

**NEW INFORMATION AND COMMUNICATIONS TECHNOLOGIES:
CHALLENGES AND OPPORTUNITIES
FOR THE SENEGALESE ECONOMY
Final Report**

Gaye Daffé and
Mamadou Dansokho

College of Economic Sciences and Management
Applied Economics Research Center
Cheikh Anta Diop University of Dakar

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UNRISD, Palais des Nations
1211 Geneva 10, Switzerland

Tel: (41 22) 9173020
Fax: (41 22) 9170650
E-mail: info@unrisd.org
Web: <http://www.unrisd.org>

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Introduction

In the course of the last three decades, information and communications technologies have become an essential, indeed a primary vector of economic and social activity in virtually all parts of the world. New information and communications technologies (NICTs) are generally defined as the totality of information storage, communications, data management and data processing systems and devices. They constitute a “converging set of technologies in microelectronics, computing (hardware and software), telecommunications/broadcasting and optoelectronics.”¹ This convergence and interaction between electronics and informatics accounts for the ability that NICT applications have demonstrated in meeting the needs not only of government and business, but of households and individuals.

Subject to the same laws of the market as any other market production activity, ICTs represent, moreover, a sector in which competition operates directly, at a global level. The globalization of enterprises, markets and financial networks has led to a reorganization of economic structures and trade flows, as well as to the professionalization of communications and information. In addition, it has produced more extensive integration of the phases of product conception, creation and use, as well as a parallel merging of previously separate and even opposing areas of activity.

Following in the footsteps of the industrial giants which, during the 20th century, took over telephone networks, electric power, and rail and air transport, small and medium-sized enterprises proceeded to build vast empires in record time. Every day, new technological advances are making previous achievements obsolete, while huge fortunes are created (and vanish) with blinding speed.²

While Africa is still relatively under-equipped in terms of information and communications media, the progress achieved in a single decade is nevertheless impressive. The development of these technologies promises to move Africa decisively into the modern industrial age, while offering hope that the vast technical and scientific potential unleashed by these technologies will help in solving the long-standing problems of under-development and economic stagnation.

Within Sub-Saharan Africa, Senegal is a pioneer in the field of new information and communications technologies. In the wake of the serious problems experienced by Senegal since the end of the 1970s, the State has come to regard NICTs as a basic ingredient in restoring the national economy's role in world trade. In this respect, Senegal brings a unique combination of assets to bear: its geographic proximity to Europe and the Americas; a highly educated population; a vast commercial and financial trade network drawing on a young and energetic émigré population; and a relatively well-developed telecommunications infrastructure capable of providing highly competitive services.

Thus, the Senegalese economy is well positioned to attract increasing foreign investment in information and communications technologies (ICTs) and to benefit from the sector's continuing expansion. However, despite increased growth and the influx of capital made possible by the 1994 devaluation of the CFA franc, Senegal has been slow to take advantage of this enormous potential and of the opportunity to become a service economy.

This paper attempts to analyze the challenges – both in terms of opportunities and of the risk of marginalization – that ICTs represent for Senegal's growth and social development, examining the steps that Senegal must take to leverage the opportunities that NICTs provide for regaining a share in the international division of labor.

The analysis is divided into five parts. The first describes the major structural characteristics of the economy; the second details the methods and means by which ICTs are being developed; the third evaluates supply and demand for services related to various ICT applications; the fourth, focusing on telecommunications as the centerpiece of these technologies, examines the current relationship between this industry and others within the economy, using Senegal's national accounts and the 1996 input-output table (IOT) as a reference point; the fifth and final section examines the nature of the constraints that the Senegalese economy must overcome in order to become part of the technological revolution.

¹ Castells (1998)

² Shapiro and Varian (1999)

Socio-economic context

Current trends, along with the general state of economic structures, suggest that Senegal has not taken advantage of the historic lead it enjoyed over other African nations, at the time of its independence, and has failed to capitalize on the modernization efforts undertaken by the newly independent state and on diversification and development within new and old agricultural, industrial and service sectors.

Socio-demographic characteristics

In addition to having an Atlantic coastline of more than 500 km., Senegal has common borders with six other countries: The Gambia, Guinea, Guinea-Bissau, Mali and Mauritania. Senegal, whose territory covers 196.190 km², is divided into ten regions and thirty departments varying widely in geographic size.

With an inter-census growth rate (1976-1988) of 2.7 per cent, Senegal's population grew from nearly 7 million in 1988 to 9.3 million in 1999 (DPS, 1992). Forty-five percent of the population is under 15 years of age. Along with the wide variation in population density, there is great variation in rate of growth from one region to another, ranging from 1 per cent in the region of Louga to 3.7 per cent in the Dakar region. Moreover, the latter region accounts for almost one third of the total population, with two-thirds of Senegal's population residing in 14 per cent of the national territory.

Despite a long educational tradition, the gross enrollment rate has remained fairly low: 65 per cent for elementary school, 16 per cent for middle and secondary school and 1 per cent for tertiary education institutions in 1998. Technical-school recruitment has experienced a decline: the number of students enrolled in 1997 was less than 46 per cent of those enrolled in 1992.

Senegal is a republic with a history of deep democratic traditions, except for the period in which a single-party regime was in power. Public life is structured around a dynamic press and broadcast media, consisting of numerous newspapers, public and private radio stations and a national television channel, as well as several foreign channels. This presence served as the backdrop for the country's first change in political administration, which occurred in March 2000, after forty years of single-party reign.³

Status of the economy

Growth profile. The trend characterizing the Senegalese economy is more one of stagnation than of growth. The GDP growth rate, which fluctuates widely, was also very low in past times. Until the end of the 60s, the economy was based on a prosperous peanut industry and on the relatively developed industrial base inherited from the colonial period. Peanut production – the heart of economic activity – which at that time was controlled entirely by the State, set the pace for the country's economic life and lent vitality to other sectors.

However, the successive droughts that plagued agriculture, along with the long subsequent phase of industrial decline led to a distinct slowing of growth beginning in the mid-70s. Weak growth was accentuated by a decline in the level of investment during that period. After having grown from 7.1 per cent in the 60s to 14.6 per cent in the 70s, the rate of investment plateaued at around 12 per cent until the mid-90s. In the period from 1994-2000 (Table 1), it climbed to 19 per cent. Because of the low savings rate, this investment was financed largely by funds from abroad.

The major economic and social development efforts of the first fifteen years of independence were followed, during the 80s and 90s, by stabilization and adjustment programs designed to improve public finance and restore external accounts.

Following the devaluation of the CFA franc in 1994, there was a revival of economic growth, increasing from a rate of 2-3 per cent to 5 per cent of GDP (Table 1). This revival led to the longest continuous period of per capita GDP growth in the country's history.

³ The Socialist Party was the first to govern, in 1960, and it remained in power until the most recent presidential election, in March 2000, in which a coalition of opposition parties won, running as their common candidate in the second round Abdoulaye Wade of the Senegalese Democratic Party (PDS).

During the 1994-2000 period, the transportation and telecommunications sub-sector had the highest and most stable growth rates, with the exception of construction and public works. Indeed, despite the poor performance of land and rail transportation in recent years, the sub-sector has had an average annual growth rate of 6 per cent, compared to 5.3 per cent for the tertiary sector as a whole (see Table 2). The explosion in mobile telephony and teleservices is primarily responsible for this dynamic growth. Structural characteristics of the economy. The respective contributions to GDP growth by different sectors are both unequal and highly inconsistent. While the tertiary sector was characterized by a high level of activity and stability, this was not true for the primary and secondary sectors. The contribution to the GDP by the primary sector, whose growth never exceeded 4.3 per cent for any of the periods under consideration, fell from 24.4 per cent in the 1960-1969 period to 19.3 per cent in the 1994-2000 period (Table 1). On the other hand, while progress in the secondary sector has relied more on energy, construction and public works than on industry per se, its contribution to the GDP has increased from 12.1 per cent to 20.4 per cent in the two periods being considered.

Thus, despite modern industrial facilities and ambitious projects launched by the country's early heads of State, Senegal has not managed to industrialize its economy. From an annual average growth rate of 5-6 per cent in the 60s and 70s, growth in industrial production fell to 1.2 per cent in the 1980-85 period, before dropping to a negative rate of growth during the 1985-91 period. Industrial activity is hindered not only by a lack of diversification, but also by an imbalance in geographic distribution. A survey of the industrial sector⁴ indicated that in 1995 the Dakar region alone accounted for nearly 90 per cent of enterprises surveyed, as well as for 75 per cent of permanent jobs and total production.

The tertiary sector's share of GDP (excluding non-market services) has remained stable at around 50 per cent since the 1960s. If non-market services are included, this figure increases to 62.5 per cent on average (see Table 1). The relative weight of tertiary activities as a share of the economy appears even more pronounced given the fact that, rather than representing what could be considered "natural" sectoral development, this appears to be a constant of the Senegalese economy.⁵

The tertiary sector's contribution to GDP is primarily from trade (including import taxes and duties and the VAT), which, with an estimated 21.1 per cent share in 2000, represents 41.2 per cent of the value added created in the sector. With an 11.8 per cent share of GDP in 2000, compared to 9.7 per cent in 1988, transportation and telecommunications constitute a sub-sector that is growing slowly but steadily. Their share represents nearly a quarter (23.3 per cent) of the value added for the tertiary market sector.

Prior to being drastically reduced as a result of recent privatizations, public enterprises have for years had a quasi-monopolistic role in strategic sectors, such as telecommunications and distribution of water and electricity. Even today, they continue to play a major role in industrial activity, investment and labor. Prior to the first privatization program in 1987, according to the World Bank (1994), the public sector was comprised of 66 national corporations or corporations with minority private ownership. Thus, it represented 29 per cent of investments and 17 per cent of jobs, but contributed only 7 per cent to GDP. In 1995, just before the second wave of privatizations, public enterprises still employed a third of industrial workers and were responsible for half of the sold output and nearly three-fifths of exports.⁶

Unlike the public sector, the private sector is, by nature, highly disparate in terms of the age, size and type of activities of the enterprises within the sector. While a limited number of large industries, controlled by foreign capital, were installed before or during the early years of independence, there is a vast number of (often informal) microenterprises. According to the last industrial sector survey⁷, large industries, while comprising merely 10 per cent of enterprises in operation between 1992 and 1995, represent 70 per cent of investments and jobs and 75 per cent of sales for the industrial sector as a whole. On the other hand, with 60 per cent of enterprises surveyed, small industry accounted for only 13 per cent of jobs and 8 per cent of total sales. Moreover, since the early 80s, while private Senegalese operators have been involved in forming industrial groups, foreign interests continue to occupy a strong presence at the head of the oldest and most powerful groups.

⁴ Senegal/UNDP (1997)

⁵ In the 1960s, market and non-market services already accounted for 63% of GDP on average.

⁶ Senegal/UNDP (1997)

⁷ Senegal/UNDP (1997)

Development of new information and communications technologies

The telecommunications infrastructure inherited from colonial times, and the investment in maintenance that was agreed upon following independence have placed Senegal among Africa's top ranking countries in regard to information and communications technologies. This section examines the development of these technologies as related to other sectors, and how they can become a driving force for growth.

Senegal's leveraging of the technological revolution

The development of information and communications technologies in Senegal is closely linked to the political, geostrategic and economic role the country has played in the expansion of French colonialism in West Africa. The introduction of means of communication in Senegal is generally considered to date from 1859, with the installation of the first St.-Louis/Gandiole telegraph line.⁸ The expansion of the telegraph network within French West Africa as a whole was followed by the creation, in 1939, of the first radio station, "Radio-Dakar." The launch of national television in 1973 transformed public service, under the direction of the Senegal Office of Radio and Television Broadcasting (ORTS).⁹ It was not until the 1990s that the first public and private radio stations, broadcasting in FM, were developed.

With SONATEL's launch, in 1988, of the packet data transmission network (SENPAC), Senegal got in on the ground floor of the era of new information and communications technologies. However, as has been noted, this technological leap in the area of telecommunications was preceded, long before, by the expansion of the national telecommunications network and by the installation of the public radio/television channel.

