provide the variety and quality of products and services demanded in today's market. Others suggest the supremacy of large corporations, which can utilize new technology to achieve the required flexibility in production, as well as exploiting the power of their human and financial resources to determine favorable relations with suppliers, clients, and regulatory institutions. Indeed, it has proved almost impossible to imitate the successful cases. Rather, a contingency approach seems to be required, to assess the options available under the specific circumstances of a country or region, and to work out an appropriate program of measures.

Perhaps the only aspect for which there is certainty in all studies of the globalization trends is that an IT infrastructure is necessary for participating in the global economy. Nevertheless, as noted earlier, The Gambia lacks adequate IT resources as well as information resources. It can acquire such resources only gradually and at a substantial cost. Even then, the results are uncertain. Investing in IT does not guarantee either economic growth or social improvement, and the experiences of the developed economies suggest that governments need to make sustained efforts for socio-economic restructuring (see OECD, 1988), and companies need to have competent management, in order to work out the sorts of organizational changes needed to exploit the technological potential[19]. Moreover, there is an inadequate understanding of what governments should do to promote

[19] See, e.g., Strassman, 1985; Applegate, 1994.

IT innovation and derive benefits from it. Thus, it is not enough for The Gambia to acquire IT resources. It is necessary also to address the question of how such technical resources can be effectively utilized within their socio-economic context, and vis a vis the global socio-economic trends.

Required institutional interventions and appropriate organizational changes are aspects of the 'technology transfer' process that have been largely neglected in the information systems literature regarding African economies. It is these issues that the remaining section will consider. The section will then examine the current ability of The Gambia to link the acquisition of technical capacity with appropriate institutional and organizational measures for its effective exploitation.

6.7 The Dynamics of a National Information Technology Policy

An IT plan for The Gambia must extend the role of IT beyond the borders of The Gambia, initiating an era of convergence in telecommunications, broadcast, and computer policies. A Gambian IT policy vision should be built on a national information infrastructure (NII) that links users, computing resources, and content.

Thus, the Gambia case portrays three shifts in the focus of IT policies: from an initial concentration on basic telecommunication services to stand-alone computing, followed by efforts to create convergence between these two, and then recognition of the interdependence and interaction between computing, carriage, and content. The case also portrays shifts in the approaches used to form and deploy the financial, technological, and

organizational assets necessary to build the NII. Each policy regime is distinguished by its institutional approach to defining the roles played in capital formation by equity, earned revenue, borrowing, capital markets; by the public and private sector; and by foreign versus local enterprises. Each regime develops new institutions to regulate or influence the supply of, and demand for, IT resources.

The Gambia's national information infrastructure (NII) policy is in its infancy, focusing on meeting the needs for basic telecommunications services, building modern infrastructure to attract multi-national corporations (MNCs), and building upon advanced network facilities to extend The Gambia's economic potential. These policies evolved in line with changes in technology, progress in national development, steady growth in the economic and social importance of the information services sector, and fundamental shifts in global economic structures.

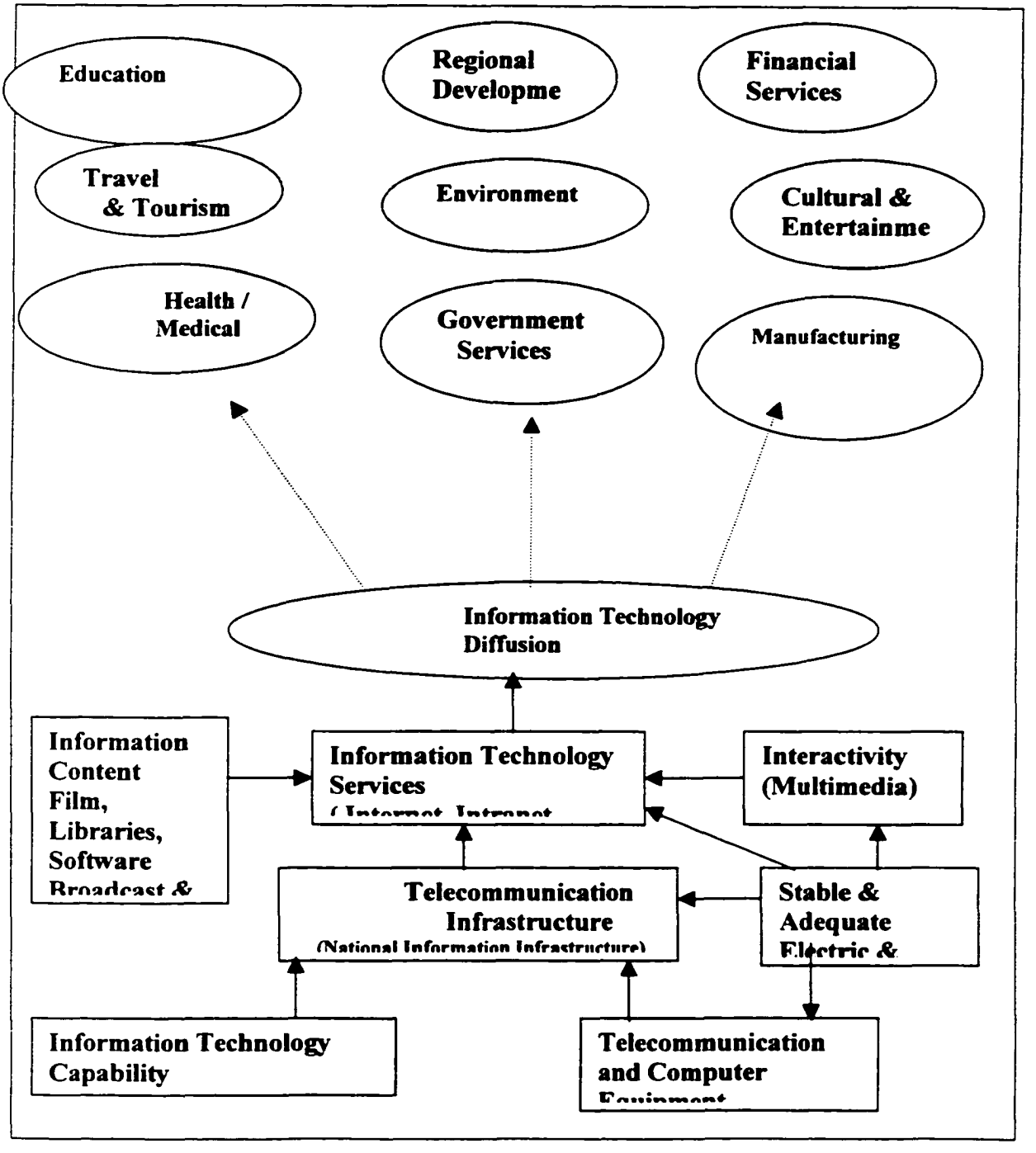
African economies have not been able to make significant progress toward the development of an industrial base and are now faced with the dawn of an information-based economy. The transformation from diverse traditional societies subsisting in agricultural base economies, to rapidly modernizing societies functioning in integrated industrial and consumer economies, has generated demand for new services, and for the information imbedded in or even constituting these services. Thus, the evolution of a global economy fundamentally altered the economic, organizational, and production structures of multinational firms (see, e.g., Dunning, 1993), restructured the basis of the competitive advantage of nations as suggested by Porter (1990), and increased the global demand for

timely business information. These trends have altered both the ends of policy, and the means by which it will be implemented.

6.8 Developing a National Information Infrastructure for The Gambia

The 2020 Vision plan signaled a new technology policy with specific targets for infrastructure. It is important for the government to establish a target; increase the number of IT professionals, research scientists, engineers, and R&D expenditure via joint public and private participations. The Gambian government needs to formulate a National Information Technology Board (NITB), armed with a budget and competent professional staff responsible for guiding The Gambia towards these goals. This Gambian national information infrastructure (NII) could then be built through the expansion of the current national Internet Gateway, funded by the United Nations. Figure 8, overleaf, illustrates the different elements of a Gambian "infostructure."

Figure 8 : Environmental Factors Needed to Build a Gambian "Infostructure"



The base of the NII model represents a large, heterogeneous network infrastructure supporting the common network services layer, which provides standard functions such as access control, transaction engines, GroupWare, and various general- and special-purpose intelligent engines. This base is bounded by two critical "soft" elements, a policy and legal context within which technical infrastructure and applications operate, and a standards regime, which mediates between the current and future technological contexts. National applications, of which two will be a TradeNet, and EduNet, run in a transparent environment.

Small size and limited R&D experience limits The Gambia's capacity to develop the new technologies required to build this infrastructure. To acquire such tools, The Gambia should leverage its long-term relationships with multi-national corporations (MNCs), invest in production and distribution activities within its borders, and formulate a strategy for utilizing the country's technical talent abroad. The MNCs not only employ its workforce and patronize its financial, business service, and logistics industries, but also act as a major channel for acquiring new technology. The government could establish joint ventures with major IT giants, bringing them on board as partners in developing its NII and getting help to develop the human, information, and technological resources necessary to help The Gambia realize its IT vision.

By exploiting such external linkages, The Gambia will be able to expand the current Internet Gateway and offer a standardized, relatively high-bandwidth, integrated digital access capability to provide service-on-demand access to customers – whether governmental or private. The country will then be able to lead the way by using technology

to support videoconferencing, long-distance learning, and interactive multimedia services, before distributing pay-per-view TV and other services on demand.

These suggestions might seem unrealistic given that The Gambia is a poor economy, one worrying about sustenance and survival. However, that was the economic development strategy adopted since independence and the economy never improved. Thus, it is the position of this study that IT-led development should be central to the economic development paradigm for developing economies and that it will enhance efficiency in the economic sectors. The Gambia is and should continue progressing with digitized transmission, digital switching, and digitizing its local loop, serving major business, and industrial and rural districts.

6.8.1 Policy Intervention: Governance of the Telecommunication Sector

According to Gurbaxani et al. (1991), as the diffusion of IT is directly related to the availability of telecommunications infrastructure, governance in the sector is a logical starting point. According to Dutherland (1992), too, there are at least four possible telecommunications service delivery patterns: (1) a typical state monopoly acquires capital resources through the national budget; (2) then it patterns the skills-based bureaucracy needed to operate its system after the public service; (3) it then develops simpler technologies in-house; and (4) finally, it acquires more complex technologies from foreign

suppliers either as an outright purchase, or via cooperative arrangements (e.g., some form of licensing). This pattern describes most African PTTs.

Prior to deregulation, the AT&T Bell System in the USA was the largest regulated private monopoly in existence. AT&T could use its revenue to fund capital projects, and its market power also provided sufficient income to fund technological development and production of even the most advanced equipment. Although its local service delivery organization was geographically decentralized, its long-distance services provided much of its income, and funded its R&D efforts at Bell Labs.

However, the most common pattern is some form of regulated competition, in which segments of the market are served by competing firms. This pattern may be mixed: in the USA, basic local services are provided by monopolies, while firms compete to provide value-added services such as mobile communications, long distance services, etc. Such firms may obtain capital from financial markets or by issuing equity to shareholders.

The neoclassical economic paradigm argues that unregulated competition provides many buyers and sellers with access to information to optimize the efficient exchange of goods. The assumptions underlying this theoretical school fit poorly with the economic realties of delivering goods (especially highly specialized services such as data) via a network-based infrastructure. Nevertheless, such a market may be taken as a state goal, which even if not fully attainable, should be pursued to the fullest extent possible.

Given this typology, and bearing in mind the sharp differences between the ways we use telephones and computers, two policy questions are: (1) which path to select in proceeding from a state monopoly to a free market; and (2) how to deal with the convergence between telecommunications and computing technologies?

Some interventions, such as tax credits, measures to attract overseas technology suppliers, or new university courses, affect technology supply. Others influence demand, such as subsidies for consulting services and mandates that the Civil Service automate transaction processing systems. The patterns reflect economic policies that have evolved since independence. In the late 1960s, a new government hoped to generate and maintain stable employment for all workers. To meet this need, the state intervened to secure multi-national corporations, capital, technology, management systems, and access to overseas markets. It is certainly important that government intervention includes the privatizing of state-owned telecommunication operators, major new institutions to guide research and development, various forms of assistance to local firms venturing into the IT arena, and expanded postgraduate technical and business education.

6.8.2 Demand-Pull and the National Information Infrastructure: Wireless Services

Mobile services such as radio telephones and pagers first appeared in the early 1970s, although use only began to expand following the installation of cellular systems during the 1980s. Today, GSM digital cellular services (implemented in 1993) facilitate call roaming services for a number of African subscribers and Gambia is currently

upgrading to a GSM. Gambia ranks very high among African countries in the highest per capita users of cellular mobile telephones, and the highest users of radio pagers. These factors increase demand for terrestrial and wireless call capacity, bandwidth, and reach to provide a strategic platform for the continuing evolution of wireless digital services.

6.8.3 Supply-Push and the National Information Infrastructure: ISDN services

The future prospects for the Internet Gateway depend on two key factors: (1) whether the current architecture for the Gambia will be sufficiently robust to incorporate new technologies; and (2) the developing and diffusion of global standards to enable decentralized design, development, and implementation of new applications which offer sufficient benefits to attract a critical mass of users.

Assuming a sufficiently robust architecture, demand for network services will originate from four main drivers: (1) globalization of markets and production which drives transaction volume growth and creates new needs for visualized information to close cultural gaps; (2) economic development alters demographic patterns, with growing prosperity, greater life expectancy, and a shift to leisure activities, leading to demands for greater information exchange and higher video and audio quality; (3) a generally higher business velocity in industries such as retailing, making information exchange more time-critical; and (4) the rapid emergence of information technologies and enabling applications to address new needs emerging from these driving forces, which vary by industry. Figure 9, below, portrays these relationships for eight key sectors of the Gambian economy.

Contextual forces in the industry domain drive demand for new applications, such as teleconferencing, virtual private networks, and interactive multimedia, while improved performance and lower costs drive demands for ISDN to replace existing services. For example, even though low labor costs are a primary basis for competition in the global printing industry, printers based in a country with strong IT infrastructure can seek niches where data acquisition skills, response time, and quality are more critical than cost. They can then develop ISDN networked-based EDI, imaging, and teleconferencing applications to improve customer service. In the global logistics industry, costs for physical activities (transport and warehousing) are essentially variable, while many of the costs to acquire, disseminate, and use knowledge (about transport modes and tariffs, customs regulations, and packing requirements) are fixed.

According to Chandler (1990), this economic structure gives rise to a wider service scope. This would enable The Gambia to develop network-based applications that supported an expanded range of services to meet the logistical needs of its multinational customers at a price lower than their internal costs.

The lesson of this simple framework is that as the driving forces rise in each key industry, new technologies appear to meet these emerging needs, and generate demands for services such as broadband ISDN. The Gambia, as a trading hub for the rapidly evolving West African region, will experience these emerging forces before other West African economies. The Gambia offers a relatively advanced supply of telecommunications services, and is a lead market for telecom-based services, albeit on a small geographical scale.

Figure 9: ISDN Service Demand as a Function of Context

INDUSTRY DOMAIN	CONTEXTUAL DRIVERS			TECHNOLOGY Domain Enabling Applications
	Globalization	Demographics	Velocity	
Electronic Advertising	Rising economies of scope	Rising personal income, salary	Client interaction	Teleconferencing Imaging
Financial Services	Increasing scope and scale economies	Rising Gambian managerial class	Response to customer	ATM, Imaging, VAN, VPN, Internet Banking
Logistics	Increasing economies of scope	Globalization of production & consumption	Service level, Capital utilization	VAN, Global Positioning Systems, Cellular
Media Services	Increase choice of media	Declining share of print media	Interaction with customer	Videotext, Video-on-Demand
Printing	Rising demand for service quality	Broader diffusion of Knowledge	Turnaround time	EDI, Imaging Teleconferencing, fax/print by demand
Manufacturing	Increasing scope & scale economies	Outsourcing tasks (programming) to low-wage nations	Inventory costs, Time to- Market	CAD-CAM Virtual Private Networks, EDI, e-commerce
Retailing	Increasing Competition	Rising consumer incomes	Inventory Turnovers	Teleconferencing Imaging, electronic commerce
Education	Increase need for skill labor	Rising need for an educated population	Response to parents and national needs	e-learning & long distance

Cellular and ISDN services are complimentary - broadband packet switched (ATM) ISDN services provide both speed and high capacity at low cost, while digital cellular can serve the "local loop" for mobile terminal users. According to Kupfer (1994), the combined effect of all-digital and advanced cellular services on quality will "make the

phones we use seem like two cans joined by a string," while enabling telephone service operators to "jump into new businesses and roll out new services with unprecedented ease and speed."

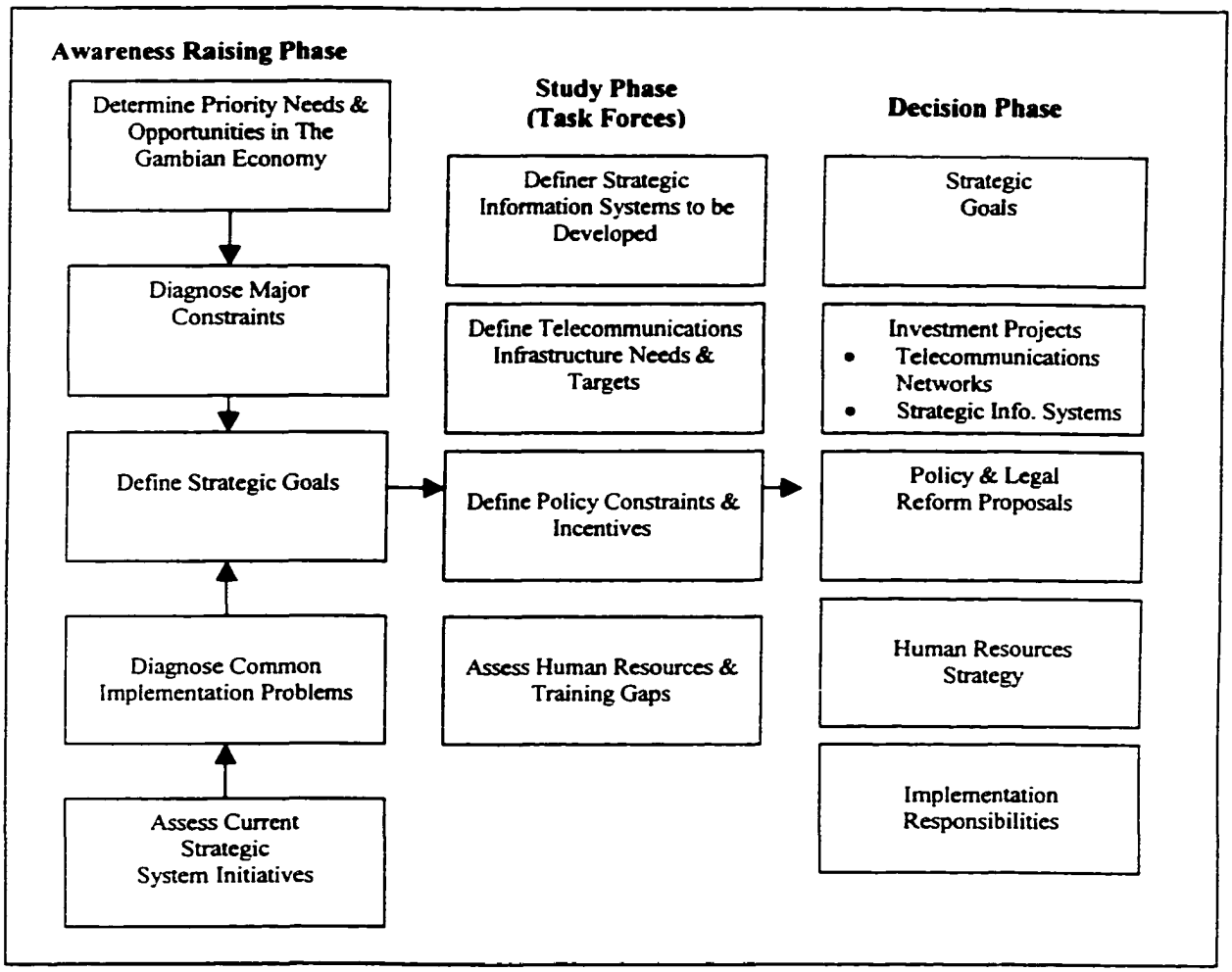
6.8.4 Approaches to Develop a National Information Infrastructure Strategy

There are important steps that need to be taken by the government of The Gambia in its attempt to develop an IT strategy. These steps were discussed in a presentation by E. Talero at the World Bank in June 1999:

- A top-down look at the Gambian economy in order to map out IT opportunities
- Assessment of The Gambia's current strategic information systems
- Formulation of goals and vision for the NII
- Definition of the strategic investments needed to achieve stated goals
- Agree on policy, legal, regulatory, or institutional reforms
- Assessment of skill and knowledge gaps and formulation of related education policies
- Development of project implementation profiles
- And determination of responsibilities for implementation and oversight of the NII strategy

Figure 10 below illustrates the phases involved in developing a National Information Infrastructure Strategy.

Figure 10: Approaches to Developing a Gambian Information Infrastructure Strategy



Adapted from a presentation by E. Talero, World Bank, Washington DC, June 1999.

6.8.5 The Evolution of Institutions to Govern the Infrastructure

The regulatory challenge is to create a policy environment that simultaneously encourages innovation while protecting investors in existing services. According to Sinha (1995), the demands for governance generated by shifting supply and demand forces are likely to vary

among nations with different economic structures, technological capabilities, and institutional structure. The Gambia's policy goals have been addressed by its evolving regulatory and control structures, capable of:

- an initial emphasis on government funding and control of its investment;
- followed by a gradual transition to a limited form of regulated competition accompanied by the differentiation of service delivery and regulatory roles; and
- the emergence of a legal structure competent to handle complex information production issues related to access, accuracy, privacy, and ownership.

The institutional framework in which telecommunications services operate evolved with changes in goals. In overcoming a lack of natural resources to compete with other African economies, The Gambia should first exploit its inherited strategic location and develop its population and basic infrastructure. However, the basic infrastructure of other African economies are of comparable levels. Direct labor and raw materials are now smaller portions of production costs, new technologies diffuse rapidly throughout the region, and the comparative advantage enjoyed earlier in the economic development cycle has began to decline. The response to this challenge is institutional reform.

Economic planning emerged in The Gambia during the 1970s in order to support efforts to improve the agricultural sector in the form of a five-year development plan. However, explicit technology planning is a more recent phenomenon. The 1984 initiative to upgrade the telecommunications infrastructure was a very important step and must, as

stressed before, be complemented with developing a human resource base to support IT and information communication.

It is my view that a national information infrastructure (NII), with a national Technology Plan, will move The Gambia into a new era, setting specific targets rather than general goals. It should include increasing the number of IT professionals, research scientists, and engineers, and increasing IT and R&D expenditure, public and private participation and partnerships, and the diffusion of IT in all schools. The suggested NITB will guide this initiative and will allocate resources to achieve leadership in specific areas, develop IT and scientific manpower, assist private and public sector IT and R&D efforts, and build the soft infrastructure capacity (e.g., technology information and legal services) needed to commercialize the fruits of its investments. The NITB is envisioned as dividing targeted technologies into three groups, based on their potential economic contribution and maturity, including telecommunications-related technologies. The first group of technologies should include EDI networks, videotex, value-added networks, local area networks (LANs), and wide area networks (WANs). R& D efforts should focus on fully exploiting the value derived from use of these technologies in all sectors of the economy. The second group of technologies involves enhancing the use and viability of wireless technologies and ISDN, and R&D efforts should attempt to acquire and develop capabilities in these areas. The third group should track the development of specific emerging technologies, and prepare to move quickly as they become relevant, appropriate, and sustainable for economic growth. The NITB should also focus on the enhancement and support of the recently implemented UNDP/GAMTEL Internet Gateway for The Gambia,

on appropriate software development to meet local needs, the building and maintaining of specialized research databases, and also serve as an incubator for nurturing Gambian and African technical talent. Through a strategic alliance between the NITB, GAMTEL, and private-sector and targeted foreign partners, the vision of the NII will be a reality with major economic impacts.

6.8.6 Policy Impacts

Some of these existing policy measures have already affected local use, access to international networks, and the availability of value-added services. The Gambia has one of Africa's highest levels of telephone installations per capita, after South Africa & Botswana. Its network now accesses numerous countries via satellite-based access to INTELSAT, and a variety of submarine cable-based access sources. Subscriptions to cellular radio-based services have accelerated despite minor setbacks, and the impact of telecommunications policy has been strongly beneficial, particularly in economic terms. Growth in IT investment is generally highly correlated with growth in national GDP and productivity, supporting the notion of IT-led development (see Kraemer & Dedrick 1994). The telecommunications-led information service sector represents a significant share of national income, and an even larger share of its service exports.

In developing an IT policy, it is important for the following elements depicted in table 16 below to be included

Table 16: Elements of an Information Technology Policy for The Gambia

General Economic Development	Supply Promotion	Demand Promotion	Market Regulation
• Trade Liberalization • Financial Liberalization • Telecommunications Liberalization • Foreign Investment	• Trade Protection and Incentives • Fiscal Incentives • Grant and Credit Programs • Export Facilitation Programs • Technical assistance • Training Subsidies • Educational Reform	• Fiscal Incentives • Technical Information Services • Directed Credit • Promotional programs: Trade Fairs, Demo Projects • Local Component Requirements for Public Contracts • Private Procurement of Public IT and Services	• Certification Standards • Technical Standards • Public Information • Intellectual Property Legislation • Electronic Signatures • Privacy, Confidentiality

Adapted from a presentation by E. Talero, World Bank, Washington DC, June 1999.

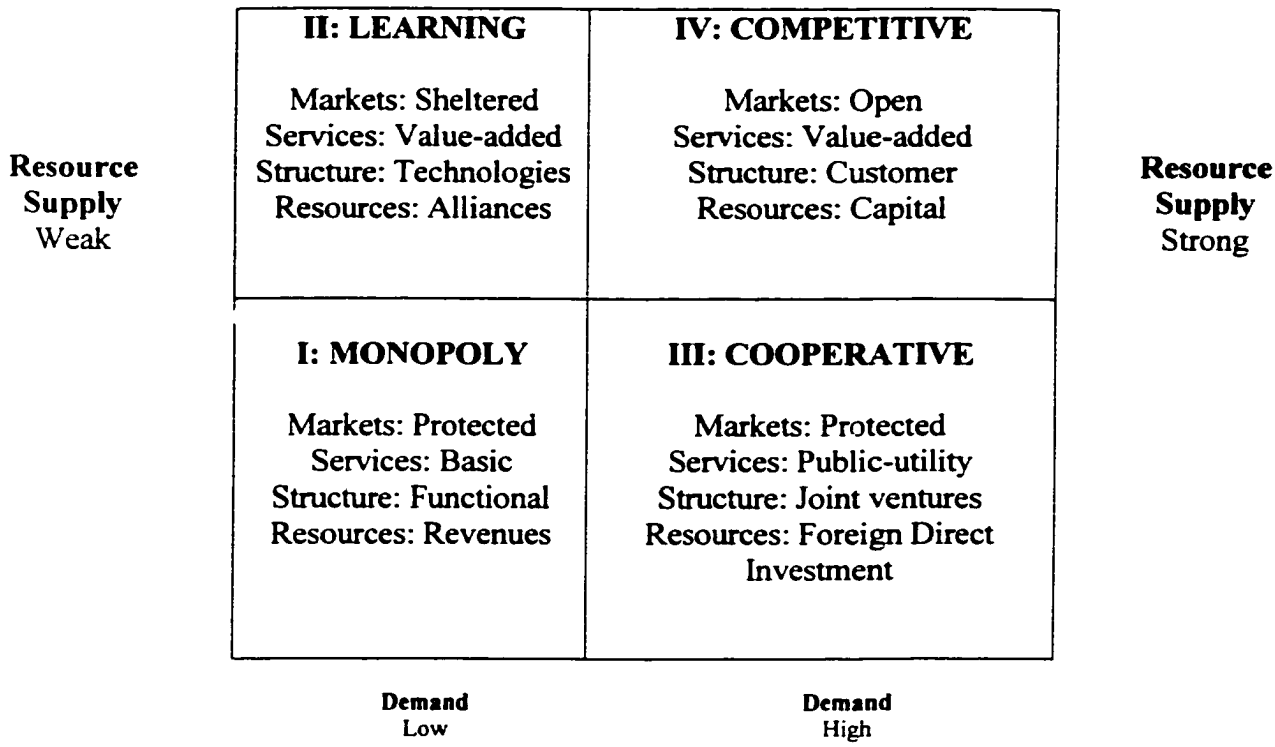
6.8.7 A Contingency Model for an Integrated IT Policy

Figure 10, below, depicts a dynamic contingency model of policy regimes governing access to telecommunications markets. The model reflects a need to match service supply with demand. At best, monopolies efficiently allocate resources only when demand is low, and the supply of resources is weak. Open markets efficiently allocate resources only when the national supply is strong enough to absorb slack resources within a reasonable time. Other conditions call for different approaches to governance: If demand is strong, but the local supply is weak, joint ventures with foreign suppliers fill service gaps while transferring technology and operational know how. When supply is stronger than

demand growth, market protection will ensure a continuing supply of new technology and the knowledge needed to transfer, adapt, and apply it. Each shift in Gambia's economic strategy demands reconfigured infrastructure, particularly telecommunications services. The multi-national corporations, seeking an environment conducive to business, required Gambia to provide factors of production, appropriate laws, governmental support, and a generalized basic infrastructure. Rising prosperity generated demand for additional services, and telecommunications service supply contributed to economic growth, a causal two-way link suggesting that inadequate service capacity could have been a severe constraint to rapid economic growth.