According to Ndiaye (1995), it was in 1948 that the first data processing equipment was installed in Senegal by the National Institute of Statistics and Economic Studies (INSEE), a French institution concerned with customs statistics, as well as with handling data from demographic surveys and later, in 1953, with applications related to civil service wages.

At the start of the 1960s, following the advent of data processing, automation of accounting procedures and of methods of dealing with wages began within the Ministry of Economy and Finance, as well as within the public banking sector (Ndiaye, 1995). The André Peytavin Accounting Center, precursor of the current Automatic Data Processing Office (DTAI), gradually extended applications to encompass all of the State's financial operations (taxes, customs, etc.).

Created in 1972, the National Information Technology Committee (CNI) is responsible for coordinating different strategies and actions regarding the development of information technology. An Information Technology Development Office (Délégation à l'Informatique, DINFO) was also formed in 1987, with the four-fold task of applying the policies established by the CNI, conceiving inter-ministerial projects, assisting the public and parastatal sector in defining their mandate, and coordinating computer training programs.

While, up until 1983, there were, according to NDiaye (1995), less than 100 computers (all categories included), the number grew rapidly in succeeding years. For 1988 alone, computer sales reached close to a thousand units. A study by the World Bank, conducted in 1995, estimated that there were 7.2 computers per thousand inhabitants, slightly higher than the figure for Tunisia (6.7) and for Nigeria (4.3), and far above that of Morocco (1.7) and Ghana (1.2).¹⁰ Another study conducted by the Office of International Economic Relations concluded that the number of computers, in June 1999, was between 40,000 and 60,000.¹¹

However, as was true almost everywhere else, the Internet would be the main engine driving the explosive growth in new information and communications technologies. Introduced at the end of the 80s by the French Institute of Scientific Research for Cooperative Development (ORSTOM) – later known as the Development Research Institute (IRD) – the Internet became highly successful, following SONATEL's signing, in 1996, of an agreement

⁸ Sagna (2001)

⁹ In 1991, the ORTS was, in turn, dismantled and replaced by Radio Télévision Sénégalaise (RTS), an autonomously managed national corporation with a public service mandate.

¹⁰ Technopolis, No. 2, April 1998

¹¹ OSIRIS and ESMT (1999).

with the oversight body, allowing for marketing access to the worldwide web in Senegal. Supply increased quickly with the arrival of other Internet operators and access providers.

Institutional and policy framework for development of the sector

In Senegal, the development policy formulated since independence has always emphasized the importance of incorporating the most modern techniques in communications and information technologies. However, as has been mentioned, it was only with the formation of the National Information Technology Committee (CNI) in 1972 that a national information technology policy took form. Following a description of public programs for telecommunications development, attention will be given to the major institutional reforms that have occurred throughout this process.

Planned public investment. Since independence, the State has been perceived as a major player in the nation's economic life. Adopting the "African road to socialism" doctrine – which was actually closer to State capitalism than to socialism – the early heads of the newly independent State implemented political, administrative and economic structures capable of taking over the productive apparatus of the colonial State. Set forth in the first development plan (1961-64), this plan was conceived as representing a way to make the State a driving force, not only in modernizing agriculture, but also in industrializing the nation.¹² While there have been changes in the strategies for implementation (Rocheteau 1982), the principles remained in force until the end of the 70s and beyond.

In terms of telecommunications, specifically, the need to assume responsibility from the colonial State for maintaining basic infrastructure, coupled with the complexity and breadth of investment needed for its development, made State intervention in the sector even more vital. Graph 1 and Table 4 trace the changes in investment in telecommunications between 1973 and 1998, pointing to three major phases in public programs for telecommunications development: the phase prior to 1978, the period from 1979 to 1990, and the period after 1990.

During the first phase, public investment in telecommunications represented a very small share of spending. In the 1973-77 period, investment in the sub-sector – which was directed primarily to maintenance and training activities – represented, on average, 2.5 per cent of total public investment and 10 per cent of public investment in the tertiary sector (Table 4).

Up until 1977, Senegal survived using the telecommunications infrastructure and equipment installed to serve the needs of the former French West Africa. In accordance with the guidelines of the Third Plan (1969-1973)¹³, this involved maintaining the existing infrastructure inherited from previous times, modernizing and developing the services provided and improving the productivity of the Office of Post and Telecommunications (OPT). The Fourth Plan (1973-1977)¹⁴ preserved the same guidelines by adding new links, particularly in the areas stretching from Dakar to St.-Louis and from St.-Louis to Bakel.

The Fifth Plan (1977-1981)¹⁵ initiated a second phase in telecommunications policy and development. This plan, in force until 1990, involves a marked acceleration in government investment in the sub-sector. In one year (from 1977 to 1978), this grew from less than half a billion CFA francs to more than 5 billion CFA francs. As a share of total government investment, telecommunications increased from 2.5 per cent to 5.7 per cent, while its share of total tertiary-sector investment grew from 10.1 per cent to 38.9 per cent (see Table 4). Table 5 reflects operations carried out as part of the public investment program for telecommunications during the 1977-81 period.

Along with this change in telecommunications policy and development, and the corresponding change in the perceived socioeconomic importance thereof, came a new approach to managing the sub-sector, aimed at making telecommunications services profitable – based on a more commercial style of management that included bringing the

¹² The first plan explains that while the State "relies on the intervention of large amounts of private capital," it does not "remain passive, but plays a driving role in defining a programme of industrialization, creating and maintaining a climate that promotes industrial expansion, undertaking studies and research that are indispensable for the establishment of new industries, and owning shares where appropriate." (Quoted by Rocheteau, 1982).

¹³ Ministry of Planning and Industry (1969): Third Economic and Social Development Plan (1969-1973).

¹⁴ Ministry of Planning and Cooperation (1977)

¹⁵ *idem*.

conduct of its agents into line with that of private-sector workers. This approach meant the “decommissioning” of a large number of OPT staff and the initiation of a training program for upper management and technical staff.¹⁶

Modeled on the set of guidelines for information technology, a national telecommunications master plan (1975-2000) was implemented as a strategic framework for developing the domestic telecommunications network.¹⁷

Though important, the investments were insufficient to meet the needs of upgrading and modernizing equipment and meeting growing subscriber demand. These needs led authorities, in the Seventh Plan (1985-1989), to assign SONATEL the task of developing a highly productive national telecommunications infrastructure with the capacity to stimulate domestic economic activity, improve access to the telecommunications system, promote the development of national data bases and promote the implementation of a local or regional telecommunications industry. In addition, it was designed to encourage financing of telecommunications through domestic savings. The strategy consisted of implementing a plan to narrow the telecommunications lag, initiating a rural communications development program and concluding a three-year performance contract between SONATEL and the State.¹⁸

In the 1990s – in the final phase of implementing public programs to establish telecommunications systems – there was a sharp reduction in public investment in the telecommunications sub-sector. The failure to include an investment project in the Tenth Plan is attributable to SONATEL’s prospects for privatization and the self-financing policy it initiated. The amounts allocated to operations of this type were cut in half, from 13.3 billion CFA francs in 1989 to 5.2 billion CFA francs in 1990, matching 1978 levels. The decline continued until 1995, when the sub-sector’s share of total investment fell to 1.4 per cent (9.2 per cent of investment in the tertiary sector).

Development of the telecommunications infrastructure. Investment efforts undertaken by the State in the 80s provided Senegal the telecommunications infrastructure and equipment needed to develop cutting-edge technologies. These efforts also helped make telecommunications one of the main sectors of the economy in terms of heavy investment. Taking over the role occupied previously by public investment programs, SONATEL’s finance policy in the mid-90s was based on near-total self-financing of telecommunications infrastructure, with self-financing increasing to 85.4 per cent in 1995 and to 90.6 per cent in 1996 (see Table 7). SONATEL’s decision to go public, the appearance of France-Télécom as a strategic partner, and the company’s entry on the stock exchange were viewed as indispensable elements in the infrastructure development process.

As shown in Table 7, investment made by SONATEL grew from 32.8 billion CFA francs in 1995 to 57.9 billion CFA francs in 1996. After a drop in 1997, investment again began to grow, to 48 billion CFA francs in 1998 and to 55 billion CFA francs in 1999. In September 1999 alone, the company invested 4 billion CFA francs to renovate its mobile telephone network in the Dakar region. Since then, SONATEL has been the largest investor, with 17 per cent of gross fixed capital investment, and has been the number-one creator of jobs in Senegal.¹⁹

Table 7 shows that most of the investment was allocated to large national projects, representing, in 1996, 88.4 per cent (32.8 billion CFA francs) of total investment, compared to 11.6 per cent for regional projects. The latter are made up primarily of desert operations in rural areas. The major national projects involve modernization of the Dakar network, implementing the integrated digital services network (IDSN) at a cost of 14 billion CFA francs, and extending the Diourbel network, at a cost of 14.8 billion CFA francs.

Another indicator of the investment effort undertaken by SONATEL is the change in fixed assets. Table 8, which traces this change between 1997 and 1999, shows the steady growth in operating equipment as a proportion of total fixed assets. In 1999, of 277.2 billion CFA francs of total fixed assets, a total of 190.2 billion CFA francs (or 60 per cent) was devoted to operating equipment, of which two-thirds was for lines, transmission equipment and public networks.

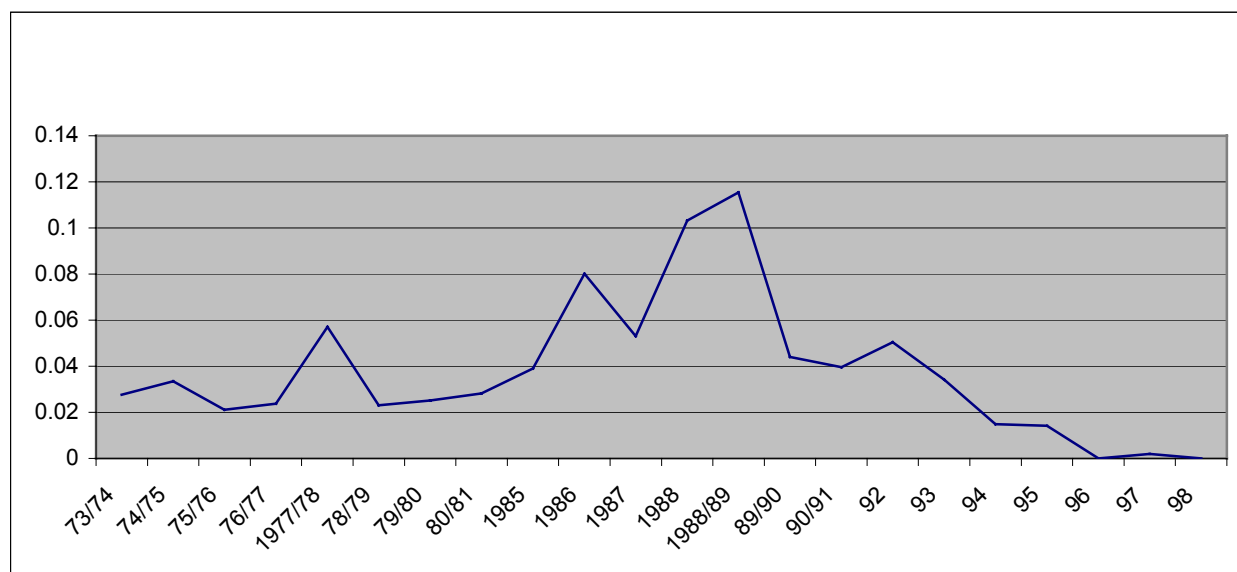
¹⁶ Republic of Senegal: Eighth Master Plan for Economic and Social Development (1989-1995)

¹⁷ Republic of Senegal: Fifth Master Plan for Economic and Social Development (1977-1981)

¹⁸ Republic of Senegal: Eighth Master Plan for Economic and Social Development (1989-1995)

¹⁹ Le Soleil, May 4, 2001.