To understand the links between policy and new services, it is useful to consider the impact of The Gambia's policies on wireless ISD-based communications services. Gambians are now among Africa's highest per capita users of cellular mobile telephones and radio pagers. Similarly, The Gambia could implement an ISDN network to support its entrepot trading center. While all are telecom-related information technologies, they are used in different contexts and require different technical and organizational infrastructures. Telecommunications is a technology-based service industry, in which new service offerings often involve acquiring new technologies, then mutually adapting organizational capabilities and technologies to meet emerging market needs. Value-added services use computers to "package" telecommunications and information-related services.

Figure 11: Four Telecommunications Policy Eras for New Services Stemming from Rapid Economic Development & Globalization



The Gambian IT infrastructure evolved through three distinct eras, each focused on different goals, to maintain alignment with the national economic strategy. In the near-term, Gambia will adopt competitive policies to govern those specific services, such as wireless, where its policymakers view competition as a means to serve public interests, e.g., by lowering costs or improving service quality. For the long-term, the government is building up new institutions to govern a fully competitive market.

The Gambia case reveals two lessons: Firstly, national telecommunications and computer policies are inseparable, even when their formulation is not well-integrated. Secondly, IT policies are dynamic, and shift as the internal and external context changes. Infrastructure is obviously an important source of economic and social value, even though it is difficult to quantify precisely the economic value of information services. The strong, two-way link between economic growth and investment in telecommunications infrastructure (see Karlsson, 1993) resonates with the theoretical views of Reich (1991), who sees human capital and infrastructure as key determinants of development, and Porter (1990), who identifies a strong link between economic success and the development of national infrastructure and support.

CHAPTER VII

TELECOMMUNICATIONS INVESTMENT AND ECONOMIC GROWTH IN THE GAMBIA: AN EMPIRICAL ANALYSIS

7.1 Introduction

The antiquated state of the telecommunications network in African economies has been identified by the ITU (1997) as a significant impediment to regional productivity, international competitiveness, and trade performance. This situation suggests that the upgrading and extension of the telecommunications network should be a priority objective for policy-makers in order to facilitate growth.

The strong positive relationship between telecommunications and growth suggests that telecommunications investment is an important determinant of the rate of economic growth. Increasing telecommunications investment to upgrade the national telecommunications infrastructure has gained renewed interest in The Gambia as a possible strategy with which to promote economic development, and a vehicle to build national capacity for the information economy. The genesis of this renewed attention is David Aschauer's (1989) research on the impact of government investment upon private sector productivity. Aschauer hypothesized that the decrease in productive government services might be an explanation for the productivity slowdown in the United States in the 1970s. He tested this hypothesis by running regressions derived from a standard Cobb-Douglas production function augmented by public capital. Unlike a lot of the

studies reviewed, Aschauer's results lead to the conclusion that public capital is productive, and not just a possible inducement to business location. In my analysis of The Gambian economy, an attempt is made to empirically investigate the robustness of the claim that telecommunications investment has positive effects on output as an indicator of economic growth.

This section examines the relationship between gross fixed investment, telecommunications infrastructure investment, and economic growth, from an empirical standpoint, as they apply to The Gambia. In particular, this section focuses on empirically determining the direction of influence, and timing, between investment and growth.

7.2 Methodology

Anecdotal evidence suggests that supporting infrastructure, such as telecommunications, is necessary to coordinate the efficient use of economy-wide investment as the Gambia approaches the 21st Century. Inadequate telecommunications infrastructure is an internal barrier to trade and effective participation to electronic commerce and the global economy. Therefore, the second stage of the analysis examines the relationship between economic growth and telecommunications infrastructure.

The volatility and changing circumstances of the Gambian economy, which has experienced some real shocks, are described using short-run data series. Use of this data is sensible, whether or not the economies are on a stable growth path, since the directional response to the supply-side impact should be the same but have a greater variance. On this point, Fischer et al. (1996a) argues that the length and severity of

recession depends on initial conditions facing the economy, such as the share of military output, the lack of a legal framework supporting markets and private property, subsequent shocks, the external environment (including aid), and economic policy. The work of Jipp (1963) found that the greatest impact of telecommunications investment on growth has been in developing countries.

The approach taken in this section is to use data available for The Gambia, West Africa to examine empirically, using econometric analyses, factors influencing economic growth. Although this study would have preferred to use cross-country data for all African countries to perform these econometric analyses, it is quite difficult to find a usable economic data set for all African countries for the purpose of investigating economic growth. However, I *was* able to find a data set for The Gambia covering the period 1975-1997.

7.3 Data Sources and Variable Construction

The sources of data used to measure the variables identified below are: various issues of the Gambia Statistical Annex (IMF, 1997); various issues of the Gambia Statistical Abstracts, published by the Department of Statistics, Secretary of State of Finance; various issues of the IMF International Financial Statistics; the IMF's International Financial Statistics database; the World Economic Outlook database; the World Bank's Social Indicators of Development database; various issues of the World Bank's World Tables; a data set regarding telecommunications investment in African countries compiled by ITU; and the STAR Database of macro-economic data.

Variables Descriptions

Table 17a below display the description and source of variables used in this study.

Table 17a: Variables Descriptions

Variable Name	Variable Description	Sources
FTSTAFF	Full Time Staff in Telecommunications	ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
GDP	Gross Domestic Product	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
GDPPGG	Rate of Growth of Real GDP Per Capita	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
GFCF	Gross Fixed Capital Formation	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
GML	Growth Rate of Main Telephone Lines per 100 inhabitants	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
GOV	Share of Government Consumption in GDP	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
INV	Share of Fixed Investment in GDP	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
LABO	Human Capital	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
MLN	Main Telephone Lines per 100 inhabitants	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
POP	Total Population	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.

Table 17: Variables Descriptions (Cont.)

Variable Name	Variable Description	Sources
POPG	Rate of Growth of the Population	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
POLS	Political Stability (dummy variable= 1 if democratically governed ; = 0 if unstable)	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
SGDP	Rate of Growth of Real GDP Per Capita in the industrial and service sector	World Bank STAR Database; IMF's International Financial Statistics Database ; ITU(International Telecommunication Union); The Gambia Statistical Annex (IMF, 1997); The Gambia Statistical Abstracts.
TINV	Share of Telecommunications Investment in GDP	ITU(International Telecommunication Union); The Gambia Statistical Abstracts.
TELINV	Telecommunications Investment	ITU(International Telecommunication Union); The Gambia Statistical Abstracts.
TELREV	Telecommunications Revenue	ITU(International Telecommunication Union); The Gambia Statistical Abstracts.
WLIST	Waiting List For Telephone Line	ITU (International Telecommunication Union); The Gambia Statistical Abstracts.

Table 17b- Items Checked in the Empirical Analysis

SYMBOL	CHECKPOINT	REFERENCE	DECISION
X, Y	Data observation	Check for data errors, especially outliers, in data output. Spot check transformations of variables	Correct any errors. If the quality of the data is poor.
df	Degree of Freedom	$n-K-1 > 0$; n = number of observations; K = number of explanatory variables	If $n-K-1 \leq 0$, equation cannot be estimated, and if the degrees of freedom are low, precision is low. In such a case try to include more observations.
$\hat{\beta}$	Estimated Coefficient	Compare signs and magnitudes to expected values.	If they are unexpected, respecify model if appropriate or assess other statistics for possible corrective procedures.
t	t-statistics $t_k = \hat{\beta}_k - \beta_{H0} / SE(\beta_k)$ or $t_k = \hat{\beta}_k / SE(\beta_k)$ for computer supplied t-scores or whenever $\beta_{H0} = 0$	Two-sided test: $H_0 : \beta_k = \beta_{H0}$ $H_A : \beta_k \neq \beta_{H0}$ One-sided test: $H_0 : \beta_k \leq \beta_{H0}$ $H_A : \beta_k > \beta_{H0}$ β_{H0}, the hypothesized β, is supplied by the researcher, and is often zero.	Reject H_0 if $\lvert t_k \rvert > t_c$ The estimate must be of the expected sign to reject H_0. t_c is the critical value of α level of significance and $n-K-1$ degrees of freedom.
R^2	Coefficient of determination	Measures the degree of overall fit of the model to the data	A guide to the overall fit.
F	F-statistics	To test $H_0 : \beta_k = \beta_2 = \ldots = \beta_k = 0$ $H_A : H_0$ not true. Calculate special F-statistic to test joint hypotheses.	Reject H_0 if $F > F_c$, the critical value of α level of significance and K numerator and $n-k-1$ denominator d.f
DW	Durbin-Watson	Tests: $H_0 : p \leq 0$ $H_A : p > 0$ For positive seriel correlation	Reject H_0 if $DW < d_L$ Inconclusive if $d_L \leq DW \leq d_U$ (d_L and d_U are critical DW values.)
e_t	Residual	Check for transcription errors. Check for heteroskedasticity by examining the pattern of the residuals.	Correct the data. May take appropriate corrective action, but test first.)
SEE	Standard error of the equation	An estimate of σ. Compare with $\bar{Y}$ for a measure of overall fit.	A guide to the overall fit.
$SE(\hat{\beta}_k)$	Standard error of $\hat{\beta}_k$	Used in t-statistic	A "rule of thumb" is if $\lvert \hat{\beta}_k \rvert > 2SE(\hat{\beta}_k)$; reject H_0 $\hat{\beta}_k = 0$

Data

The study uses data from The Gambia for the period 1975-1997. (Table 18a-c reports the descriptive statistics of the variables used in the analysis).

Table 18a: Descriptive Statistics

	INVG	FTSTAFF	TELREV	WLIST	TELINV
Mean	-0.001682	589.5000	11822857	8595.714	38078913
Median	0.000000	588.5000	12100000	5315.000	10100000
Maximum	0.204678	892.0000	19800000	22000.00	1.37E+08
Minimum	-0.180556	370.0000	2520000.	2000.000	212000.0
Std. Dev.	0.081105	173.4717	6567862.	7874.602	46582880
Skewness	0.060165	0.133701	-0.187835	0.775747	0.874974
Kurtosis	4.307432	1.673036	1.468289	1.837512	2.411980
Jarque-Bera	1.580203	1.068864	1.450906	2.192467	3.266079
Probability	0.453799	0.586002	0.484105	0.334127	0.195335
Observations	22	14	14	14	23

Table 18b: Descriptive Statistics

	GDPPC	GML	GOV	POP	TINV
Mean	300.9189	15.63639	117.3823	815304.3	14.11979
Median	311.7831	8.860758	120.9524	778000.0	4.139344
Maximum	371.2949	57.57575	253.6232	1170000.	87.82051
Minimum	200.5141	0.000000	22.13115	548000.0	0.089076
Std. Dev.	47.83193	16.68077	74.54305	196388.9	20.71407
Skewness	-0.486161	1.463715	0.184044	0.326700	2.186354
Kurtosis	2.255833	4.149808	1.509824	1.796341	8.103130
Jarque-Bera	1.436727	9.479748	2.257941	1.797572	43.28074
Probability	0.487550	0.008740	0.323366	0.407063	0.000000
Observations	23	23	23	23	23

Table 18c: Descriptive Statistics

	GFCF	INV	LABO	MLN	SGDP
Mean	3.27E+08	19.32609	414095.9	1.205652	16.02174
Median	2.54E+08	19.70000	404833.8	1.400000	17.36000
Maximum	7.00E+08	22.20000	561440.4	2.120000	21.70000
Minimum	27000000	17.10000	286510.0	0.330000	8.680000
Std. Dev.	2.57E+08	1.516041	89898.45	0.618553	3.952457
Skewness	0.329602	-0.210605	0.224374	-0.060463	-0.413523
Kurtosis	1.395841	2.166949	1.763128	1.482592	1.926484
Jarque-Bera	2.882547	0.835084	1.659092	2.220601	1.759923
Probability	0.236626	0.658664	0.436247	0.329460	0.414799
Observations	23	23	23	23	23
Observations					23

The time patterns of some of the variables are examined to show the shocks experienced by the Gambian economy and also to demonstrate the positive connection between per capita GDP, TINV and Teledensity. The annual data for GDP in local dollars and USD, gross fixed investment, government consumption, and population were obtained from the World Bank (1997a), (1997b), and telecommunications investment and main telephone lines were obtained from the International Telecommunication Union (ITU, 1997). Inspection of the data, as reported in Figure 12, show that The Gambia experienced some major shocks in its economy in 1981 and 1994. In 1981, The Gambia experienced some political instability - there was an attempted coup d'etat – but this was foiled. In 1994, the country experienced another coup d'etat, however, which resulted in a military regime. The country became democratic again in 1996.

Figure 12: Political Stability in The Gambia 1976-1996

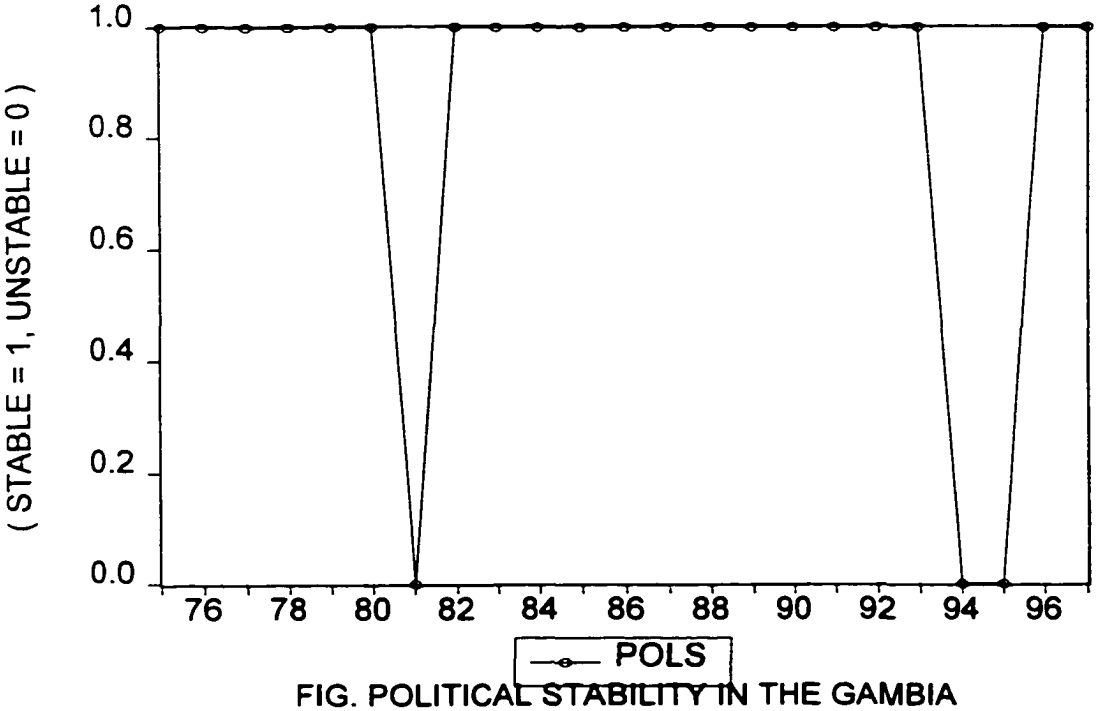


FIG. POLITICAL STABILITY IN THE GAMBIA

In 1981, the share of investment in GDP for The Gambia experienced no growth due to the shock, while in 1994 it declined by 14 percent. However, in contrast to the pattern exhibited by gross fixed investments, telecommunications infrastructure investment in The Gambia increased between 1984 and 1993. As part of the microeconomic process, many countries, including The Gambia, began to restructure their telecommunications sector and expand their telecommunication networks during this period. Investment in network expansion is reflected by tele-density data and, between 1984 and 1997, tele-density in The Gambia increased by 15 percent.

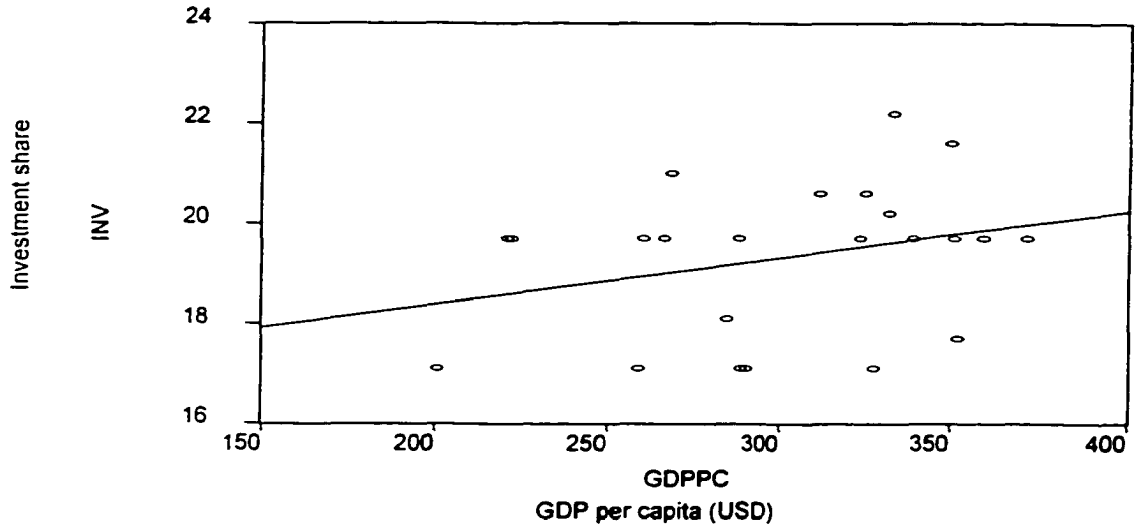
Despite this growth, average tele-density remains low and is a major barrier to improved competitiveness, trade performance, and economic growth. While Gambia's government have increased investment in its telecommunications sector, the size of this investment is significantly lower than that of developed economies. The most substantial telecommunications investments in The Gambia are still less than US$ 100,000, compared to the developed market economies of Western Europe that typically invest, per annum, around five billion US dollars in telecommunications.

An indication of the relationship between the indicators measuring investment share and per capita GDP can be provided by plotting each of the measure of investment share and tele-density against per capita GDP for the period 1975 to 1997. The patterns in figures 13 and 14 indicate a positive relationship between investment and GDP, and a positive relationship between tele-density and GDP.

The inclusion of a regression line shows the positive relationship between tele-density and GDP to be more pronounced than that between investment and GDP. This

suggests that telecommunications sector investment may provide an important determinant of economic growth.

Figure 13: Investment Share &GDP Per Capita 1975-1997
Regression Line: Investment Share = 16.5 +0.0093GDP per capita.

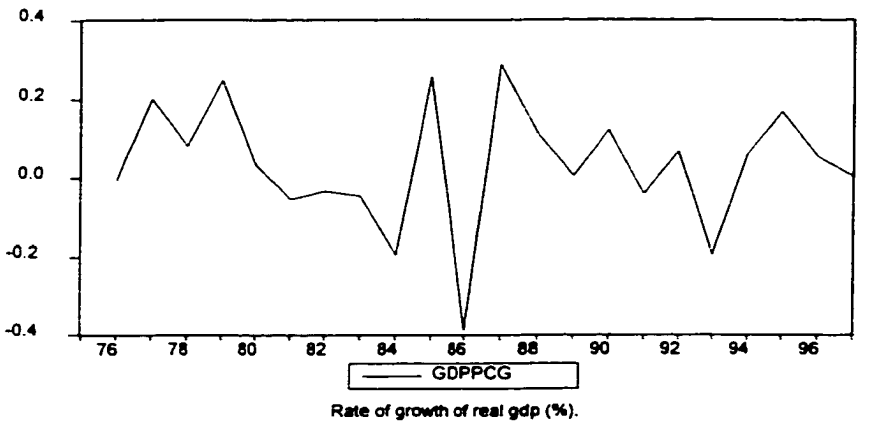


Source (ITU)

Figure 14: Tele-Density and GDP Per Capita 1984-1997
Regression Line: Tele-density = - 1.49 + 0.009GDP Per Capita

Source: (ITU)

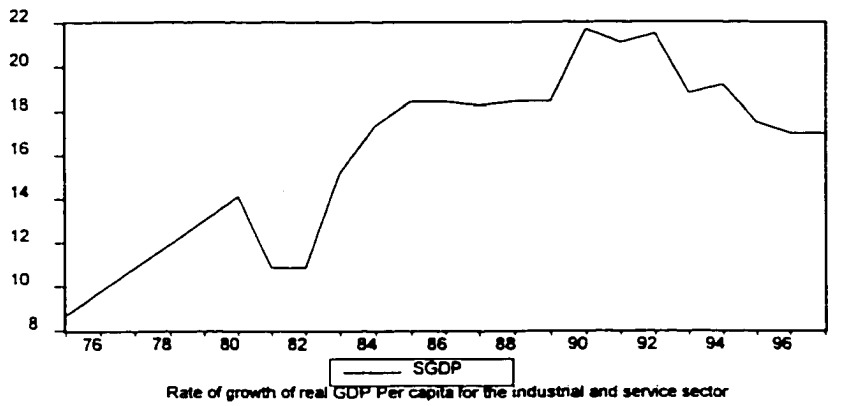
Figure 15: Rate of Growth of Real GDP (%) in The Gambia.



Source: World Bank

A general description of the economic conditions in The Gambia is provided by figures 15 to 19. Figure 15 shows that the average rate of economic growth was positive from 1975 to 1997. A relatively deep recession occurred in 1986, and a shock to the economy, due to the political instability, occurred in 1997.

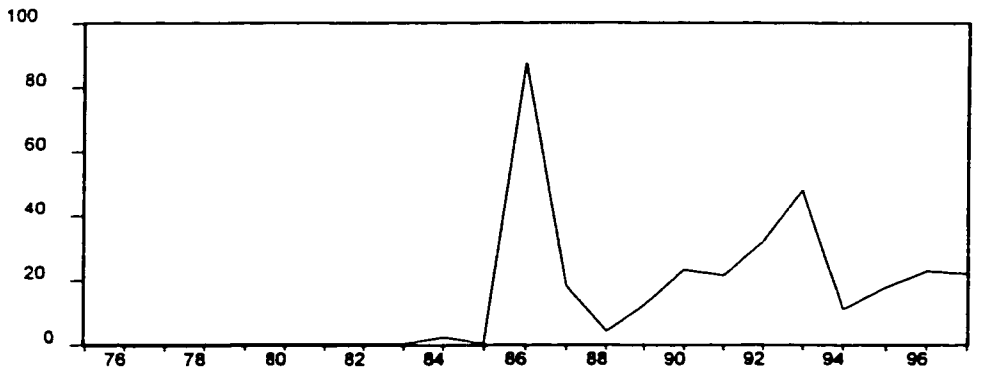
Figure 16: Rate of Growth of Real GDP for the Industrial and Service Sector in The Gambia, 1975-1997.



Source: World Bank

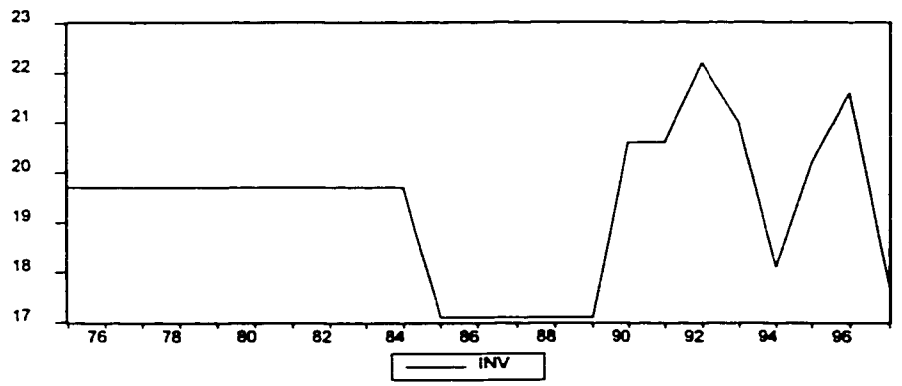
Since 1975, the aggregate growth rate has steadily become less negative, and positive for The Gambia. A similar growth path is apparent for the industrial and services sectors, and is reflected in figure 16, with the industrial services sector showing strong positive growth in 1990.

Figure 17: Telecommunications Investment Share of GDP (%) in The Gambia



Telecommunications investment share of GDP (%) in The Gambia, 1975-1997.

Figure18: Investment Share of GDP (%), 1975 – 1997 in The Gambia



Investment share of GDP (%), 1975-1997 in The Gambia; Source: World Bank

Source: World Bank

Figure 19. Growth Rate of Tele-density for The Gambia, 1975-1997

Growth rate of teledensity for the Gambia, 1975-1997. Source World Bank

Source: World Bank

Telecommunications investment, represented in figures 17 and 19, respectively, exhibit a similar pattern to that of output growth observed in figures 15-16. The telecommunications investment share of GDP and growth rate of tele-density declined initially, reaching a trough in 1983. After 1984, telecommunications investment increased, coinciding with the improvement in economic growth at both the aggregate and sectoral level. An examination of the growth paths of real GDP and telecommunications investment suggests that microeconomic action, in the form of telecommunications investment, also coincided with this period of improved economic growth.

7.4 Theoretical Framework & Methodology

An examination of the determinants of economic growth for the Gambian economy was conducted through the use of an econometric model. This model was developed from the cross-country economic growth equation used by Kormedi and Meguire (1985), Barro (1991), and Levine and Renelt (192). Following the general approach of DeLong and Summers (1991), the growth equation is extended to the sectoral level to allow examination of the relationship between telecommunications infrastructure investment and economic growth. DeLong and Summers (1991) use three different disaggregations of investment: transport equipment; electrical machinery, and non-electricity machinery.

A traditional aggregate production function is utilized here except that I introduce additional variables. The form of the production function is:

$$Y_t = f(L_t K_t \lambda_t C_t P_t D_t) \quad (1)$$

Y_t = is the rate of growth of real GDP per capita

L_t = is labor

K_t = is the share of fixed investment in GDP

λ_t = is the share of telecommunications investment in GDP

C_t = is the share of government consumption in GDP

P_t = is the rate of growth of the population

D_t = is the dummy variable, which equals 1 if the country is democratically governed and zero if it is unstable

t = time index.

The following functional form is proposed:

$$Y_t = e^{\alpha_o} K_t^{\alpha_1} L_t^{\alpha_2} \lambda_t^{\alpha_3} C_t^{\alpha_4} P_t^{\alpha_5} D_t^{\alpha_6} e^{\varepsilon_t} \qquad (2)$$

The model is estimated by taking natural logs of this equation and applying ordinary or restricted least squares to impose constant returns to scale. The aggregate economic growth equation is:

$$GDPPCG_t = \alpha_1 + \alpha_2 INV_t + \alpha_3 LABO_t + \alpha_4 TINV_t + \alpha_5 GOV_t + \alpha_6 POPG_t + \alpha_7 POLS_t + \varepsilon_t \qquad (3)$$

Where ***t*** indexes time; ***GDPPCG*** is the rate of growth of real **GDP** per capita; ***POP*** is the rate of growth of the population; ***GOV*** is the share of government consumption in **GDP**; ***INV*** is the share of fixed investment in **GDP**; ***TINV*** is the share of telecommunications investment in **GDP**; and ***POLS*** is a dummy variable that equals **one** if the country is democratically governed and **zero** if unstable. The dummy variable ***POLS*** is included to capture the growth path of our sample countries. The unknown parameters α_1 are to be estimated, and ε_t is a white noise error term. It captures the unexplained movements in output.