Graph 1: Telecommunications' share of public investment
1973-1998



In addition to the installation of infrastructure, SONATEL invested extensively in training its personnel, at a cost, between 1995 and 1996, of 300 million CFA francs (Table 9).

Sentel, the second-largest mobile-telephone provider, at its start-up in 1999, invested 6.3 billion CFA francs, of which 4.2 billion was for infrastructure. Its development plan envisaged 13.8 billion CFA francs for investments between 1999 and 2000.

A total of 4,791 km of transmission lines are presently in operation. The company has twelve automatic switching centers and two international switching centers.²⁰ The international network links are provided by satellite and by four undersea cables. Senegal also has two hertzian networks for communications between countries of the sub-region.²¹

Along with improving the quality of service, there have been efforts to expand and strengthen SONATEL's business centers, improve the provision of business information and the handling of systems failures. In addition, there are plans to establish a center for registration and itemized billing, and a plan to set up a business information system (SISCO).

Along with these projects, there are others underway, such as the construction of two undersea cable systems – one linking West Africa, South America and Europe (Atlantis 2), the other connecting the countries on the coast of West Africa, South Africa, the Far East and South Asia (SAT3/WASC/SAFE),²² as well as an initiative, within the framework of the "Manantali Energy" project, to install fiber optic cable (CGFO).²³ Besides opening up Africa to the outside and providing access to the information superhighway, these systems will make it possible to link West Africa with the global network of undersea cables, develop basic services (telephone, fax, etc.), and diversify means of transmission that ensure absolute security for international transmissions.²⁴

²⁰ Diouf (1999)

²¹ The networks involved are PANAFTEL and INTERCOM, which link five countries in the subregion: Benin, Burkina Faso, Mali, Niger and Senegal. They also provide for domestic communication between certain cities on their routing. (Diouf, 1999)

²² This is the cable that reached Dakar on May 22, 2001. Besides Senegal, it is to connect Portugal with the Ivory Coast, Benin, Nigeria, Cameroun, Gabon, Angola, South Africa and the island of Réunion. When SONATEL initiates service in the first quarter of 2002, it will also be able to serve countries such as Mali and Mauritania. With an overall cost of approximately 420 billion CFA francs, this undersea cable will bring the system's capacity to 120 gigabits, the equivalent of almost 1.5 million communications per second (BATIK, May 21, 2001).

²³ The contract for the construction and maintenance of the fiber optic cable was signed in April 2001 between SONATEL (Senegal), SOTELMA (Mali) and Mauritel (Mauritania) on the one hand, and the Société de Gestion de "Energie de Manantali" Management Corporation (SOGEM), on the other. Once it is operational, the cable should improve connectivity among the three countries' networks, and should make it possible to lengthen the undersea cables ATLANTIS 2 and SAT3/WASC/SAFE. With an overall cost of 2.5 billion CFA francs, the cable will make possible the transmission of 30,000 simultaneous communications, or 48 television channels (BATIK, April 21, 2001).

²⁴ SONATEL (1999)

The combination of fiber optic cable and satellite opens up the possibility for other projects – offering interesting prospects for the rural telephone system, while at the same time improving the quality of service and significantly reducing unit costs.

Moreover, Senegal is connected to the Internet as a result of its links with both the United States and Canada. A third link, to France, is also envisioned. There are two possibilities for connection: permanent connection through specialized links, for which SONATEL has a monopoly, and intermittent connection with free access.

The Intelligent Network, instituted in 1998 by SONATEL, increased the possibilities for providing value added services. This makes it possible to handle network services in the same manner as credit card billing, toll-free calling, phone booths, etc.²⁵ Senegal also has videotex and voice kiosks that provide for the possibility of establishing effectively managed public wide area information servers (WAIS).

Due to SONATEL's investment initiatives, there was an estimated average annual growth of 10 per cent in telecommunications equipment during the 90s.²⁶ The national transmission network now in place is entirely digital. Between 1985 and 2000, the number of fixed telephone lines increased by a factor of nine,²⁷ while the number of mobile telephone subscribers has grown even more rapidly: from 665 in 1996 to 7,000 in 1997²⁸ and 300,000 (including Sentel subscribers) by May 2001²⁹.

Institutional reforms. Policies and strategies for the development of information and communications technologies have been marked by two major reforms in the telecommunications sector – the first undertaken in 1983 to strengthen and modernize the national telecommunications network and the second in 1996, through the “Senegalese Telecommunications Development Policy Declaration (1996-2000)” and the passing into law (96-03) of the Telecommunications Code.

The purpose of the two-part 1983 reform was to make telecommunications a priority sector within the economy. The first part of the reform consisted of separating telecommunications from the other activities of the Office of Post and Telecommunications, splitting it into two distinct entities: the Office of Post and Savings (OPCE) and the National Telecommunications Corporation (SONATEL). The second part involved an emergency plan designed to make up for Senegal's late entry in the telecommunications arena. In addition to strengthening the financial autonomy of SONATEL, this reform encouraged the financing of significant investments designed to develop and modernize the sector. These investments propelled SONATEL into Africa's top rank of telecommunications companies.

In 1994, a strategic plan was formulated, setting forth general policy principles for the development of information technology and related services, and defining management's role – particularly that of the Information Technology Development Office (DINFO) – in implementing overall organizational and operational principles for the sub-sector. At the same time, it laid the foundation for cooperation between the public and private players involved.³⁰

Created within the Ministry of Energy, Mining and Industry, an Industry Council (CSI) was charged with promoting service industries to support the ongoing development of information and communications technologies. Studies were carried out within the teleservices cluster to ensure greater cohesiveness among the sector's various participants and to make decisions and select development strategies for enterprises and services within the teleservices sector.³¹

As a result of pressure by the World Bank, and in the wake of structural and institutional reforms due to the devaluation of the CFA franc, the second major reform will consist of liberalizing the telecommunications sector by allowing the public to purchase stock in SONATEL and by entrusting its management to an internationally respected strategic partner (France-Télécom).³² Thus, the company's capital will be held as follows: 42.3 per cent by France-Télécom, 27.7 per cent by the State, 20 per cent by institutional shareholders

²⁵ OSIRIS and ESMT (1999)

²⁶ Jensen (2000)

²⁷ www.osiris.sn/chiffres3

²⁸ SONATEL (1997)

²⁹ www.osiris.sn/chiffres3

³⁰ OSIRIS and ESMT (1999)

³¹ *idem*.

³² In 1999, SONATEL's capital was distributed as follows: 42.3 per cent for France Telecom, 27.7 per cent for the State, 20 per cent for institutional investors and the general public, and 10 per cent for employees.

and the public at large, and 10 per cent by the employees. This major decision signaled a change in the State's role in managing the sector, though SONATEL continues to hold a monopoly on fixed telephone service and on international transmission up until 2004. The reform thus stimulated private investment in mobile telephony, value added services and telecommuting.

The Telecommunications Development Policy Declaration set forth the following objectives:

- i) raising the sector's contribution to GDP from 2.4 per cent to 3.5 per cent;
- ii) tripling the number of telephones and increasing teledensity to 2.5 lines per 100 inhabitants; and
- iii) promoting a local telecommunications equipment industry.

Until the adoption of the 1996 Telecommunications Code, SONATEL had a legal monopoly on the installation and use of basic telecommunications networks and services.³³ Law 96-03 put an end to this concession, with management of the telecommunications network reverting to the State, which could then grant the right of use to public or private agents.

In addition, the Telecommunications Code envisaged the implementation of an independent regulatory body responsible for formulating rules and procedures, in advance, governing the creation and provision of telecommunications services. Unanimity was finally reached: in order for developing countries to develop information and communications technologies and position themselves in the global market, within the context of a liberalized, openly competitive system, such a body is a necessity.

Five years after the adoption of the new code, the planned telecommunications regulatory authority still had not seen the light of day. In its place, the Directorate of Research and of Telecommunications and Postal Regulation, within the Ministry of Communication, was installed. This entity was charged with enforcing regulations, defining principles and authorizing rate-setting for monopoly services, as well as with issuing authorizations for the provision of telecommunications services.

One of the problems encountered in implementing policies set forth in such reforms was the multiplicity of decision-making entities involved. Regardless of the governmental architecture involved, the overall management of the sector is overseen by the following ministerial departments: Communications and/or Information, Scientific Research, and Industry. Alongside the ministerial departments, CNI and DINFO, a National Information Technology Committee, were established, with responsibility, within the framework of the general policy defined by the President of the Republic, for developing strategies in the area of information technology and determining conditions for the use of information and communications technologies, particularly of the local networks and of the Internet. The instability and large number of decision-making bodies led to a mutually neutralizing effect. As a result, in 1998 the Government assigned DINFO the task of implementing a coherent framework for promoting new information and communications technologies.

The status of supply and demand

The institutional reforms adopted in Senegal, the quality and breadth of the installed telecommunications network, the availability of human resources and the entrepreneurial spirit among a growing number of young Senegalese created the foundation for the dissemination and development of new information and communications technologies. However, despite promotional efforts and numerous incentives provided by the Government and by international organizations, and in spite of the successive reductions in rates charged by SONATEL and the elimination of customs duties on importation of computer-related materials (with the exception of a 5 per cent customs stamp), information and communications technologies remain inaccessible to many enterprises and to the vast majority of the population.

The under-developed state of equipment-production industries and strong competition in the market supplying information technology materials

³³ Terminals and value added services could, however, be offered by other entities, such as private calling centres.

In regard to manufacturing, the information and communications technologies industry includes several components, which can be grouped in four categories of production: telecommunications equipment; data processing equipment and software; semi-conductors; and consumer electronics. In Senegal, apart from some poor experiences in television assembly (CCBM, Numéro Un) and computer assembly (the WAC-SA project),³⁴ there are no high-technology industries based on micro-electronics or information technology. This lack of equipment production facilities reflects the stagnation of the industrialization process prevalent in the economy as a whole. However, in the absence of such activities, it would be fanciful to expect to be able to quickly and easily overcome the problems connected with incorporating and learning new technologies. Likewise, under these conditions, the development of new information and communications technologies can not be expected to produce a work force able to do more than assemble parts, carry out repetitive tasks and provide services.

Made up almost exclusively of imported materials, the supply of computer, telecommunications and audiovisual equipment is therefore provided by a multitude of vendors of all sizes. According to an economic study of the new information and communications technologies sector (GRCC/Cabinet Consultants Associées, 2001), supply is distributed as follows: 37 per cent by vendors of computer equipment; 36 per cent by vendors of telecommunications materials; and 24 per cent by vendors of audiovisual equipment. The range of products supplied is dominated primarily by the large makers, such as IBM, Bull, Compaq, HP, Dell, etc. for computers,³⁵ or Alcatel, Philips, Bell, Motorola, for telecommunications equipment. The same dominance by world-famous brands can be found in the audiovisual market. In addition to these materials, however, is a host of others, as numerous and as varied as the small retailers who sell them.

While the intense competition resulting from this situation has increased the choices of the buying public, it has not led to a noticeable drop in market prices. Because of the oligopolistic nature of the information and communications technology industry market, the prices in each country – particularly in developing countries – are, in reality, determined by the trade strategies of ten or fifteen multinational firms.

Information and communications technology applications

Given the lack of high-technology industries in Senegal, the level of development of applications and services linked to the new information and communications technologies is generally viewed as vital to the country's entry in the information economy.

Fixed telephone. As has already been noted, the existing telecommunications infrastructure makes Senegal one of the best-equipped countries of Sub-Saharan Africa. The number of telephone trunk lines was estimated to be 200,000 in December 2000, compared to 116,000 in 1997 and 23,000 at the time SONATEL was created in 1985³⁶ -- representing a 9-fold increase in fifteen years, with a teledensity of 12 lines per 1,000 inhabitants. However, this figure rises to 25 for urban centers and drops to 5 for rural areas. Table 10 shows the extent to which Senegal has gained ground on countries such as Côte d'Ivoire, Ghana or Cameroon.

While 70 per cent of existing lines are in Dakar, all thirty of the country's departments are now connected to the general network by a digital transmission link. Moreover, twenty-two departments are connected to the general network by a fiber optic transmission link.³⁷ As of 2000, all rural *arrondissements* also have telephone access.