Table 19a: The Expected Signs for the Parameters

Variable	Description	Expected Sign
INV	Share of Fixed Investment in GDP	+ve (positive)
LABO	Human Capital Stock	-ve (negative)
TINV	Share of Telecommunication Investment in GDP	-ve (negative)
GOV	Share of Government Consumption in GDP	+ve (positive)
POPG	Population Growth	+ve (positive)
POLS	Political Stability (dummy variable=1 if democratically governed; = 0 if Unstable)	+ve (positive)

As indicated in Table 19a, the expected sign for the parameters are all positive except for the Regressors **TINV** and **LABO**. The rationale is that economic growth in The Gambia is retarded by the low human capital stock and inadequate investment in telecommunication. These are expected to be negative given that there is an inadequate stock of human capital although it has improved significantly and although the Gambia invested heavily to modernize its telecommunication infrastructure, the investments are observed to be sporadic and inadequate.

According to the findings of Cronin et al. (1993), Greenstein and Spiller (1995), investment in telecommunications can improve productivity and enhance growth at both the aggregate and sectoral level. While data limitations limit the estimation of sector-

specific models in African economies, it is possible to run regressions for the industrial and services sectors of The Gambia.

A sectoral economic growth equation is also specified where the dependent variable is the rate of growth of real GDP per capita in the industrial and service sectors, G_t . The form of the production function is:

$$G_t = f(L_t, K_t, \gamma_t, C_t, P_t, D_t) \quad (4)$$

G_t = is the rate of growth of real GDP per capita in the industrial and service sectors

L_t = is labor

K_t = is the share of fixed investment in GDP

γ_t = is the growth rate of main telephone lines per 100 inhabitants

C_t = is the share of government consumption in GDP

P_t = is the rate of growth of the population

D_t = is the dummy variable, which equals 1 if democratically governed and zero if it is unstable

t = time index.

The following functional form is proposed:

$$G_t = e^{\beta_o} K_t^{\beta_1} L_t^{\beta_2} \gamma_t^{\beta_3} C_t^{\beta_4} P_t^{\beta_5} D_t^{\beta_6} e^{\varepsilon_t} \quad (5)$$

The model is estimated by taking natural logs of the equation and applying ordinary or restricted least squares to impose constant returns to scale.

The aggregate economic growth equation is:

$$SGDP_t = \beta_1 + \beta_2 GML_t + \beta_3 LABO_t + \beta_4 GOV_t + \beta_5 INV_t + \beta_6 POPG_t + \beta_7 POLS_t + \varepsilon_t \quad (6)$$

Where ***SGDP*** is the rate of growth of real **GDP** per capita in the industrial and service sectors respectively; ***GOV*** is the share of government consumption in GDP; ***INV*** is the share of fixed investment in **GDP**; **LABO** is human capital, ***GML*** is the growth rate of main telephone lines per 100 inhabitants; and ***POLS*** is a dummy variable that equals **one** if the country is democratically governed and **zero** if unstable. The dummy variable ***POLS*** is included to capture the growth path of our sample countries. The unknown parameters β_1 are to be estimated, and ε_{it} is a white noise error.

Table 19b: The Expected Signs for the Parameters

Variable	Description	Expected Sign
GML	Growth Rate of Main Telephone Lines Per 100 Inhabitants	+ve (positive)
LABO	Human Capital Stock	-ve (negative)
GOV	Share of Government Consumption in GDP	+ve (positive)
INV	Share of Fixed Investment in GDP	+ve (positive)
POPG	Population Growth	-ve (negative)
POLS	Political Stability (dum.var. =1 if democratically governed; = 0 if Unstable)	+ve (positive)

The expected sign for the parameters are all positive except for the regressors **LABO** and **POPG**. The rationale is that economic growth in the private sector is

improving in The Gambia. Private sector participation in the economy is increasing and economic growth is enhanced positively with private sector development. A finding of a positive sign for a regressor coefficient suggests the importance and effect of a variable in promoting economic growth. The coefficients for **LABO** and **POPG** are expected to be negative given that there is an inadequate stock of human capital which is needed for private sector development, although it has improved significantly in the Gambia and a low participation of the population in private sector development in the Gambia. Equation (3) and Equation (6) are estimated by ordinary least squares (OLS) using annual data from The Gambia for the period of 1975-1997.

7.5 Discussion of Results

In the analysis of The Gambian economy, an attempt is made to investigate, empirically, the robustness of the claim that telecommunication investment has a positive effect on output as an indicator of economic growth. However, the methodologies of Aschauer (1989) and his followers have been criticized on several grounds (see Sturm, Kuper and de Haan 1998). Firstly, the adoption of the production function approach may be too restrictive. Inter-regional, inter-sectoral and inter-temporal allocation and distribution effects, trade effects, agglomeration effects, consequences for the public budget, employment effects as well as direct consumption and welfare effects are ignored. Secondly, Aschauer and his followers avoided the issue of causality in their study. Eisner (1991) questions whether reduced output growth would diminish the demand for public capital. Thirdly, Aschauer does not take the time series properties of

the variables into account (see Evans and Karras 1994a, 1994b; Sturm and De Haan 1995; Sturm 1998).

Given that the variables used in the estimating equations are stationary, the ordinary least squares (OLS) procedure is used to estimate the regression coefficient of the equations. The results are given in tables 20 and 21. The numbers in parentheses below the estimated coefficients are the absolute values of the t-statistics. The ADJ-RSQ measure is the adjusted coefficient of determination. The DW measure is the Durbin-Watson test statistic for serial correlation. The Durbin-Watson statistic is a test for first-order serial correlation. More formally, the DW statistic measures the linear association between adjacent residuals from a regression model, and is a test of the hypothesis $\rho = 0$ in the specification:

$$e_t = \rho e_{t-1} + \varepsilon_t \qquad (7)$$

If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall below 2 if there is positive serial correlation (in the worst case, it will be near zero). If there is negative correlation, the statistic will lie somewhere between 2 and 4. Positive serial correlation is the most commonly observed form of dependence. As a rule of thumb, with 50 or more observations and only a few independent variables, a DW statistic below about 1.5 is a strong indication of positive first order serial correlation. See Johnston and DiNardo (1997, Chapter 6.6.1) for a thorough discussion on the Durbin-Watson test and a table of the significance points of the statistic. The results from estimating the model in equation (5) - **GDPPCG** are reported in table 20. The coefficient

for **POLS** is positive and significant and excluding it from the model sees the estimated coefficients for our variables change substantially.

Table 20 : Estimates for Aggregate Economic Growth- Dependent Variable = GDPPCG

Independent variable		Estimated coefficients
Constant	α_1	- 0.168557 (0.418873)
INV	α_2	0.288434 (0.965797)
LABO	α_3	2.24E-06 (0.163097)
TINV	α_4	-0.005620[a] (-6.584944)
GOV	α_5	4.93E-05 (0.075297)
POP	α_6	-3.33E-0.7 (-0.099177)
POL	α_7	0.036954 (0.510164)
R^2		0.40
ADJUSTED R^2		0.16
D.W		2.1
F-test		1.67
Schwarz		-0.40
Akaike		-0.75
Number of observations		22

Standard errors are estimated using the White (1980) Heteroscedastic-consistent covariance matrix. t-statistics in brackets. [a]statistical significance at the 5% level: [b]statistical significance at the 10% level. The sample period due to data availability is 1975-1997.

The sign on the coefficient for **INV** is positive but not significant. Also, the coefficient for **TINV** is negative but significant at the five percent level. While the estimated effect of **TINV** is negative and significant at the five percent level, it may suggest that the level of investment is very low, an increment of which will dominate the explanation of the model. In addition, the estimated coefficients for **LABO** and **GOV** are both positive, but also not significant. The impact of the two investment variables appear to dominate the model. Furthermore, the explanatory power of the regression is poor.

Thus, the finding suggests that the model for aggregate growth does a poor job of explaining time-series changes in per capita **GDP**. These findings suggest poor contribution of the public sector to economic growth in The Gambia.

According to DeLong and Summers (1991); Levine and Renelt (1992) the rate of investment and policies that promote capital formation can determine national economic growth rates. It is the view of this study that a policy of a liberalized market that encourages competition and the development of a private sector will promote capital formation, increase the rate of investment and facilitate a faster development and use of information technology. This would have a greater impact on economic growth in The Gambia than a public sector approach as demonstrated earlier. The second model investigated the private sector in The Gambia which is at its infancy. The private sector model captured the recent modest private sector development and some of the private sector policy initiative taken by The Gambia government resulting in a much improved model than the latter.

The results obtained from estimating the separate model for the industrial and services sector are reported in table 21. The estimated coefficient for ***GOV*** is positive and significant at the 5 percent level. This suggests that an increment in government consumption expenditure coincides with a reduction in output growth of the industrial sector. Coefficient estimates for telecommunications continues to play an important role in explaining growth. The sign on the ***GML*** coefficient is both positive and significant at the five percent level.

The services sector regression displays a high explanatory power and, given the embryonic stage of the Gambian sector development, this result is quite surprising and encouraging. The finding of a strong and positive relationship between

telecommunications investment and economic growth suggests that the allocation of investment funds to productive infrastructures, such as telecommunications, is important.

An obvious extension of this dissertation is to determine the relative importance of other sector investments on economic growth as well as performing the analysis for the entire African economy, and also comparison with Asian economies with macro-economic dynamics to similar African economies.

These findings support the notion that the private sector plays a significant role in economic growth and the more public entities are privatized, the more of a positive impact it will have on the economy.

Table 21: Estimates from Sectoral Economic Growth :- Dependent Variable = SGDP

Independent variable		Estimated coefficients
Constant	β_1	- 3.618862 (-0.596323)
GML	β_2	0.051741[a] (2.022376)
LABO	β_3	0.000225[a] (2.692900)
GOV	β_4	0.021085 (1.632236)
INV	β_5	1.336780 (0.163797)
POP	β_6	-9.60-E05[a] (-2.689319)
POLS	β_7	1.999770[b] (1.972910)
R^2		0.80
ADJUSTED R^2		0.73
D.W		1.98
F-test		10.61[a]
Schwarz		4.73
Akaike		4.39
Number of observations		22

Standard errors are estimated using the White (1980) Heteroscedastic-consistent covariance matrix. t-statistics in brackets. [a]statistical significance at the 5% level: [b]statistical significance at the 10% level. The sample period due to data availability is 1975-1997

In summary, the findings reported in table 20 suggest that the model for aggregate growth does a poor job of explaining time-series changes in per capita **GDP**; however, table 21 suggest a marked improvement in the private sector. Furthermore, the results discussed above square with my theoretical expectations.

7.6 Testing for Granger-Causality

An attempt is also made in this dissertation to use another econometric methodology, Granger-causality tests, within the framework of Vector Auto-Regression (VAR) models as suggested by Sims (1980). The analysis looked at the time-series properties of the data. The existence and direction of Granger-causality between output and investment is discussed. Note, however, that correlation does not necessarily imply causation in any meaningful sense of that word. The econometric graveyard is full of magnificent correlations, many of which are spurious or simply meaningless.

It is important to note that the test for causality is useful when we know that two variables are related but we do not know which variable causes the other to move. This is not a theoretical causality test, instead a test for granger causality. Granger causality, or precedence, is a circumstance where one time series variable consistently and predictably changes before another variable does (Granger, 1969). If one variable precedes ("Granger causes") another, one cannot be sure that the first variable "causes" the other to change, but one can be fairly sure that the opposite is not the case.

Consider two time series $\{ Y_t \}$ and $\{X_t\}$. The series X_t fails to Granger cause Y_t on lagged Y's and lagged X's, if the coefficients of the latter are zero.

$$Y_t = \sum \alpha_i Y_{t-i} + \sum \beta_i X_{t-i} + u_t \qquad (8)$$

If $H_0 : \beta_1 = \beta_2 = \ldots \beta_{k2} = 0$, X_t fails to cause Y_t. The lag lengths k_1 and k_2 are arbitrary. However, the disturbance term u_t in the above regression must be close to being white noise. Therefore, suitable values of k_1 and k_2 must be chosen .

Also, X_t fails to cause Y_t in the Granger sense if in a regression of Y_t on lagged, current, and future X's, the latter coefficients are zero.

$$Y_t = \sum_{j=-k_1}^{k_2} \beta_j X_{t-j} + u_t$$

$$H_0 : \beta_{-1} = \beta_{-2} = \ldots \beta_{-k1} = 0.$$

In words, the prediction of Y from current and past X's would not be improved if future values of X are included. In implementing this procedure, it is important to take account of any serial correlation in the disturbance term. Sims regards test for Granger causality as tests for exogenity. Granger causality simply tests whether a certain variable precedes another. We are not testing causality, as it is usually understood.

Granger causality is important because it enables one to analyze which variable precedes or "leads". This is very useful in economic forecasting, however, this study is in no way suggesting that Granger causality proves economic causality in any rigorous manner. According to Granger, to see if for example, GDPPC Granger causes TINV, one should run:

$$TINV_t = f(TINV_{t-1}, TINV_{t-2}, \ldots, TINV_{t-p}, GDPPC_{t-1}, GDPPC_{t-2}, \ldots, GDPPC_{t-p}) \qquad (9)$$

And test the null hypothesis that the coefficients of the lagged ***GDPPC's*** jointly equal zero. If we can reject this null hypothesis using the F-test, then we have evidence that GDPPC granger causes TINV. It is also recommended to run granger tests, one in each direction, that is for example,

$$GDPPC_t = f(TINV_{t-1}, TINV_{t-2}, \ldots, TINV_{t-p}, GDPPC_{t-1}, GDPPC_{t-2}, \ldots, GDPPC_{t-p}) \qquad (10)$$

If the F-test is significant for equation (9) but not for equation (10) , then we can conclude that ***GDPPC*** Granger Causes ***TINV.***

The Granger (1969) approach to the question of whether ***TINV*** causes ***GDP*** is to see how much of the current ***GDP*** can be explained by past values of ***GDP*** and then to see whether adding lagged values of ***TINV*** can improve the explanation. ***GDP*** is said to be Granger-caused by ***TINV*** if ***TINV*** helps in the prediction of ***GDP***, or equivalently if the coefficients on the lagged values of ***TINV*** are statistically significant. Note that two-way causation is frequently the case; in this case, ***TINV*** Granger-cause ***GDP*** and ***GDP*** would Granger-cause ***TINV***.