The Tambacounda region surpasses all others in terms of the distribution of telephone lines, with 13 per cent of the country's total phone lines. Second is the region of

³⁴ THE CCBM group (Comptoir Commercial Bara Mboup) under a Korean licensing arrangement, is engaged in the assembly of televisions at a pace of several hundred units per day. Considering the quality, the proposed prices -- according to the GRCC/Cabinet Consultants Associées 2001 study on the economics of the NICT cluster -- would be 20 per cent below market prices. Numéro Un is a computer assembly firm that works with components imported from abroad. With a small team of Senegalese technical staff, it produces 150 to 200 computers yearly (Sud Quotidien, supplement of June 27, 2000). A protocol has also been signed for a deal between a French computer technology firm (ECB-Informatique) and Mission du Technopôle which would create an on-site computer assembly unit. The company is called WAC-SA (West-Africa Computer). Its capital totals 100 million CFA francs, and it will have a production capacity of 200,000 computers annually (GRCC/Cabinet Consultants Associées, 2001).

³⁵ For the position of the main computer manufacturers in the Senegalese market, see Ndiaye (1995).

³⁶ SONATEL (1999).

³⁷ Sagna, 2001

Ziguinchor, with 11 per cent, followed by St.-Louis, Kaolack and Thiès, each with 9 per cent. While the Dakar region has the highest teledensity, it accounts for only 5 per cent of the total number of fixed lines. With nearly 13,500 lines in 1999, Touba is the second-ranking city in terms of number of subscribers.³⁸

SONATEL's telecommunications projections call for increasing the number of fixed telephone lines to 300,000 in 2002 and 400,000 in 2006. The company also anticipates linking 1,000 rural localities between 2000 and 2005, through the rural telephone system. Pursuant to the Telecommunications Development Policy Declaration, the goal is to have no inhabitant more than 5 km. from a telephone, which would be equivalent to a teledensity of 25 lines per 1,000 inhabitants.

Along with expansion of the telephone system, there has been an improvement in the quality of services offered, with an increase in rating from 91.2 per cent in 1995 to 94.3 per cent in 1996.³⁹ In addition, there has been a steady decline in subscription fees and communications rates.

Cellular telephony. Among the various new information and communications technologies, the development of cellular telephony has been the most dramatic. Currently, with nearly 300,000 subscribers (including those of Sentel), in less than seven years of existence, the cellular network has attained a density 1.5 times greater than that of fixed telephones. The use of cell phones, a phenomenon that has rapidly gained popularity, is no longer limited to the privileged classes in the Dakar region, but increasingly includes rural areas – particularly rural areas with high levels of emigration, where it makes up for the lack of fixed telephone lines.

Launched in 1994, SONATEL's "Alizé" cellular network grew to nearly 73,500 subscribers in 1999, compared to a mere 22,100 in 1998,⁴⁰ representing a more than three-fold increase in one year. SONATEL's goal, which was to reach 150,000 subscribers by the end of 2000, has been vastly exceeded, with its network boasting 200,000 subscribers in December 2000.⁴¹ This network covers nearly all of the country's cities and a number of large rural towns. It also has links to foreign networks.

Opened to competition in 1998, the cellular network market has seen the entry of a second private provider, Sentel.⁴² As the subsidiary of a multinational corporation (Millicom International Cellular) specializing in cellular telephony, Sentel succeeded in obtaining a renewable 20-year license. The company began operations in April 1999, with a network covering the Dakar-Thiès-Mbour axis. In less than a year, and with a network less dense than that of SONATEL, Sentel gained more than 14,000 subscribers, representing nearly 15 per cent of the market. In May 2001, after only two years in operation, the company celebrated its 100,000th subscriber.⁴³

Connection to the Internet. Connection to the Internet – while still failing to completely satisfy professionals – has changed significantly as a result of SONATEL's efforts to expand the bandwidth for Internet links, moving from 64 bps in 1996 to 42 Mbps in 2001 and thus becoming one of the major players in West Africa.⁴⁴

Five years after Senegal's official connection to the Internet, there are already some thirty access providers. These can be grouped in four categories: private-sector providers in the form of cybercafés; research and teaching facilities; government; and NGOs. Among the main access providers are Télécomplus (a 100 per cent subsidiary of SONATEL), Arc Informatique, Metissacana, the Cheikh Anta Diop University, AUPELF-UREF, Trade Point Senegal and Silicon Valley, or Primature. In addition, while the total number of Internet access points is estimated at 160, the number of addresses with the official ".sn" domain increased to nearly 700 in May 2001.⁴⁵

³⁸ Sud Quotidien, January 15, 2001.

³⁹ The comprehensive service quality index is made up of indicators for efficiency of local service, long-distance service, delays in obtaining a dial tone, and speed in repairing problems. (SONATEL, 1996).

⁴⁰ SONATEL (1999).

⁴¹ Batik, May 22, 2001.

⁴² However, since October 2000, the government has threatened to revoke Sentel's authorization.

⁴³ Batik (May 22, 2001)

⁴⁴ GRCC/Cabinet Consultants Associés (2001)

⁴⁵ www.osiris.sn/chiffres3.htm.

In return for payment of installation costs and a monthly lease charge, access providers – as is the case with a number of large enterprises or institutions – lease lines from SONATEL on the Internet, gaining the right to a permanent connection via specialized links. Table 13 gives the subscription rates for May 2001 charged by SONATEL for access to different specialized Internet links, as well as the corresponding installation fees. Monthly lease charges range from 285,000 CFA francs (excluding VAT) for lines with the slowest access speeds (19.2 kbps) to 2,520,000 CFA francs for the fastest lines (2,048 kbps).⁴⁶ Compared to previous rates, there has been a reduction of 20 per cent for the slowest-speed lines and 40 per cent for the highest-speed lines.

As with the telephone, there is great disparity between the Dakar region and the rest of the country in regard to Internet access conditions. There are very few access providers outside the regions of Dakar (with 61 per cent of connection points), Thiès (with 13 per cent) and St.-Louis (with 11 per cent). Thus, the seven other regions must share the remaining 15 per cent of links. The disparities between Dakar and the other cities is even greater in terms of the number of cybernauts, with Dakar accounting for 98 per cent.

The press. As a public service corporation, Radio Télévision Sénégalaise (RTS) provides coverage for almost the entire nation (95 per cent, to be exact⁴⁷), through both radio and television broadcasting. However, it increasingly faces competition from private and foreign radio and television stations. The authorizing of the pay-television channel Canal Horizons, in 1991, the creation of private radio stations beginning in 1994, and the development of satellite television access – due, in large part, to a low-cost antenna system (MMD) carrying approximately thirty channels – have cleared the way for multiple players in the radio and television broadcasting field. Currently, there are at least eight private FM radio stations, in addition to six rural radio stations and three foreign stations.⁴⁸

Currently, print and broadcast media enterprises are taking full advantage of the benefits of new information and communications technology applications. The available technologies also provide the media commercial and financial opportunities, making it possible for them to expand the services they offer by reaching, in real time, a widely dispersed public throughout the world. Making use of the possibilities provided by multimedia, a number of newspapers and radio stations have increased their audience base abroad by providing the possibility of online access. Currently there are four daily newspapers and three radio stations that can be accessed or listened to online via the Internet.

Now that Le Soleil and the public radio station no longer enjoy monopoly positions, the process of granting operating licenses to two private television stations is due to be carried out.⁴⁹ Already in 2000, Groupe Sud Communication launched a television channel, “La Chaîne Africaine” [The African Channel], which is broadcasting from Paris while awaiting authorization to broadcast from Senegal.

Available services

Development of teleservices. Teleservices are new information and communications technology applications that make possible the production, sale, and use of services between points separated, at times, by several hundred thousand kilometers. In terms of the country's economy, the development of these services offers the opportunity to gain access to global trade and to benefit from more advanced technologies.

Apart from the great organizational flexibility this provides for work purposes, teleservices have the advantage that they do not require investment in infrastructure, high-cost equipment or a permanent dependent labor force. By encouraging telecommuting, enterprises are able to economize on space, while avoiding the costs and loss of time involved in having workers travel between home and the workplace. Such teleservices cover a wide range of fields: secretarial work, accounting, advertising, publishing, industrial design, architecture, trade, and computer-generated comic strips, to cite but a few.

Teleservices are considered to be one of the most promising sectors of the Senegalese economy. Governed explicitly by the free competition system envisaged in the

⁴⁶ www.osiris.sn/chiffres3.htm

⁴⁷ Diouf, 1999

⁴⁸ Diouf, 1999.

⁴⁹ A call for candidates was issued starting in January 2001 (Batik, No. 18, January 2001)

1996 Telecommunications Code, teleservices also came under the scrutiny, in 1998, of a Special Interministerial Council. The decisions made at that time were concerned with adopting appropriate fees for the use and establishment of service industries, creating an environment favorable to projects involving high value-added services and adjusting common-law taxation with a view to applying it to electronic commerce.

Despite these many initiatives and incentives, teleservice operations remain underdeveloped in Senegal. Currently, there are approximately ten such enterprises, of which the most well-known are Téléservices SA, Alphacad, Alliance Technologie et Informatique (ATI) and Trade Point.

With capital of 76 million CFA francs, Téléservices SA is the main teleservices operator in Senegal. Resulting from a partnership between private capital (consisting primarily of the Jurisen corporation and SONATEL (with a 34 per cent share of capital), Téléservices SA provides services in the areas of remote document retrieval, translation and summary of legal documents, web site development, etc. The company has a staff of 40-50 professionals working at least 14 hours per day.⁵⁰ Its total sales reached 500 million CFA francs in 1998.

Created in 1997, Alphacad is a limited-liability company with 5 million CFA francs in capital. It specializes in telecommuting, focusing on the capture of technical and industrial designs, conference organization, translation, etc. It represents more than 100 million CFA francs of investment in a variety of computer materials and equipment, and has a skilled staff of 45 employees.

Founded in 1993, Alliance Technologie et Informatique (ATI) also plans to provide services for distribution and installation of computer equipment and software – representing a number of large international brands – as well as installation of communications networks. The company is one of the main Internet providers in Senegal and is also involved in web site design, extending as far as the Côte d'Ivoire market.

Trade Point Senegal, a public service enterprise established in 1996, is a center for economic and trade information. Its objective is to facilitate foreign transactions carried out by economic agents, by serving as a point of access to the international network of electronic commerce and as a center for providing advice and assistance. It is part of the worldwide network, Global Trade Point Network (GTPNet), established in 1994 by the United Nations Conference on Trade and Development (UNCTAD). Senegal is a member of the group of 19 initial countries selected by UNCTAD to launch the project.

Trade Point Senegal grew from an initial 3 members, at start-up, to a staff of 70 in 1999.⁵¹ Along with offering online trade information, the structure is designed to provide member enterprises assistance in import/export procedures. In addition to the access point in Dakar, it has regional antennas in Thiès, St.-Louis, Podor, etc. These regional antennas have brought to 85 the total number of jobs created directly by Trade Point. The objective is to have an antenna in each of the country's departments sometime between now and 2005. Statistics indicate that in 1999, 497 economic agents were members and 427 of these were involved in promoting business opportunities abroad.⁵²

Technopole. Technopole represents another major project in the field of teleservices, in terms of both the highly attractive legal and fiscal framework it provides for domestic and foreign investors and the "cyberpark" project's prospects of offering modern infrastructure and a skilled workforce.⁵³ Created in 1996, the Dakar Technopole was conceived specifically as a site for the installation of enterprises linked to information and communications technology enterprises. It is designed explicitly to make these technologies one of the vectors for promoting economic growth. The first of its kind in Africa, the site is modeled after California's Silicon Valley – a center for innovation contained within a defined space.⁵⁴ It is thus designed to act as the interface between research and the economic and commercial applications arising from such research, in the areas of agriculture, industry and services. It represents an economic zone constructed to encompass research, educational and business centers that

⁵⁰ Technopolis, No. 2, April 1998.

⁵¹ GRCC/Cabinet Consultants Associés (2001).

⁵² GRCC/Cabinet Consultants Associés (2001)

⁵³ [www.osiris.sn/MNdiaye .htm](http://www.osiris.sn/MNdiaye.htm)

⁵⁴ It should be noted that, as Castells points out (1998), it is in Silicon Valley that, among other discoveries, the integrated circuit, the microprocessor and the microcomputer were perfected. It is also there, for what is now almost fifty years, that the technological revolution has been in full flower, with some 250,000 information technology specialists.

are focused on developing innovative technology in return for tax relief measures and the provision of technological infrastructure.

However, despite the hopes it raised, the technopole has so far failed to produce the anticipated results in terms of both investment and job creation. Contrary to the commonly held view, this clear lack of success is linked not only to problems of administrative procedure or market failure, but above all, to the absence of high-technology industries. Thus, the site has turned more into a center for service enterprises than for the production of equipment and materials connected with information and communications technologies.

Information and communications technologies in education and health care. It is now widely recognized that the use of information and communications technologies can and should bring progress in the areas of education and health care in Africa. Radio and television were the first technologies used in primary and secondary education to reach rural areas that lacked sufficient teachers and educational infrastructure, dating back to experiences with educational television and radio in the 1960s and 70s. In terms of their relevance and effectiveness, however, these efforts, which were abandoned after several years, were less than convincing.

While computer instruction (often of a theoretical nature) became part of the programs in various university courses beginning in the 70s, it was only in the 80s that a university degree in information technology was created at the National College of Technology (Ecole nationale supérieure de technologie, or ENSUT), which became the College of Polytechnology (Ecole supérieure polytechnique, or ESP) of Cheikh Anta Diop University (UCAD). The creation of this degree would be followed, at the start of the 1988-89 academic year, with a masters degree and a diploma of advanced studies in information technology at the UCAD's College of Sciences, and then by the opening of an information technology and applied mathematics department at the University of St.-Louis.⁵⁵

In 1998, under a program initiated by the State and the World Bank, computers were introduced in secondary classrooms. While the World Bank and UNESCO purchased the computers, SONATEL provided a 50 per cent reduction in the telephone communications charges. This program has already succeeded in providing Internet connections for some twenty secondary schools, with the similar equipping of an additional twenty secondary schools anticipated by 2000.⁵⁶ However, the problems posed by the daily management of this program (service interruptions in the telephone lines and electric outages) demonstrate that merely making available computer equipment is insufficient to ensure the viability of projects of this type.

The most advanced projects involving the use of information and communications technologies, however, are found at the university level. In addition to UCAD's vital role in introducing the Internet to Senegal, it has used these technologies to develop distance-learning programs. There are two major projects of this type: the Francophone African Virtual University, initiated by the World Bank, and AUPELF-UREF. The latter institution installed the first web server in Senegal in the mid-90s, making it possible for more universities and students to access the Internet. Likewise, the Distance Learning Center (CED), established by the Institute and the World Bank in 2000 at the Ecole Nationale d'Administration et de Magistrature, is of value both as a test and as a symbol.

However, while academic learning via computer and universal access, by students, to the Internet undoubtedly have benefits, the future profitability and viability of such applications are uncertain. Widespread use of information and communications technologies in the area of education requires parallel reforms designed to maximize the benefits. Deployment of these resources – by necessity a gradual process – must be evaluated in relation to available human and material resources and to the priority needs of the sector.⁵⁷

Telemedicine involves the application of information and communications technologies to health care. It makes it possible to interconnect hospitals for the purpose of transmitting images in real time and allows professionals to consult among themselves and to discuss the treatment of specific illnesses. Its areas of application range from simple consultations and diagnosis to surgical or dermatological procedures.

⁵⁵ www.osiris.sn/MNDiaye.htm

⁵⁶ Sagna (2001).

⁵⁷ Kenny, Navas-Sabater and Qiang (2000)

The use of new information and communications technologies in medicine offers a number of benefits. By saving time and space, by providing broader dissemination of information, and by rational use of human resources, telemedicine makes it possible to save on investment costs, hospitalization and travel, which can prove to be overly expensive for health care institutions, medical personnel and patients.

The first initiative aimed at introducing telemedicine to Senegal was organized by the telemedicine steering committee. The idea, conceived by SONATEL and by the Centre Hospitalier Universitaire (CHU) of Fann, "was to provide a network for the country's hospitals to facilitate the exchange of medical records between hospitals in the interior of the country with hospitals such as Fann."⁵⁸

Two partnership possibilities will soon provide a concrete dimension to the initial project. First, Senegal was selected by the International Telecommunications Union (ITU) as one of the pilot countries for developing telemedicine applications. This was followed – in the framework of the Acacia initiative – by an agreement between the Cheikh Anta Diop University and the CRDI to implement a telemedicine project. To the credit of the telemedicine steering committee, there already are projects such as that connecting the hospitals of Diourbel and St.-Louis to the CHU, of Fann, due to begin operation in the second quarter of 2001,⁵⁹ and that connecting the regional hospitals of Tambacounda and Ziguinchor to the telemedicine network, for which the equipment has already been supplied. It is anticipated that the project will soon be extended to gradually include other regional hospitals in the interconnected network.⁶⁰

As with learning, a number of precautions must be taken in the field of health care – an area in which the use of information and communications technologies will inevitably be limited (due to the high cost) to a minority of patients, thus raising the question of equity in accessing high-quality health care.

Information and communications technologies in government. Though it played a pioneering role in early applications of information technology, the Senegalese government is relatively weak in terms of computer equipment. Few of its computers are networked, with the great majority of them functioning as autonomous units.⁶¹ Few government offices are connected to networks of any kind. Those that are a part of one or another network include the office of the President, Primature, the Ministry of Foreign Affairs, and the Ministry of Economy and Finance. Eighty-five percent of the various government bodies still exchange information manually.⁶²

The government does, however, have several offices that deal with computer technology or documentation and these employ the government's main computer specialists. These offices are the Automatic Data Processing Office (DTAI), the File Digitization Office (DAF), which is part of the Customs Information Management Center (the Gaïndé system), the National Center for Scientific and Technical Documentation (CNDST), and the Oceanographic Research Center. In addition, there are the Ecological Monitoring Centre (CSE), the Multinational Telecommunications College (ESMT), and the Computer Engineering department of the University of Dakar's College of Polytechnology (ESP). The latter, as the primary Internet technology resource center in the country, also houses the Network Information Centre responsible for registering ".sn" domain names, while serving as Senegal's main resource center for Internet technologies.

As of January 2001, the Senegalese government has approximately 3,800 computer work stations and 154 computer specialists (0.28 per cent of the total number of government workers).⁶³ Of these, however, the Automatic Data Processing Office (DTAI), alone, employs 128 and the government, as a whole, is under-equipped, with only one computer per 21 workers.⁶⁴

⁵⁸ Revue Recherche Impact, No.3, February 2000, CRDI.

⁵⁹ GRCC/Cabinet Consultants Associés (2001)

⁶⁰ More specifically, the Bulletin d'Analyse sur les Technologies de l'Information et de la Communication (Batik) No. 23 of June 2001 informs us of the June 28, 2001 inauguration of a computer and communications room for video-assisted surgical operations at the Hôpital Aristide Le Dantec in Dakar. Costing 60 million CFA francs, this health care unit is the result of a partnership with two French universities (Toulouse and Strasbourg) and one Belgian university (Brussels).

⁶¹ ANAIS network (2000)

⁶² ANAIS network (2000)

⁶³ GRCC/Cabinet Consultants Associés (2001)

⁶⁴ GRCC/Cabinet Consultants Associés (2001)

The number of Internet users in the government was estimated at 500 in 1999.⁶⁵ Thus, given that the total number of government employees is approximately 60,000, only 0.8 per cent of government employees use the Internet. More than a third (36 per cent) of these access the Internet through the Primature server, which has 200 Internet access accounts. The remaining users employ private ISPs.

The very limited Internet access within the government is due to at least two factors: a lack of funds, which is accentuated by current budgetary constraints, and a lack of information and of promotional efforts regarding information and communications technologies, despite numerous seminars and workshops held for the purpose.

Among the missions for which the National Information Technology Committee (CNI) was created are the automation of governmental functions, computer training for personnel, and the promotion and development of information technologies in service firms and high-growth sectors. Conceived in 1979, the information technology master plan is the first large-scale State initiative attempting to analyze the country's computer system and to create a governmental database.⁶⁶

The State's strategy and effort to expand access to information and communications technologies is complemented by a number of bilateral and multilateral initiatives and programs. Thus, the Acacia initiative of the International Research Development Centre (CRDI) is designed to support the most disadvantaged populations by providing information and communications technologies for use in their economic and social development activities. The program has three principal objectives: to demonstrate how information and communications technologies can aid disadvantaged communities (particularly women and young people) through research and experimentation; to create and disseminate a body of knowledge regarding new information and communications technologies; and to encourage the participation of populations in producing information and communications resources. Acacia has already accomplished a great deal.

Another program supporting the development of new information and communications technologies is InfoDev, (the World Bank's Information for Development Program), which began in 1995 and is designed to help developing countries benefit from technological innovations and to ensure their participation in the global economy through the possibilities provided by modern computer systems. The program's activities come under several categories: access to market information; combating poverty; education; health; and governance. Like almost all of the World Bank's projects, however, InfoDev is designed primarily to open the new information and communications technology sector to competition and to encourage private activity by privatizing public enterprises and by establishing independent regulatory bodies.

Access to information and communications technologies

New developments in information and communications technologies occur at an extremely rapid pace. Not only are the products they spawn beyond the buying power of the general population; they also must overcome the inertia of ingrained buying habits. Furthermore, for countries such as Senegal, the low literacy rate, the dearth of computer equipment, and the high cost of equipment, as well as the expense of maintenance, communications and electrical power, make information and communications technology tools luxury items for the average consumer.

Telephone access. With the development of telecommunications infrastructure in Senegal, the telephone is no longer considered an inaccessible tool. Telephone use, however, cannot develop unless the services offered provide quality and price advantages. Though the cost of communication in Senegal is considered one of the lowest in Sub-Saharan Africa, it is still a dissuading factor for a large number of potential telephone users. Local calls cost 60 CFA francs for 2 minutes during normal calling hours and 60 CFA francs for 4 minutes during off-peak hours.

A price drop in May 2001 reduced international calling rates to other African countries from 340 CFA francs to 325 CFA francs per minute, while rates to the rest of the world

⁶⁵ OSIRIS and ESMT (1999)

⁶⁶ [www.osiris.sn/MNDiaye .htm](http://www.osiris.sn/MNDiaye.htm)

dropped from 510-530 CFA francs (depending on location called) to 400 CFA francs.⁶⁷ Thus, between 1997 and 2001, SONATEL rates declined by 58 per cent for calls to France, and by 75 per cent for calls to the United States.

While the service charge for home telephones is 43,900 CFA francs in urban areas, it varies from 19,500 to 126,500 CFA francs in rural areas. For businesses, the rate is 71,400 CFA francs.⁶⁸ The average bill for a private phone line is 15,000-20,000 CFA francs.⁶⁹ When one considers these rates as a percentage of per capita GDP (approximately 318,000 CFA francs in 1999), it is clear that they are beyond the reach of the average Senegalese consumer.

For SONATEL's mobile phone users, normal and off-peak rates are 180 CFA francs and 90 CFA francs per minute, respectively.

The telecenter explosion. The improvement in access to land-line telephone service is largely due to the proliferation of private calling centers. These were introduced in Senegal in 1993, when SONATEL granted authorization to individuals and corporate entities to commercialize the use of single or multiple telephone lines.⁷⁰

According to SONATEL officials, the country's No. 1 ranking worldwide in the ratio of public lines to private lines is attributable to the calling centers.⁷¹ The total number of public lines represents 8 per cent of the number of private lines, with calling centers alone representing 6 per cent.

The calling center phenomenon exists even in small villages, providing telephone service to 65 per cent of the country's population. In 1998, there were estimated to be 5,800 telecenters, of which 63 per cent were in Dakar; in 1999, this figure was 9,130; by June 2000 the total number of lines in calling centers was 12,600.