It is important to note that the statement "***TINV*** Granger-causes ***GDP*** " does not imply that ***GDP*** is the effect or the result of ***TINV***. Granger causality measures precedence and information content, but does not by itself indicate causality according to the more common usage of the term. With reference to choosing the lags, in general it is better to use more rather than fewer lags, since the theory is couched in terms of the relevance of all past information. A lag length τ, corresponds to reasonable beliefs about

the longest time over which one of the variables could help predict the other. In addition, the availability of data and degrees of freedom restrict the length of the time lag. The following forms of bivariate regressions are analyzed:

$$TINV_t = \alpha_0 + \alpha_1 TINV_{t-1} + \text{---} + \alpha_n TINV_{t-\tau} + \beta_1 GDP_{t-1} + \text{---} + \beta_\tau GDP_{t-\tau}$$

$$GDP_t = \alpha_0 + \alpha_1 GDP_{t-1} + \text{---} + \alpha_n GDP_{t-\tau} + \beta_1 GDP_{t-1} + \text{---} + \beta_\tau TINV_{t-\tau}$$

for all possible pairs of (***GDP*** , ***TINV***) series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis

$$\beta_1 = ... = \beta_\tau = 0$$

for each equation. The null hypothesis is, therefore, that ***GDP*** does not Granger-cause ***TINV*** in the first regression and that ***TINV*** does not Granger-cause ***GDP*** in the second regression. The test results are given in Table 22. With the order of integration established, it is useful to test the existence and direction of causality between ***GDPPC, GDPPCG, MLN, GML, TINV, INVG AND SGDP***. Owing to its popularity in this type of work, the Granger (1969) test is used for this purpose.

If, for example, private investment Granger-causes economic growth, the null hypothesis that the sum of the coefficients c_i (I = 1,...,n) in equation (above) is equal to zero is rejected. Also, if economic growth Granger-causes private investment, then the null hypothesis that the sum of the coefficients d_i = (1,...,q) is equal to zero is also rejected.

The conclusions of the Granger-causality tests are as follows-

GDP Granger Causes MLN
TINV Granger Causes GDP
TINV Granger causes GDPPC
GML Granger causes INV
GML Granger causes SGDP
GML Granger causes TINV
MLN Granger causes INV
TINV Granger causes MLN
TINV Granger causes SGDP

Table 22: Results: Granger -Causality Test Outcomes

Pairwise Granger Causality Tests **Sample: 1975 1997** **Lags: 2**			
Null Hypothesis:	**Obs**	**F-Statistic**	**Probability**
MLN does not Granger Cause GDP	21	3.006865247	**0.0778773**
GDP does not Granger Cause MLN		1.771781091	0.201804136
TINV does not Granger Cause GDP	21	1.166930784	0.336456001
GDP does not Granger Cause TINV		6.571979077	**0.0082522**
TINV does not Granger Cause GDPPC	21	0.324047702	0.727852559
GDPPC does not Granger Cause TINV		3.44590047	**0.0569535**
INV does not Granger Cause GML	20	3.143773621	**0.0724006**
GML does not Granger Cause INV		0.152020083	0.860277802
SGDP does not Granger Cause GML	20	5.664832949	**0.0147009**
GML does not Granger Cause SGDP		0.255035019	0.778182125
TINV does not Granger Cause GML	20	3.199591178	**0.0696154**
GML does not Granger Cause TINV		0.521737297	0.603873833
MLN does not Granger Cause INV	21	0.186519999	0.831620677
INV does not Granger Cause MLN		5.21898984	**0.0179942**
TINV does not Granger Cause MLN	21	1.921688028	0.178663303
MLN does not Granger Cause TINV		3.937491819	**0.0406832**
TINV does not Granger Cause SGDP	21	0.148723527	0.862984968
SGDP does not Granger Cause TINV		6.234119144	**0.0099558**

Thus, analyzing the above results, we cannot reject the following null hypothesis:

1. GDP does not Granger Cause MLN
2. TINV does not Granger Cause GDP
3. TINV does not Granger Cause GDPPC
4. GML does not Granger Cause INV
5. GML does not Granger Cause SGDP
6. GML does not Granger Cause TINV
7. MLN does not Granger Cause INV
8. TINV does not Granger Cause MLN
9. TINV does not Granger Cause SGDP

But we do reject the following null hypothesis:

1. MLN does not Granger Cause GDP
2. GDP does not Granger Cause TINV
3. GDPPC does not Granger Cause TINV
4. INV does not Granger Cause GML
5. SGDP does not Granger Cause GML
6. TINV does not Granger Cause GML
7. INV does not Granger Cause MLN
8. MLN does not Granger Cause TINV
9. SGDP does not Granger Cause TINV

7.7 VAR Analysis

Many dynamic relationships can be captured using single equation time-series methods. Multi-equation models are increasingly being use in time-series research. The Concept of VAR(Vector Auto Regression) is used in this section to generalize univariate methods to consider multivariate systems of equations. The most basic form of VAR treats all variables symmetrically without making reference to the issue of dependence versus independence. VAR analysis uses tools such as Granger causality, impulse response analysis, and variance decomposition. This is useful in the understanding of the inter-relationship among economic variables and in the formulation of a more structured economic model. Here, the tools of Granger causality and impulse response analysis are used.

When we have several time series, we need to take into account the interdependence between them. Consider two economic time series Y_{1t} and Y_{2t}. Y_{1t} and Y_{2t} correspond to ***TINV*** and *GDPPC*, respectively.

$$Y_{1t} = \alpha_{11}Y_{1,t-1} + \alpha_{12}Y_{1,t-2} + \ldots\ldots \alpha_{1m}Y_{1,t-m} + \alpha_{21}Y_{2,t-1} + \alpha_{22}Y_{2,t-2} + \ldots \alpha_{2n}Y_{2,t-n} + \varepsilon_{1t}$$

$$Y_{2t} = \beta_{11}Y_{1,t-1} + \beta_{12}Y_{1,t-2} + \ldots\ldots \beta_{1p}Y_{1,t-p} + \beta_{21}Y_{2,t-1} + \beta_{22}Y_{2,t-2} + \ldots \beta_{2s}Y_{2,t-s} + \varepsilon_{2t}$$

One can also add exogenous or predetermined variables Z_t to the specification.

In Matrix notation

$$\begin{vmatrix} 1-\alpha_{11}L-\alpha_{12}L^2-\ldots-\alpha_{1m}L^m & -\alpha_{21}L-\alpha_{22}L^2-\ldots-\alpha_{2m}L^n \\ -\beta_{11}L-\beta_{12}L^2-\ldots-\beta_{1p}L^p & 1-\beta_{21}L-\beta_{22}L^2-\ldots-\beta_{2s}L^s \end{vmatrix} \begin{vmatrix} Y_{1t} \\ Y_{2t} \end{vmatrix} = \begin{vmatrix} \varepsilon_{1t} \\ \varepsilon_{1t} \end{vmatrix}$$

$$\nabla$$

$$\therefore \quad \nabla \begin{vmatrix} Y_{1t} \\ Y_{2t} \end{vmatrix} = \begin{vmatrix} \varepsilon_{1t} \\ \varepsilon_{1t} \end{vmatrix}$$

$$\begin{vmatrix} Y_{1t} \\ Y_{2t} \end{vmatrix} = \nabla^{-1} \begin{vmatrix} \varepsilon_{1t} \\ \varepsilon_{1t} \end{vmatrix}$$

If stability conditions are satisfied, then we can express Y_{1t} and Y_{2t} as functions of current and lagged values of ε_{1t} and ε_{2t}. These are known as impulse response functions. An impulse response function traces the response of endogenous variables in the system to shocks in the errors. With ***GDPPC*** and ***TINV***, a change in ε_{1t} will immediately change the value of ***GDPPC***. It will also change all future values of ***GDPPC*** and ***TINV*** due to the dynamic structure of the system. An impulse response separates the determinants of the endogenous variables into shocks or innovations identified with specific variables. It then traces the effect on current and future values of the endogenous variables of one standard deviation shocks to the innovations. If ε_{1t} and ε_{2t} are uncorrelated, ε_1 is the ***TINV*** innovation and ε_2 is the ***GDPPC*** innovation. An impulse

response function for ε_2 measures the effect of one standard deviation ***TINV*** shock today on current and future ***GDPPC*** and ***TINV***. However, it is very rare to have a case where the errors are uncorrelated. When the errors are correlated, they have a common component which cannot be identified with any specific variable. An arbitrary method of dealing with the problem is to attribute all of the effect of any common component to the variables that come in the VAR system. The errors are orthogonalized by a Choleski decomposition so that the covariance matrix of the resulting innovations in lower triangular. The transformed disturbances by the Choleski decomposition are in " standard deviation" units. That is,

$$\frac{\varepsilon_t}{\sigma} = 1 \qquad \Rightarrow \varepsilon_t = \sigma.$$

Changing the order of equations can dramatically change the impulse responses thus requiring care on interpreting the impulse response functions. If the disturbance terms are not correlated, the order of the equation does not matter.

A VAR is essentially a system of equations that makes each endogenous variable a function of its own past and the past of other endogenous variables in the system. In a VAR model a limited number of variables are distinguished that are explained by their own lags and lags of other variables. In the empirical analysis we use innovation accounting, specifically using impulse responses and variance decompositions, to analyze the effect of telecommunications investments and the other variables over time (Litterman, R.B, pp. 25-38).

According to Litterman, overparameterization is one of the major problems with VAR models. He suggested to overcome this problem by Bayesian vector autoregrression (BVAR). In BVAR, we assign some prior distributions for the coefficients in the vector autoregressions.. The BVAR and VAR models have been criticised as being " a-theoretical econometrics." Neither model uses any economic theory. Nevertheless, the BVAR has produced better forecasts than many structural simultaneous equation models. Also, Sims criticized traditional simultaneous equation models on the grounds that they relied on ad hoc restrictions on the parameters to achieve identification. However, VAR has proven a successful technique for forecasting systems of interrelated time series variables. The BVAR technique is not use in this study.

In the empirical analysis, there is strong evidence of a Granger-causality relationship between the variables used in this study – i.e., the Gambian economy. This evidence suggests a quantitative underpinning to the claim put forward by this dissertation that adequate telecommunications investment (amongst other relevant economic agents) induces economic growth.

This, however, does not rule out the possibility that telecommunication investment or infrastructure rose in anticipation of future GDP growth. VAR studies by Clarida (1993), McMillin and Smyth (1994), Otto and Voss (1996) and Sturm, Kuper and de Haan (1998) suggest that there is no evidence for the thesis that public capital spending influences productivity. According to Blomstrom et.al. (1996), the finding of a strong association between investment and growth does not necessarily imply a "causal' relationship. The relationship may run from economic growth to telecommunications

investment or from telecommunications to growth. Hardy (1980a), Cronin et al. (1991), Lee (1994), and Edirisurija (1995) suggest that there exists a mutual, or two-way, causal relationship between telecommunications investment and economic development. Telecommunications infrastructure investment enhances economic activity and growth, while growth results in a higher proportion of national income spent on telecommunications services and stimulates further telecommunications investment.

To test these relationships, a Granger-causality analysis can be performed. For instance, ***TINV*** is said to 'Granger-cause' a rise in ***GDPPCG,*** if the time-series prediction of ***GDPPCG*** from its own past improves when lags of ***TINV*** are added to the equation. This interpretation of causality is intuitively attractive, despite the problematic implications. For example, one of the critiques of this Granger-causality technique is that it cannot discriminate between ***TINV*** causing ***GDPPCG*** to rise and ***TINV*** rising in anticipation of future ***GDPPC*** growth. Simultaneity effects may also disturb it - ***TINV*** may Granger-cause ***GDPPCG***, while ***GDPPCG*** also Granger-causes ***TINV.*** To avoid this problem, analysis of Granger-causality is performed in a Vector AutoRegression (VAR) model.

The VAR methodology is similar to simultaneous-equation modeling in that several endogenous variables are considered together. In a VAR, its own lagged values and the lagged values of the other endogenous variables explain each variable. If necessary, deterministic variables, such as a constant or a trend, are included. The simultaneity problem is solved in a trivial way: no a priori identifying conditions concerning the causal relationship of the variables are needed.

Generally, a VAR model with p lags, VAR(p) model, for a vector Y of n endogenous variables has the following form:

$$Y_t = \Sigma^{p}_{i=1} A_i Y_{t-1} + D_t + \varepsilon_t$$

Where $A_{i,\, i=1,\ldots,p}$ are $n \times n$ matrices of parameters, D_t is a vector of deterministic variables, like a constant and a trend, and ε_t is a n-vector of disturbances with mean zero and variance-covariance matrix Σ . In case the order **p** is known, each equation in the system can be estimated by OLS.

An other problem with using VAR is that the number of estimated parameters can easily become large - one additional lag in the VAR model brings in n^2 extra parameters, which reduces the degree of freedom in the estimation procedure. In order to give an indication of statistical reliability, the impulse responses with a 95 percent confidence interval are reported. A variance decomposition analysis is also performed. The forecast error variance decomposition suggests the proportion of the movements in a sequence due to its own shocks versus shocks that may be ascribed to the other variables. If shocks in ***TINV*** explain none of the forecast error variance of ***GDPPCG*** at all forecast horizons, this suggests that ***GDPPCG*** is exogenous to *TINV*. Thus, ***GDPPCG*** evolves independent of the ***TINV*** shocks and the ***TINV*** sequence. At the other extreme, ***TINV*** shocks could explain all the forecast error variance in ***GDPPCG*** at all forecast horizons, so that ***GDPPCG*** would be entirely endogenous.

As suggested earlier, Vector Auto Regression (VAR) analysis is usually not done in the presence of a strong theoretical model. However, in this study, the inconclusive

results in the ***GDPPCG*** model, as indicated by the results displayed in table 21, suggests that an attempt to do a VAR analysis might be useful.

7.8 Time Series Properties of the Data

In time series, data often poses problems, the independent variables can appear to be more significant than they actually are if they have the same underlying trend as the dependent variable. These problems causes spurious correlation, which is a relationship between two or more variables that is caused by in some instances, the nature of the specification of the variables or statistical fluke and not by a real underlying causal relationship. Running a regression in which the dependent variable and one or more independent variables are spuriously correlated result to a spurious regression, and the t-scores and overall fit of such a regression are likely to be overstated or have validity issues. Some causes of this is when one divides the dependent variable and one independent variable by a third variable that varies more than the first two and some are caused by nonstationary. We investigate these issues in our data set.