In order to open a private calling center one must post a deposit of 500,000 CFA franc per line in Dakar and 300,000 CFA francs per line elsewhere, in addition to a connection charge of 67,200 CFA francs.⁷² Calling centers were responsible for the creation of almost 17,000 jobs between 1993 and 2000.⁷³ Depending on the particular locations, centers have fax machines, photocopy machines, computers with word processors, and, in a small number of cases, Internet connections. As a result, SONATEL has encouraged calling centers to host or create websites for their clients, thus making the calling centers much like cybercafés.

Though they represent only 6 per cent of the total number of land lines in the country, calling centers accounted for 30 per cent (33 billion CFA francs) of total SONATEL earnings (110 billion CFA francs) in 2000.⁷⁴ Except for large businesses, they represent the company's most important client base. Average billing for a telecenter line is 150,000 CFA francs,⁷⁵ in contrast to 15,000-20,000 for private lines. Because of the importance of this commercial market to SONATEL, the company has created a new service exclusively for calling centers, called "distribution and partnership."

Competition now poses a serious problem for the calling center industry, with a consequent effect on its future development. When the first centers opened, the unit charge for telephone calls was 100-105 CFA francs; however, it has dropped to 75 or even 65 CFA francs. With SONATEL making many lines available for calling centers, the market was quickly saturated, and SONATEL continues providing more lines at a rapid rate. This has led to a price war among calling centers that may in some cases be situated only steps from each other. With SONATEL charging 60 CFA francs for the communication service itself (including VAT), more and more calling centers are operating at a loss.⁷⁶

Internet access. Despite the slowdown of the last two years caused by the high cost of Internet access and computer equipment, the Internet presence in Senegal is growing. Just as calling centers made the telephone accessible to the average person, cybercafés are now playing the same role in providing access to the Internet. Moreover, an increasing number of

⁶⁷ Batik, May 22, 2001.

⁶⁸ Diouf (1999).

⁶⁹ Sud Quotidien, January 15, 2001.

⁷⁰ Zongo, 2000

⁷¹ Sud Quotidien, January 15, 2001.

⁷² Diouf (1999)

⁷³ Sud Quotidien, January 15, 2001.

⁷⁴ Sud Quotidien, January 15, 2001.

⁷⁵ Sud Quotidien, January 15, 2001.

⁷⁶ Wal Fadjiri, May 22, 23 and 24, 1999.

telecenters in Dakar have also begun to offer Internet access. There is an increasing number of access points that provide users, through a subscription system, with e-mail addresses and with the ability to access various Internet services. Some non-governmental organizations (NGOs) also provide Internet support for young people in schools and colleges. However, due to the high cost of equipment and telephone service many Internet users can only connect via their workplace, where they have access to the necessary equipment. Only slightly over half of Internet users have their own Internet service.

In 2001, GRCC/Cabinet Consultants Associés conducted a survey of new information and communications technology clusters. Eighty-eight percent of the businesses and organizations surveyed had Internet connections.⁷⁷ Télécomplus, with 59 per cent of ISP-user accounts, is the leading service provider for businesses. In second place is Arc Informatique (10 per cent), followed by Metissacana (7 per cent) and Trade Point (5 per cent). However, numerous businesses (12 per cent) subscribe to a special connection directly through SONATEL. It should be noted, however, that close to two thirds (62 per cent) of businesses with Internet connections have had them for less than two years. The survey indicates that the Internet services most commonly used by businesses with Internet access are: electronic messaging (40 per cent), information searches (34 per cent) and commercial transactions (16 per cent).

While the cost of Internet access in Senegal, like the cost of telephone service, is among the lowest in Africa, it remains expensive for average users. An hour of Internet use in a cybercafé costs between 750 CFA francs and 2,000 CFA francs, while a monthly subscription costs between 8,000 CFA francs and 10,000 CFA francs. The telephone-charge component of the service is the same as for local calling (60 CFA francs for 2 minutes during normal calling hours). Table 14 shows amounts charged by the main ISPs, ranging from 2,500-12,000 CFA francs in monthly service charges.

The impact of communications technologies on the economy

The foregoing analysis demonstrates the dual role that new information and communications technologies play in the economy: first, as an economic activity per se, and second, as a factor of production. It follows that there is a clear distinction between the dissemination of new information and communications technologies (i.e., their increasing use in various sectors of the economy) and the economic importance of activities involved in producing goods and services related to these new technologies. The task of assessing the dissemination of these technologies, as well as that of calculating their share of the economy, however, is a difficult one.

Following will be an examination of the role generally attributed to telecommunications in theories on growth and development, followed by an evaluation of the subsector's contribution to production and growth. This will be carried out through an analysis of the production account for the subsector as it appears in the 1987-97 national accounts. Bearing in mind the dual nature of telecommunications as a consumer good and as a factor of production, there will then be an examination, based on the 1996 input-output table, of the relationship between telecommunications and other areas of activity.

Telecommunications in theories of growth and development

Since the time of Adam Smith, it has been recognized that economic growth is based on technological advancement as reflected in concrete productivity gains, particularly in labor. As Joseph Schumpeter has shown, however, while these gains may appear at any time, the great leaps in technology depend on major discoveries that drive the system of production: the steam engine at the end of the 18th century; the railroad during the first half of the 19th century; electricity, the automobile and the telephone during the first half of the last century. By engendering new methods of production, communications and transportation and by creating new markets and models of industrial organization, these innovations have triggered long cycles of economic expansion.

⁷⁷ Though it concerns only NICT-cluster enterprises, this proportion may seem excessively high. The authors of the report, themselves, offer the following explanation: "This situation is probably the result of strong efforts to promote awareness over the last four years -- efforts carried out by the State, cooperation entities, experts, etc." It should be recalled that the sample involved in this study comprised 275 businesses.

According to many economists, the end of the 1990s marked the beginning of a new era of major innovation, specifically in the information and communications industries. This “third industrial revolution,” as it has often been referred to, is considered to be the engine for a new cycle of economic growth. The changes now occurring are based on the transformation to digital technology. In this process, information and the increased speed with which information can be transmitted become the new material and technological basis for production, thus placing telecommunications at the heart of the production system.

In his approach to stages of growth, Rostow⁷⁸ suggests that the importance of telecommunications goes hand in hand with the intensification and growing complexity of the changes provoked by the expansion of industrial production. The development of industrial activities certainly entails a greater flow of information, making telecommunications the indispensable channel and support structure for economic agents involved in such activities. Thus, Rostow's approach is in line with the classical model of economic development, in which growth is based on the dynamic of capital accumulation that accompanies technological progress.

While classical growth theory posits that growth may be hindered by a decline in capital productivity, the theory of endogenous growth, which is based on the notion of diverse sources of productivity, considers economic progress to be a self-sustaining process. This view holds that if productivity gains are based on both human and physical capital, as well as on technological research and innovation, they can serve as the driving force for uninterrupted economic expansion. From this perspective, the development of public telecommunications infrastructure, for example, tends to drive growth by offering the opportunity for a threefold accumulation of capital: at the physical/material level, by extending the installed telephone network; technologically, by introducing new technologies; and at the human level, through the process of learning and adaptation. The theory of endogenous growth, then, does not place telecommunications downstream from the launch phase; rather, it suggests that the development of telecommunications networks, like electrification, should accompany economic growth.

It is this correlation between teledensity and economic development that is measured by the Jipp relationship, named after the author of the pioneering article entitled “Richesse des nations et densité téléphonique”.⁷⁹ This article was followed by other econometric studies attempting to link teledensity to per capita GDP. The results of those studies, carried out by the ITU's International Telegraph and Telephone Consultative Committee (CCIT), were presented to developing countries for use in planning their telecommunications networks.⁸⁰

Analyzing the correlation of sampled-data series, Hardy goes further, showing dual causality between the number of telephone lines and the level of economic development as measured by per capita GDP. The author adds, however, that the less advanced a country's telecommunications system, the greater will be the multiplier effect.

In other studies, microeconomic approaches have attempted to evaluate the impact that expanded telecommunications infrastructure has on business performance. Starting with the substitution of telecommunications services for certain factors of production used by businesses (work time, price of the factors of production), Bower⁸¹ has, in this manner, measured the potential impact of telecommunications on the functioning of businesses, taking into account the effect of telecommunications on competitiveness, on the prices of factors of production and on the development of commercial activity.

The contribution of communications technologies to production

The problem of defining the boundaries of the sector, as well as the rapid evolution of the technologies themselves, makes it particularly difficult to carry out relevant statistical or accounting evaluations: it is easier to analyze interactions between new information and communications technologies and other economic sectors through the impact of a subsector such as telecommunications, which serves as the main foundation for the development of

⁷⁸ Rostow (1960) indeed believes that the development of an economy is a cycle that goes through four successive stages: the traditional economy, the launch, maturation and mass consumption.

⁷⁹ Jipp (1963)

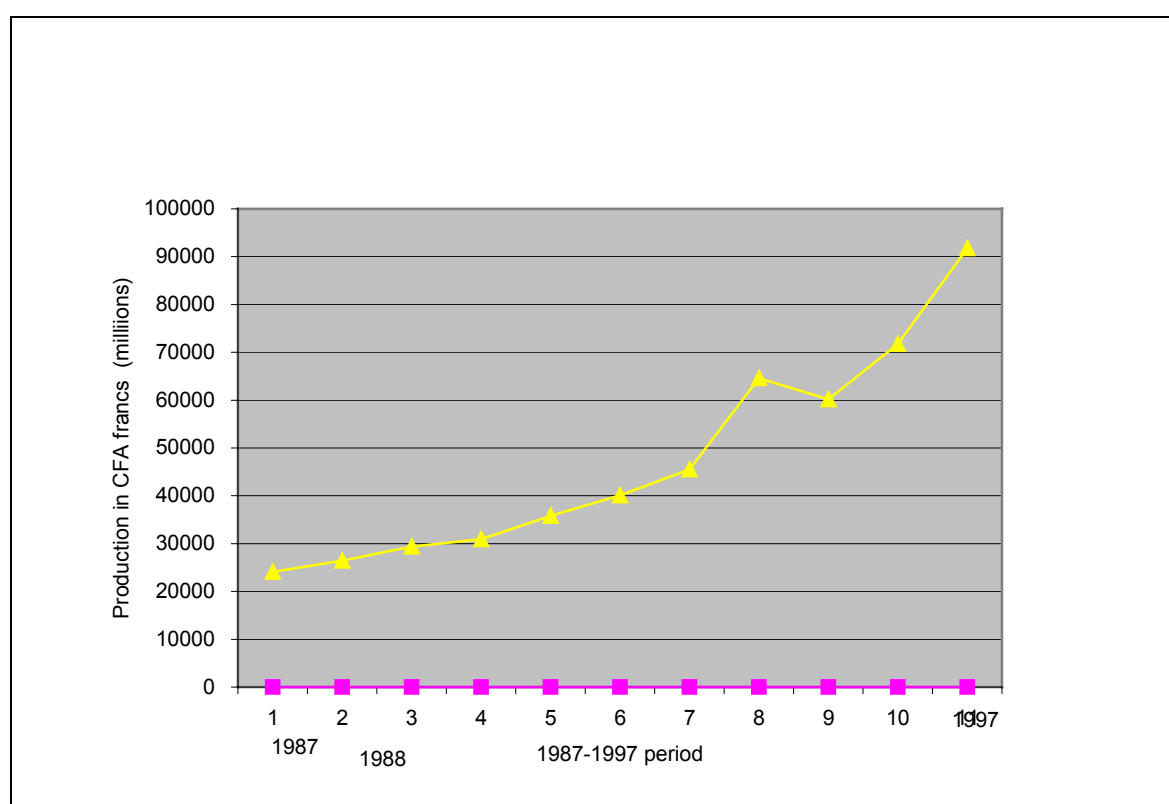
⁸⁰ Debois (1999)

⁸¹ Bower (1972)

these technologies.⁸² The contribution of telecommunications to productive activity is measured in two ways: first, through changes in production in the subsector; and second, by examining the share that the value of goods and services produced represents as a percentage of overall GDP growth.