The consequence of nonstationarity is spurious correlation that inflates R^2 and the t-scores of the nonstationary independent variable. The reason for this is that the regression estimation procedure attributes to the nonstationary $TINV_t$ changes in say $GDPPC_t$ that were actually caused by some factor (trend, for example) that also affect $TINV_t$. Thus, the variables move together because of the nonstationairty, increasing $\bar{R}^2$ and the relevant t-scores. A stationary time series is one whose basic properties do not change overtime. While a nonstationary variable has some sort of upward or downward

trend. A time series variable $TINV_t$, is stationary if the mean of $TINV_t$ is constant over time, the variance of $TINV_t$ is constant over time and the simple correlation coefficient between $TINV_t$ and $TINV_{t-k}$ (also called autocorrelation function) depends on the length of the lag(k) but on no other variable (for all k). If one or more of these three properties is not met, then $TINV_t$ is nonstationary. If a series is non-stationary, that problem is known as nonstationarity.

The tests adopted for nonstationarity is to visually examined the data set. A diagram of the data set will suggest to you that the mean of a variable is increasing dramatically overtime and that the series is non-stationary. In addition, one also looks at the autocorrelation functions (ACFs) for a variable tend to zero as k (lag length) increases and see if the ACF is significantly different from 0. If the ACF tends to 0 rather quickly, the variable is stationary, but if they do not, the variable is nonstationary. The other method utilized is the Dickey-Fuller test. This examines the hypothesis that the variable in question, for instance, TINV has a unit root, as a result, is likely to benefit from being expressed in first difference form. (Dickey and Fuller, 1979). For example to run the Dickey-Fuller test, one estimates the following equation:

$$\Delta TINV_t = (TINV_t - TINV_{t-1}) = \beta_0 + \beta_1 TINV_{t-1} + \varepsilon_t$$

And run a one-sided t-test on the hypothesis that $\beta_1 = 0$

$$H_0 : \beta_1 = 0$$

$$H_A : \beta_1 < 0$$

If β_1 is significantly less than 0, then we can reject the null hypothesis of nonstationarity but if we are not able to reject the null hypothesis, we still have not "proven" that Y is nonstationary

The sample distributions of causality tests are sensitive to unit roots and time trends in the data series (Sims, Stock and Watson 1990; Stock and Watson 1989). The model is assumed to be stable in this analysis: a necessary condition for model stability is that the time series are (trend) stationary. Therefore, non-stationary variables must be transformed into stationary ones before using them in our regression analysis. To determine whether series are stationary, we follow the testing strategy suggested by Dolado, Jenkinson and Sosvilla-Rivero (1990) and use the Augmented Dickey Fuller (ADF) test. Table 24 reports the outcomes of the test. Comparing the t-statistics from the ADF test and the corresponding critical values, shows that all time series under consideration are trend stationary, hence a trend variable is included in the VAR models.

In order to avoid the problem of spurious correlation in the regression analysis, the time-series properties of the variables used in the regression analysis are investigated using the standard augmented Dickey-Fuller (ADF) and the Phillips-Perron unit root tests under two alternative hypotheses. Following Reinhart and Wickham (1994), it is first assumed that there are no structural breaks in the series. Secondly, it is assumed that there is a one time break in both the mean and the trend at a specific point in time (Perron, 1989).

The form of the ADF test employed is given by:

$$\Delta w_t = \mu + \beta t + \alpha w_{t-1} + \Sigma \delta_i \Delta w_{t-i} + \varepsilon_t$$

where **w** is the variable of interest. The equation above allows for the presence of a non-zero mean and a constant deterministic drift. The number of lags was determined by a general-to-specific method, whereby a generous lag structure was allowed and the insignificant lags were eliminated sequentially. However, once a one time structured break is accounted for, these variables are integrated of order Zero.

Table 23: Unit Root Tests: Stationary Testing

Alternative hypothesis: **no unit root**

Regression: $\Delta w_t = \mu + \beta t + \alpha w_{t-1} + \Sigma \delta_i \Delta w_{t-i} + \varepsilon_t$

Series	Optimal Lag Length	t-statistics on α (ADF statistic)
GDPPCG	1	-3.07
SGDP	1	-1.87
INV	1	-2.41
LABO	1	-2.51
TINV	1	-1.81
GOV	1	-1.39
POP	1	-1.47
POLS	1	-3.46

* The critical value at the 5 % sig. level is -3.51 from N= 50 ((Guilkey and Schmidt (1989))

The rewriting of our original VAR model - necessary to conduct impulse response analysis and variance decomposition analysis - assumes stability of the model. A necessary condition to achieve stability is that the time series are (trend) stationary. A trend stationary suggests that changes in one variable do not have a permanent effect on the other variables because, by definition, all series ultimately return to their long-run

trend paths. Therefore, the fact that our series are trend stationary is very surprising and also frustrates long-run effects of infrastructure investment. For this reason this analysis is limited to short-run effects.

7.9 Impulse Responses

To further analyze the estimated VAR model, an impulse response analysis is applied. The ordering employed is "Main Lines per 100 inhabitants (***MLN***)", "the share of telecommunications investment in *GDP (TINV)",* and "Gross Domestic Product per capita ***(GDPPC)***". Placing GDPPC last is consistent with single-equation studies like Aschauer's (1989), in which the other variables in the model directly affect ***GDPPC.*** Placement of ***"MLN"*** first is based on the assumption that contemporaneous shocks to ***MLN*** stem mostly from government decisions, which are considered less endogenous than the other variables. Figures 20a and 20b display the impulse-response functions and their error bands for the estimated equations below.

VAR Model - Substituted Coefficients:

MLN = 1.423083442*MLN(-1) - 0.4157125625*MLN(-2) + 0.0032455732*TINV(-1) - 0.000355436743*TINV(-2) + 0.001251458186*GDPPC(-1) - 0.0007611265036*GDPPC(-2) - 0.1446566142

TINV = 68.12078931*MLN(-1) - 66.40986328*MLN(-2) + 0.4856708403*TINV(-1) - 0.3609206679*TINV(-2) + 0.2723785907*GDPPC(-1) - 0.2791048429*GDPPC(-2) + 7.229777703

GDPPC = - 45.11187907*MLN(-1) + 69.44533647*MLN(-2) - 0.6442951364*TINV(-1) + 0.2012066772*TINV(-2) + 0.09668186374*GDPPC(-1) + 0.2777961417*GDPPC(-2) + 191.1728912

In interpreting the graphs, note that a movement corresponds to a one-percent change. Also, the scale on the vertical axis is the same for all shocks. These graphs allow several conclusions, and the response of the ***GDPPC***-equation to a shock in ***MLN*** is positive.

An impulse response function traces the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables- ***MLN, TINV,*** and ***GDPPC***. A shock to the ***MLN*** variable directly affects the ***MLN*** variable, and is also transmitted to all of the endogenous variables through the dynamic structure of the VAR.

In the VAR model above, a change in ε_{1t} will immediately change the value of current ***MLN.*** It will also change all future values of ***MLN*** and ***GDPPC*** since lagged ***MLN*** appears in both equations.

If the innovations ε_{1t} and ε_{2t} in the VAR model above are uncorrelated, interpretation of the impulse response is straightforward. ε_{1t} is the innovation for ***MLN*** and ε_{2t} is the innovation for ***GDPPC*** . The impulse response functions measure the effect of a one standard deviation ***MLN*** shock on current and future ***GDPPC*** and ***MLN***. The innovations are, however, usually correlated, so that they have a common component that cannot be associated with a specific variable. A somewhat arbitrary but common method of dealing with this issue is to attribute all of the effect of any common component to the variable that comes first in the VAR system. In our example, the common component of ε_{1t} and ε_{2t} is totally attributed to ε_{1t}, because ε_{1t} precedes ε_{2t}. ε_{1t}

is then the ***MLN*** innovation, and ε_{2t} the ***GDPPC*** innovation, is transformed to remove the common component.

The responses in the graphs display a positive relationship between investments in telecommunications and economic growth. It also suggests that it takes some time for the system to adapt to changes in the infrastructural environment. The initial small positive effects displayed in the figures may be caused by backward linkages, or direct impulses on the economy through the demand for labor, and other capital goods, when the telecommunications infrastructure is being built.

Figure 20a: Impulse Response Functions

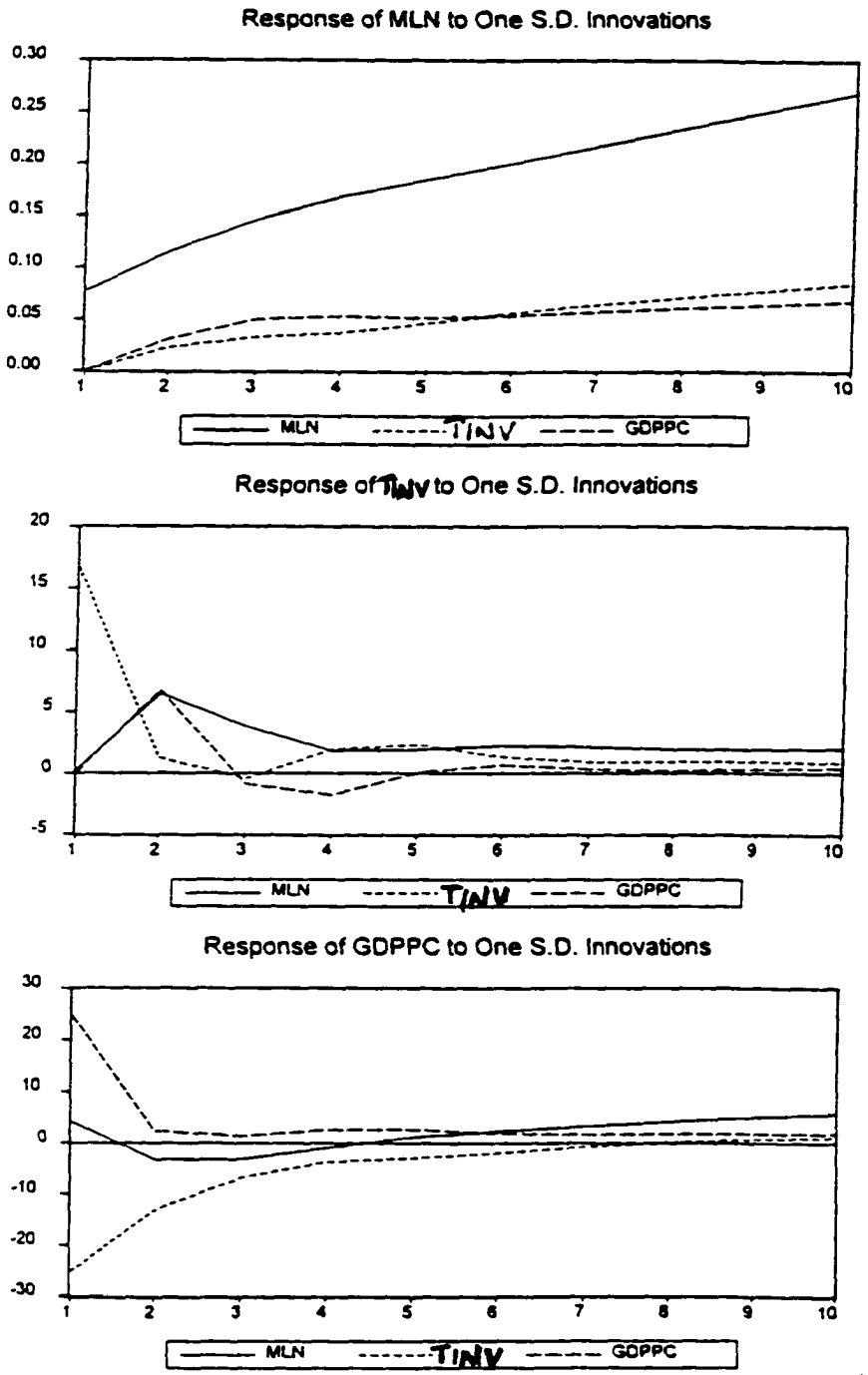
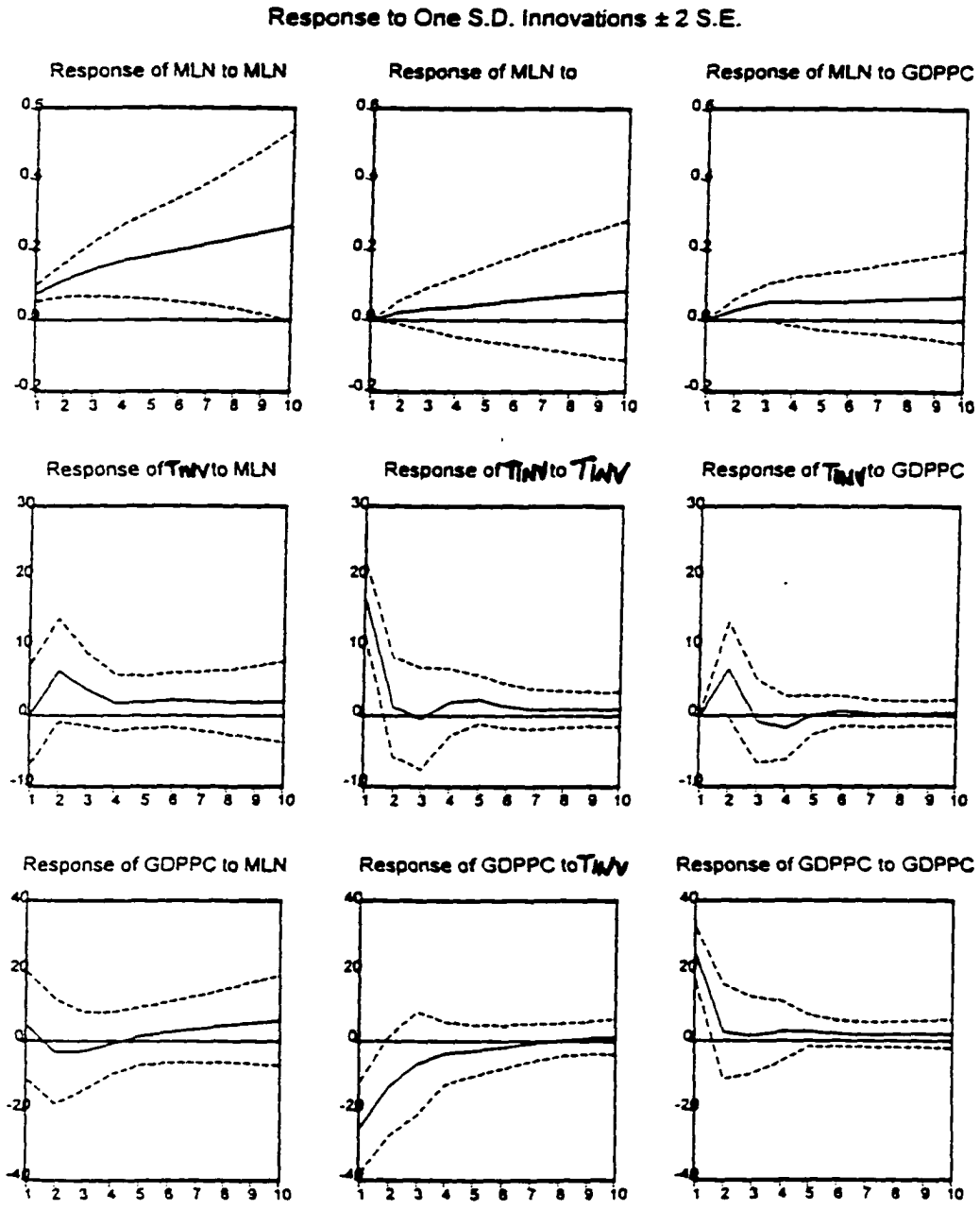


Figure 20b: Impulse Response Functions



CHAPTER VIII

Conclusions and Policy Implications

This chapter concludes this thesis by summarizing the thesis findings and discussing areas of further research. The motivation, hypothesis development, and thesis insights are summarized in section 8.1. Section 8.2 describes the relevance of these findings to policy making, economic growth, and development literature. Finally, section 8.3 describes further research that could build on this thesis.