Change in the production account of the telecommunications subsector. The graph below, along with Table 15, reflects the strong advance in telecommunications services between 1987 and 1997. From slightly over 24 billion CFA francs in 1987, the subsector's production, in current prices, grew to almost 92 billion CFA francs in 1997, representing a fourfold increase over 10 years. Production overall and in the tertiary sector, on the other hand, increased only 90 per cent and 76 per cent, respectively, during the same period.

Graph 2 : Change in telecommunications production



The fact that the sector's share of overall production and of tertiary-sector production doubled in the ten-year period from 1987 to 1997 – from 1.2 per cent to 2.5 per cent, and from 2.6 per cent to 5.6 per cent, respectively (Table 16) – is attributable to the steady advance of telecommunications services. Progress is even more pronounced for telecommunications when considered as a percentage of value added in all areas of activity and in the service sector – rising from 1.4 per cent to 3.4 per cent and from 2.5 per cent to 6.1 per cent during the period in question. A parallel, though less pronounced, phenomenon can be observed in wages for the industry.

While these changes demonstrate the increasing role of production in the telecommunications sector itself, they also underscore the importance of production in the

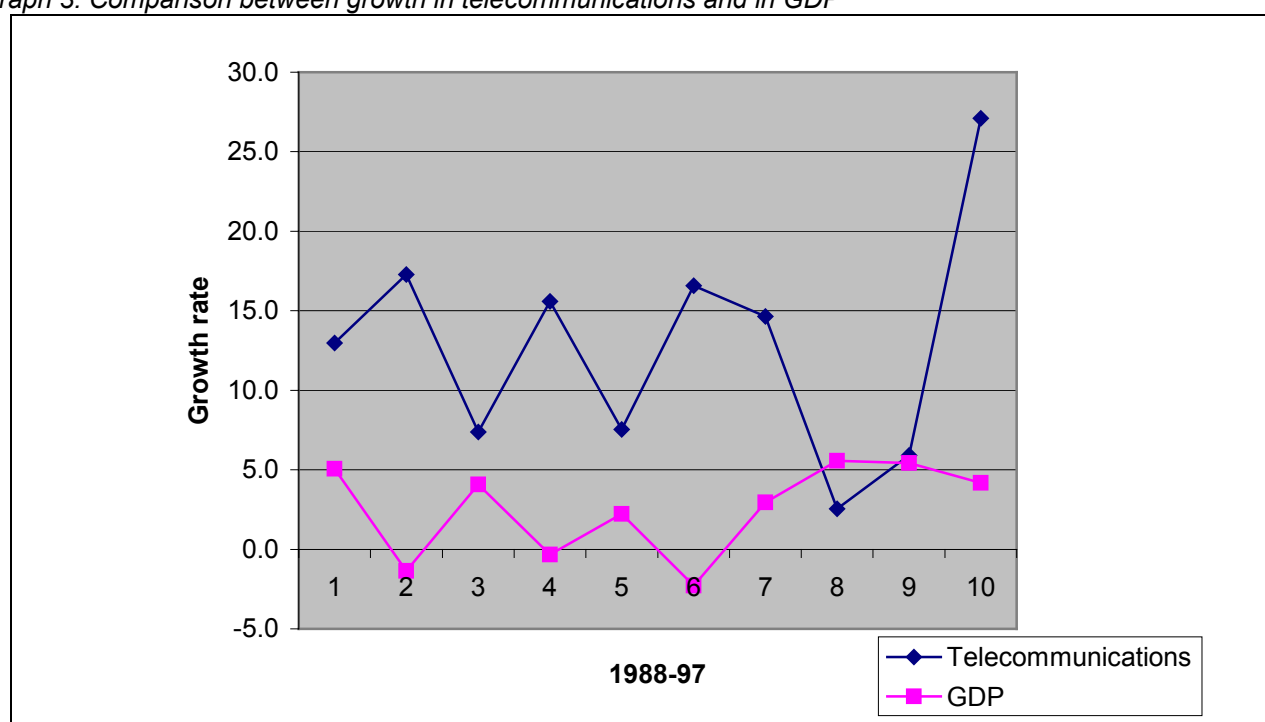
⁸² Furthermore, this choice is forced on us by the fact that the structure of the national accounts not only fails to include information technology as a subsector, but also omits production and investment in communications materials. This latter limitation should not, however, affect the evaluation of the impact of information and communications technologies, insofar as, as we have seen, almost all telecommunications equipment and computer equipment used in Senegal are of foreign origin.

area of telecommunications-related tools and applications. By way of comparison, in 1998 telecommunications services represented 1.4 per cent of GDP (1.8 per cent, including telecommunications equipment) in France and 1.8 per cent (2.3 per cent, including equipment) in the United States.⁸³

Contribution of communications technologies to growth. Value added for the telecommunications sector is growing, albeit unevenly. The average annual rate for the 1987-97 period was 16 per cent (Table 17). Graph 3 shows that, except for 1995, this growth remained above the GDP growth figures (6.3 per cent annually, on average). It also remained more than twice as high as the growth of value added for the tertiary sector as a whole (7 per cent). Thus, as a percentage of GDP, telecommunications rose from 1.3 per cent in 1987 to 3.1 per cent in 1997 – representing a doubling during the ten-year period (Table 16).⁸⁴

These figures demonstrate the strong contribution made by telecommunications services to economic growth in general, and to GDP growth in particular. It is instructive to compare these with the contribution of computer and communications equipment to annual GDP growth in other countries: 0.17 per cent for France, 0.42 per cent for the United States and 0.19 per cent for Japan in the 1990-96 period.⁸⁵

Graph 3: Comparison between growth in telecommunications and in GDP



The above graph shows a lag in GDP growth compared to growth in telecommunications. This lag is reflected in a systematic asymmetry between the two curves, demonstrating in a striking manner that GDP growth is always a year behind the telecommunications subsector – as if telecommunications were exercising a negative or positive multiplier effect on GDP. This is related to the above discussion as to the causal relationship between the dissemination of communications technologies and the level of economic development, as measured by GDP.

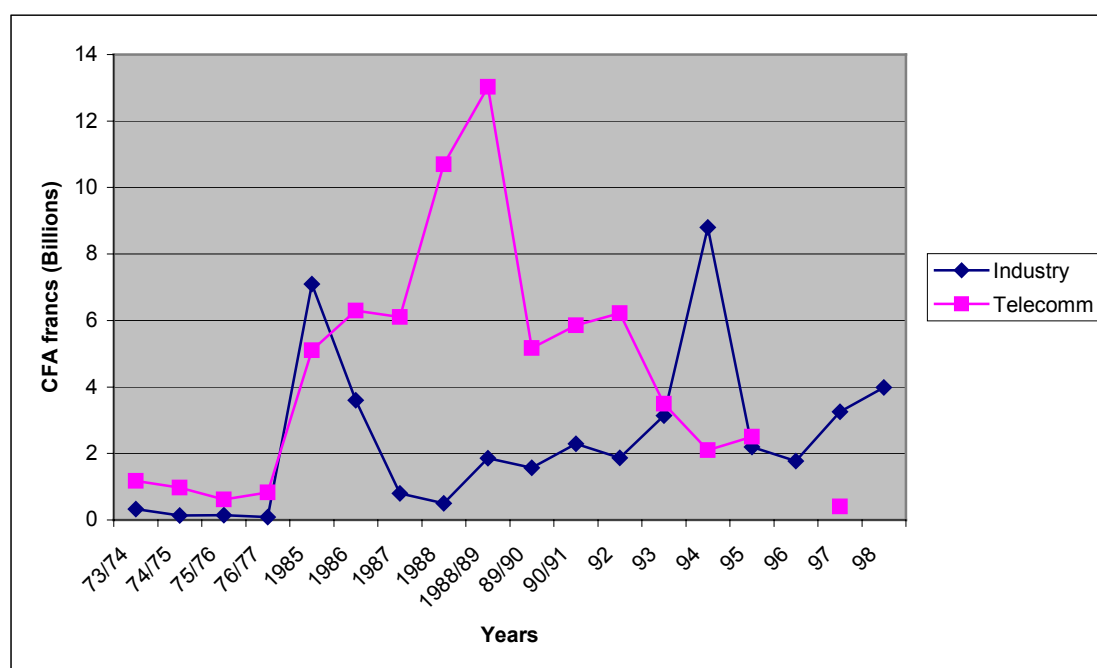
⁸³ Cette *et al.*, (2000)

⁸⁴ It should be noted that one of the objectives of the telecommunications development policy statement (1996-2000) for the year 2000 was to raise the subsector's contribution from 2.4% to 3.5% of GDP.

⁸⁵ Cette *et al.*, (2000)

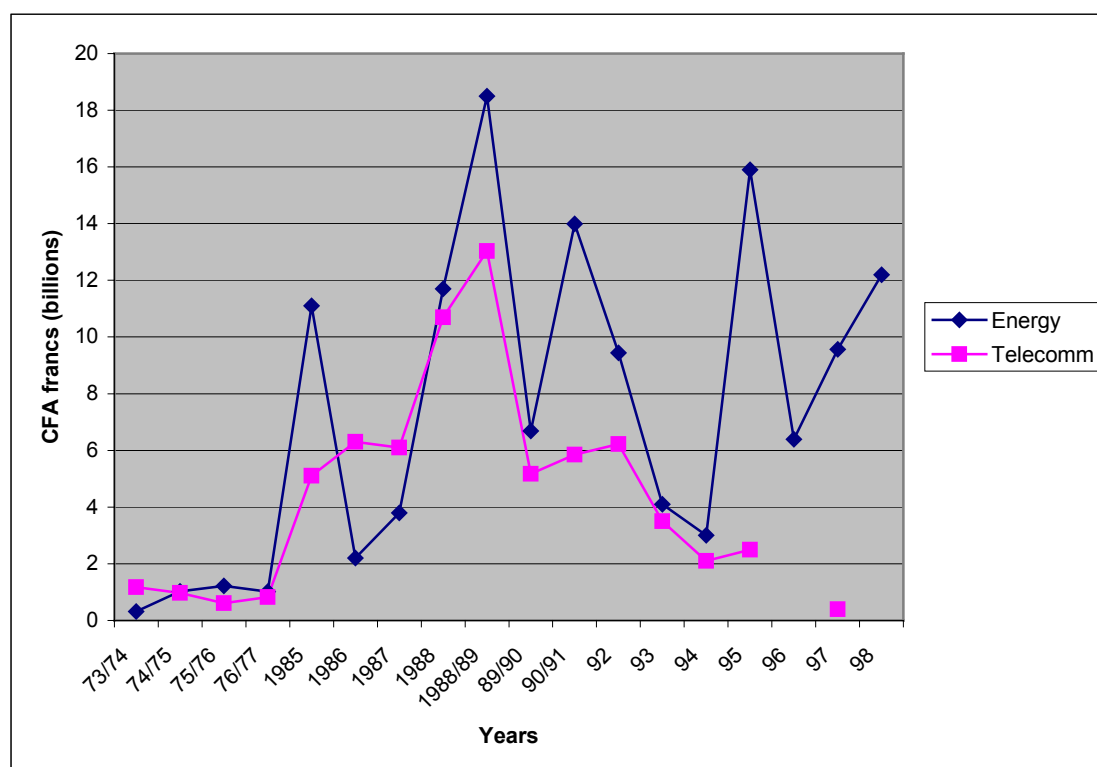
Aside from the difficulty of measuring the impact of new information and communications technologies, an initial explanation for the contrasting movement of the telecommunications subsector and GDP can be found in the imbalance between investment in this subsector compared to investment in other productive sectors, particularly industry. A comparison of investment in these two sectors indicates that between 1974 and 1997 Senegal invested twice as much per year, on average, in the telecommunications subsector as it did in industry (4.41 billion CFA francs versus 2.35 billion CFA francs). In fact, Graph 4 shows that, from 1974 to 1996, there were only two years in which industrial-sector investment exceeded telecommunications investment. Given the divergence of the two curves – at least for the 1985-92 period – one may conclude that telecommunications has exerted a crowding-out effect on the financing needs of the industrial sector.