8.1 Thesis Findings

This thesis began by analyzing the telecommunications sector in The Gambia. My analysis shows that the sector has developed substantially in the last few years, and the findings in this study suggests a great opportunity for The Gambia to position herself as a major hub for the information economy, given her modern telecommunications and information technology infrastructure. Major challenges found in this study include inadequate IT human capital, insufficient private and public investments in IT, minimal support and incentives for the private sector to invest in IT, and a lack of appreciation and know-how concerning the strategic use of IT to improve business processes, decision making, and economic efficiency.

The empirical analysis examined the relationship between growth and economy-wide investment. A positive relationship between aggregate investment and growth is found. There is evidence of growth preceding investment; however, support for

investment preceding growth is not established. This is not really surprising, as economic growth for The Gambia is very low, anyway. In this context, it is reasonable to expect that internal investment would closely track economic performance. It is argued in this thesis that an adequate telecommunications and information infrastructure is necessary to coordinate the efficient use of economy-wide investment. Our analysis also examined the relationship between economic growth and telecommunications infrastructure, particularly the direction of influence. The finding that telecommunication investment, especially when measured by main telephone lines, is related to economic growth is important. It lends support to policy makers in developing countries such as The Gambia in seeking investment designed to provide an adequate telecommunications and IT infrastructure in their countries. This results suggests that improving the inadequate investment levels in the telecommunications infrastructure of The Gambia, will improve the channel between aggregate investment and growth right across the economy.

This dissertation attempted to contribute to the growth literature with an analysis of economic growth and its relationship to telecommunications. My findings support the use of an endogenous growth model. In this part of the study my results suggest that physical and human capital accumulation and economic policies appear to play important roles in influencing economic growth. This could also be generalized for other African countries given the similarity in their macro-economic data.

The results in this study suggest the following points: Firstly, it appears that at the aggregate level, there are positive externalities stemming from physical and human

capital development, thus supporting a key assumption of a number of endogenous growth models. An important aspect of these models is that changes in economic policies and physical and human capital stocks can affect economic growth in the steady state. In contrast, in the neoclassical growth model, growth in the steady state can occur only from exogenously-given technological progress and population growth. Secondly, human capital development clearly plays a significant role in output expansion. Thirdly, telecommunication investment also plays a key role in output expansion. The empirical analysis also established that the model for aggregate growth – **GDPPCG** - does a poor job of explaining time-series changes in per capita **GDP**; however, the model for sector economic growth – **SGDP** - suggests a marked improvement within the private sector. This finding supports the notion that the private sector plays a significant role in economic growth and that, the more public entities are privatized, the more of a positive impact it will have on the economy.

The impact of the expansion of telecommunication investments on growth is robust to the addition of other relevant explanatory variables, and thus reinforces the crucial role played by this type of investment in output expansion. As increases in private investment stimulate growth, the government should formulate and implement policies that encourage private sector investment. Also, there is evidence that economic growth is influenced by economic policies. Politically unstable governments impact (depress) economic growth.

Thus, this research has contributed a case study of telecommunications in The Gambia, including its technological, economic, and social dimensions; proposed policy changes or initiatives to improve economic development through telecommunications and IT; and conducted an empirical analysis of economic growth and its relationship with telecommunications.

Using time series data from The Gambia to study factors influencing economic growth, the study suggests that the aggregate production function displays increasing returns to scale. Increases in infrastructure and human capital investments, together with appropriate policies, have significant impacts on economic growth.

In this study I have argued for the relevance of information technology and the need for adequate telecommunications infrastructure in addition to skilled human capital in the economic development models of developing countries, by using the Gambia as my case study.

8.2 Recapitulation and Policy Recommendations

Between 1975 and 1997 the average tele-density (number of main telephone lines per 100 inhabitants) in The Gambia was about 0.78. The percentage of main telephone lines connected to digital exchanges was about 5 percent (compared to over 50 percent in Western Europe), while an estimated 22,000 persons were waiting for connection to the telephone network (ITU, 1997). In 1975, The Gambia had one of the lowest incidences of telephone line ownership in Africa, with a tele-density of 0.26 and less than 1,000

national subscribers. This is not comparable to any developed country. Furthermore, most villagers in The Gambia had no access to telephones in their homes. Recently there has been an increase in village access through tele-centers located near most villages, although over 95 percent of telephones are still located in urban areas. These findings suggest that upgrading and extending the telecommunications network should be a priority objective for policy-makers in order to facilitate growth in The Gambia.

Until recently, the service sector, and particularly the telecommunications services, had a relatively low priority in the investment decision process of the Gambian government. Because of the structure of the government, hierarchically organized, vertical communication lines in industry were provided by the Ministry of Works, Transport and Communication through the public telecommunication operator (PTO). However, the individual horizontal communications links vital for competing firms in market economies were neglected. Further, investment in telecommunications infrastructure was low between 1975 and 1983. The investment that was eventually forthcoming between 1984 and 1997 was used to connect new telephone lines, replace and upgrade the network from analog to a one hundred percent digital network with a fiber optic backbone, and strengthen the underlying telecommunications infrastructure. Thus, The Gambia has developed one of the best telecommunications infrastructures in Africa. However, although some private companies and public enterprises have a workable level of telecommunications infrastructure, there is still an under-utilization of the digital network. Most government agencies or public enterprises and private businesses have not benefited fully in their use of the fiber optic network, and services

such as data transmission, data networks, internet use, and World Wide Web use, are still in their infancy. Unlike telecommunications services in other African countries, often characterized by few if any nationwide dialing facilities, low service quality, slow fault clearance, high noise and distortion ratios, and frequent disconnections, The Gambia's telecommunication service could be compared to that of most developed countries. Although subscriber charges and basic telephone service prices are moderate in The Gambia, the huge excess demand among potential telephone subscribers effectively invalidated the existence of cheap uniform domestic call rates. International traffic flows are enhanced by high quality and sufficient digitization, which not only increased personal international communication, but also enhanced the expansion of trade and international investment. There are currently ten local Internet sites in the Gambia, offering services to local businesses, and carrying these local businesses globally. The political changes and restructuring efforts of The Gambian government have finally begun to focus upon the telecommunication sector - policy makers have begun to recognize that The Gambia's competitiveness depends on the quantity and quality of information flows, and especially the generation and productive exploitation of new information (Vision 2020, 1995). The number of privately-owned businesses is increasing as a result of economic restructuring and the improved telecommunications infrastructure, and this growth in private businesses, combined with the increased role of information technology in management, has led to a substantial increase in demand for telephone lines.

To respond to these demands, the Gambian government have: installed new digital international switches to decongest a critical bottleneck; constructed overlay digital networks to relieve congestion in the trunk networks, providing high-quality service to large users; constructed the skeleton for long-term network modernization; licensed cellular operators; and licensed the building of packet-switched data networks for large data users. The building of cellular networks is a quick way of providing business with telephones and this service has recently been privatized to allow further expansion and growth. The cellular network is used for mobile communications and to reduce pressure on the demand for telephone lines.

In the longer term, the Gambian government is aiming to at least double the rate of investment and network growth, with a view to achieving continued tele-density growth. To put this resource requirement into perspective, it is informative to note that The Gambia's GDP per capita is about 300 US Dollars (USD).

The following recommendations have been offered for The Gambia:

1. Adequate and urgent attention should be directed toward the establishment of computer and IT education in the educational system of the country, including the University of The Gambia currently planned. E-learning (electronic Learning) should be adopted. E-learning eliminates the barriers of time and distance creating universal, learning-on-demand opportunities for The Gambian people. It also delivers accountability, accessibility and opportunity, allowing Gambians and

organizations to keep up with changes in the global economy that now occur on internet time.

2. An institution should be established to formulate national policies on training, strategic planning, and the procurement and coordination of IT. The non-existence of an IT policy has encouraged the dumping of all sorts of computer hardware into the country and has exacerbated the difficulties inherent in regulating professional practice. The lack of intellectual property and copyright laws has also caused rampant software piracy. The Gambia must adapt to the demands of the information economy to stay ahead in an increasingly competitive global market place.
3. The electrical power supply should be improved. Poor economic conditions have heightened the frequency of electrical power failures in The Gambia. This situation has created the need to acquire expensive generating sets as a way of assuring uninterrupted power supply, thereby making computerization a capital-intensive project.
4. The private sector should be empowered to innovate with IT and should be involved in the formulation of IT policies.
5. Hardware and software should be standardized.
6. Provisions should be made for locally assembling some hardware as well as encouraging software development to meet the needs of the public and private sector, and to build capacity and capability for export.
7. Figure 7 is a recommended schema for an IT strategy

Private sector development is required to foster an internationally competitive supply of IT and of goods and services (especially in telecommunications systems). In order to accumulate IT, attract FDI, and develop innovative information and telecommunications services, the government should progressively eliminate state monopolies in telecommunications and TV broadcasting. The government should also ensure competitive supply of key technologies through open market policies and legal reform. In addition, the government should stimulate improved technological capabilities in local industry, as well as promote human capital formation designed to align human resources strategy and educational delivery mechanisms with the needs of an IBE. Public sector management should be strengthened in order to increase productivity and innovation in public sector services through better use of informatics. Information regulation is also necessary - to safeguard civil liberties and consumer rights against risks created by informatics.

A public-private sector partnership that tackles this agenda can make informatics a catalyst for The Gambia's economic modernization and a potent source of international competitiveness. Building an information-based workforce would be a challenge for the government. The Gambia's young population is potentially the country's greatest asset, but only if the educational system works efficiently, is responsive to market demand, and can be properly funded. To create the talent and skill base central to an information-based economy, policy makers must design the planned University of The Gambia so that it can build capacity and capability in IT. They must also mobilize private resources for the training system and create an enabling environment for general skills formation

in IT and information use. The government must also embark on computerizing the civil service and all sectors of the economy.

In short, government policy makers need to eliminate state monopolies in telecommunication and broadcasting; foster technology development in the private sector; ensure competitive and open informatics markets; diffuse computer literacy throughout the civil service, and build a Gambia information infrastructure. Furthermore, they should implement national databases and an information policy; improve the electricity and power supply in the country; introduce government procurement, standards, training and risk management, modernize the legal framework for informatics, introduce a consistent regulatory framework regarding information content, and prepare and enforce better information standards. This will turn the country into an information-based economy and will have a positive impact upon economic growth and development and help produce a better quality of life. Below is a proposed information-based economic development model derived from this dissertation's analyses and findings.

7.3 Further Research

The finding of a strong relationship between fixed investment and economic growth rates has led many economists to conclude that the rate of capital formation determines the rate of economic growth (DeLong and Summers, 1991); Wolf, 1991; Levine and Renelt, 1992). Further, Aschauer (1989), and DeLong and Summers (1991)

argue that specific types of investment, such as public infrastructure and machinery and equipment, have a strong association with productivity and growth.

Consequently, the optimal allocation of investment funds to sector-specific infrastructures is an important policy issue. In particular, investment in telecommunications infrastructure has the potential to improve national productivity and economic growth. Economy-wide gains occur through the reduction of transport and transaction costs, improved marketing information, and the accelerated diffusion of information and knowledge.

Accordingly, the second stage of the empirical analysis is concerned with examining the relationship between economic growth and telecommunications infrastructure. In particular, should telecommunication investment be related to economic growth, it would lend support to World Bank programs that have provided substantial, but as yet inadequate, investment towards telecommunications network development and deployment. The empirical results may prove useful to Gambian policy makers, international organizations, and foreign investors as they consider the large investment required to enhance Gambia's telecommunications infrastructure.

Chapter Seven can be used as a methodology to analyze the impact of IT investments on economic growth. The data in this chapter opens up new opportunities for further data analysis. Enhanced data collection could give greater insight into just how indicative this data is of IT investment's link to economic growth. Most importantly, data collection that increases the time window examined can give insight into the progression of changes that characterize IT investments over the longer term.

A more complex methodology can examine economic growth models to determine which model best describes IT-led growth. The data collection can be expanded beyond The Gambia to examine African and other countries.

New hypotheses can be developed to augment the ones tested in this thesis. Survey and interview data could help compliment the data utilized in this thesis in order to carry out a somewhat more qualitative assessment of the benefits of IT and telecommunications investment.

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- **Cross-Platform Customer Solutions Award** - *AT&T Bell Laboratories, Middle town, Human Factors Group, Global Communications Systems (GBCS - 1993)*
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Publications & Presentation

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2. Katz, I. R, Zukerman, D.I & Kah, M. M. O (1994). A Software Tool for Developing Computer based, Free-Response Assessments. **(American Educational Research Association, 1995 Conference, California).**
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