Graph 4: Comparison between industrial investment and telecommunications investment



Graph 5 compares changes in investment in the telecommunications subsector and in energy. Telecommunications holds up well in this comparison, despite the tendency, over the last few years, to view energy as the country's primary focus for investment. It is evident that investment in telecommunications is at least equal to energy investment, with generally stronger and more consistent growth from the mid-1970s through the 80s.

Graph 5: Comparison between energy investment and telecommunications investment



A second explanation, frequently cited, is that the information revolution is limited, in its impact, to the information and communications industries;⁸⁶ thus, technological advances in this sector do not filter down to the rest of the economy. This can be explained by the fact that time is required for the knowledge and increased awareness of technological possibilities arising from information and communications technologies to be assimilated by the rest of the economy. It should be pointed out that information and communications technologies are still in the embryonic stage in Senegal and are strongly biased toward imports, thus they play a very limited role in overall economic growth.

A third possible explanation of the asymmetry between overall economic growth and telecommunications growth is structural in nature. This concerns the weakness of intersectoral relationships within the Senegalese economy, particularly in terms of the relationship between telecommunications and other areas of the economy – as indicated by the following analysis examining the role of telecommunications services in the input-output table.

Integration of communications technologies: An evaluation based on the 1996 input-output table

To gain a more precise view, analysis of the contribution of telecommunications to GDP growth must be complemented by examining the interdependent relationships between this subsector and other areas of the economy, as shown in the input-output table. This accounting table reflects, in an integrated and balanced fashion, the reciprocal transactions between different areas of the economy over the course of a given year. Thus, it reflects the structure of productive activity, as well as the interdependent relationships between resources and the use of goods and services that the economy produces and imports.

Table 18 contains a simplified version of the 1996 input-output table. This serves the dual purpose of describing the role of telecommunications services in the overall economy

⁸⁶ Voir Adda (2000).

and of analyzing the interaction between telecommunications production and production in other areas of the economy.

The resource-use relationship in the telecommunications services subsector. The 1996 input-output table shows an economy composed of 29 categories of production (with a corresponding number of products), of which four are in the primary sector, seventeen are in the secondary sector and eight are in the tertiary sector. For the purposes of analysis, however, we have only considered data relating to areas of the economy that are consumers of telecommunications services or to products consumed in the process of producing these services.⁸⁷

The table shows that the production of telecommunications services (category 25) -- which, unlike the majority of tertiary activities, is limited to the modern sector -- represents 69.8 billion CFA francs. In the course of this production, the sector consumed products from other sectors in the amount of 11.9 billion CFA francs, with its own services accounting for 240 million CFA francs.

As can be seen in Table 19, over two-fifths (42.5 per cent) of inputs in the telecommunications sector represents services provided to businesses (category 28). Next in size is the category of metal and mechanical products (category 19), which accounts for 29.5 per cent of inputs. Energy (category 20) and petroleum products (category 24) are far behind, with 7 per cent and 5.4 per cent, respectively. As will become clear below, the preponderance of services to businesses and metal and mechanical products as inputs consumed in the production of telecommunications services reflects the foreign origin of the essential materials and technological knowledge utilized in this area.

The value added of the telecommunications industry is 57.6 billion CFA francs, or 82.5 per cent of its annual production, as compared with 64.5 per cent for the tertiary sector and 53.9 per cent for the economy as a whole. While close to three-fifths (58.7 per cent) of this value added constitutes the operating surplus, more than one third (36.5 per cent) is distributed in the form of wages, as compared with 68.6 per cent and 29.8 per cent in the tertiary sector, and 73.2 per cent and 25.4 per cent in the economy as a whole (Table 23). With 4.8 per cent of the value added, the contribution of telecommunications to production-linked taxes is twice as great as for other productive areas (2 per cent).

The figure for imports of telecommunications services is 1.6 billion CFA francs, which is less than one percent of all services imports, and 0.2 per cent of total imports (Table 24). An examination of the telecommunications services trade balance (Table 25) shows that Senegal is really a net exporter in this area. Indeed, the input-output table indicates that telecommunications services have the highest specific coverage rates (1120) after canned fish products.⁸⁸

Of a total of 71.7 billion CFA francs, resources in the telecommunications services industry were allocated as follows: 29 per cent to inputs, 45.4 per cent to final consumption, and 25.6 per cent to export (Table 20). The principal users of telecommunications services are enterprise services (category 28, 18.6 per cent), trade (category 22, 16.3 per cent) and domestic services (category 29, 11.7 per cent) (see Table 22).

Telecommunications services and relationship with other industries. The interaction between the telecommunications industry and the rest of the economy can be assessed in three ways: the use of telecommunications services by other types of industries; the composition of telecommunications sector inputs; and the percentage that local products represent in the industry's inputs. In terms of the first, it can be seen that telecommunications services constitute inputs for all productive areas except two, namely, livestock (category 2) and forestry (category 4) (Table 26). It is notable that these two industries, which do not use telecommunications services, are entirely within the informal sector. The production of telecommunications services, on the other hand, uses products from only 11 industrial categories (Table 26).

This dual fact underlines one of the features that generally characterizes the dissemination and integration of ICTs in the overall economy of Senegal and in that of most of the countries in Sub-Saharan Africa: the absence of a local industry in information and

⁸⁷ The area actually reflected in the 1996 input-output table is "mail and telecommunications." Given the overwhelming role of telecommunications, however, we ascribe all the activity of this area to telecommunications.

⁸⁸ Office of Forecasting and Statistics (1999).

telecommunications equipment and materials, despite the growing and increasingly universal demand for the services they provide.

Furthermore, of a total of 12.2 billion CFA francs in products and services consumed by the telecommunications area, 3.8 billion CFA francs (31.1 per cent) represents imports, as opposed to 8.4 billion CFA francs for local inputs (Tables 19, 24 and 27). Half of imported inputs are enterprise services (category 28) and one-fifth are metal and mechanical products (category 19). On the other hand, of the 21 billion CFA francs of telecommunications services consumed in the production of the various areas of economic activity, only 485 million CFA francs (2.3 per cent) represents imports (Table 27).

The development of telecommunications services is also characterized by strong demand from the informal sector. According to the 1996 input-output table, nearly two-fifths (38.8 per cent) of inputs in telecommunications services comes from informal activities, as compared with three-fifths (61.2 per cent) from the modern sector. However, two-thirds (66.9 per cent) of inputs from the informal sector come from two of ten categories, namely, trade and enterprise services.⁸⁹ As is true for the modern sector, while telecommunications services are used throughout most of the sector, there is a concentration of usage in government (with 11.5 per cent of inputs) and in areas of activity involving international dealings, e.g., financial institutions (13.6 per cent) and transportation (11.8 per cent).⁹⁰

Analyzing the impact of telecommunications services on the economy cannot, however, be reduced to simply assessing the situation in accounting terms. Direct and indirect external effects resulting from improved telecommunications infrastructure must be taken into account. Though such an approach makes measurement problematic, it is clear that the use of telecommunications services by certain businesses has positive effects on the productivity of the economy as a whole.

Constraints on the development of ICTs

Senegal's position at the forefront of new information and communications technologies in Africa does not mean that the country has been successful in overcoming all obstacles to the effective development of these technologies. Existing constraints relate to the institutional, fiscal and customs environment and to policy approaches, as well as to the development dynamics of the sector that derive from its particular characteristics and financing conditions.

Mixed institutional environment and risky policy approaches

As Hamelink (1987) emphasized, one of the main problems in implementing policies concerning ICTs in a country such as Senegal is that of balancing the long-term goal of technological independence with the short-term demands of those using these technologies, including those in government services. While many users expect the latest generation of technology, which can only be supplied through imports, the implementation and harmonious development of domestic technological capacity requires two elements: minimal control and the selection of imported tools and materials. The importance of the second of these two elements is accentuated by the wide variation in user needs. The difficulty, in Senegal, of choosing between these two requirements is complicated by the fact that decisions affecting such matters are generally confined to public entities whose actions are poorly coordinated.

In addition, the State has been constrained – due to investment needs and pressure from deregulation -- in liberalizing the telecommunications industry by two factors: the restructuring of the OPT into two public institutions (the OPCE and SONATEL) and SONATEL's decision to enter into a strategic partnership with a foreign partner. However, this liberalization process did not end the monopoly that the State (via SONATEL) or the RTS (in the audiovisual arena) exercises over the ICT sector. One of the arguments frequently raised by those opposing SONATEL's monopoly is that it distorts the rules of competition, given that the public operator is the provider of services for which it is also the primary source of supply. According to this argument, SONATEL's monopoly on Internet connections, for example, allows it, in the absence of a body regulating the telecommunications industry, to freely set the rates it charges all Internet access providers. Being, itself, an Internet provider

⁸⁹ Office of Forecasting and Statistics (1999).

⁹⁰ Office of Forecasting and Statistics (1999).

(particularly through its subsidiary Télécomplus), SONATEL is able to offer the same services as its competitors without sustaining the same costs.

Nevertheless, the problems faced by Senegal – a country with hopes of narrowing its lag in the technological race – go beyond those of financing investment in planned projects. In order for Senegal to emerge as a major player in the field of NICTs and gain access to the corresponding markets, it must also have the technical capacity to appropriate and redeploy these technologies according to its needs and taking advantage of the opportunities at hand. The dilemma now facing Senegal is how to reconcile financial equilibrium and profitability with the need to develop basic infrastructure and the constraints of universal public service.

Supply side constraints

Surveys carried out among users of information and communications technologies indicate that, despite an improvement in fiscal and customs regulations, taxes and duties on telecommunications materials and services (a 20 per cent VAT and average customs duties of 30 per cent) continue to weigh heavily on the supply of information and communications technologies. The economic study of the NICT cluster (GRCC/Cabinet Consultants Associés) also makes clear that regulatory constraints, in general, and constraints related to the fiscal and customs environment, in particular, are the factors that most strongly affect emerging enterprises within the sector (71 per cent of respondents).⁹¹

While sub-contracting on the part of teleservices enterprises may create jobs, it also reinforces the dependence of these enterprises, and that of the national economy, on the needs of inevitably unstable foreign markets. It also tends to increase the exclusive relationship between enterprises and regulatory institutions. While teleservices operations are experiencing problems in the start-up phase, such difficulties are not attributable exclusively to low profit margins, but are also the result of exclusive supply contracts, generally with foreign partners.

Moreover, while the development of ICTs produces gains in productivity and lower production costs, it can also eliminate the low-cost-labor advantage that countries such as Senegal enjoy – to the benefit of the developed-country partners. Development geared to new technologies can also lead to under-employment and under-skilled workers and can end up producing goods that are unable to compete in foreign markets.

The danger from the proliferation of service-related activities, such as telecenters and teleservices, is that it creates the false allure of being high added-value activities and of creating productive, well-paid jobs for a young, under-employed workforce. However, for an economy the size of Senegal's, these advantages are somewhat illusory since the saturation threshold for this type of market is quickly reached and is highly competitive, as demonstrated by the case of Dakar's telecenters.

Teleservices will be profitable only if they are run according to strict standards and with ongoing financial support and strong State incentives. The lack of infrastructure and of an appropriate legal framework represent major obstacles to the development of electronic commerce.

The telecommunications sector's strong dependence on the distribution of electricity, which has become highly undependable and of poor quality, constitutes a structural weakness – one that telecommunications enterprises, individually, are not in a position to solve.

Given the policies regarding deregulation, disengagement on the part of the State, and privatization of the information and communications technology sector, success will depend on consolidating these technologies in partnerships with large international operators.

Demand side constraints

Investments made in the past and the effort to lower and simplify SONATEL's rates – particularly those related to international traffic⁹² -- have not only made Senegal's telecommunications rates the lowest in Africa, but have also propelled growth in the number of fixed telephone lines and in the volume of international traffic, creating a dramatic increase

⁹¹ GRCC/Cabinet Consultants Associés (2001)

⁹² This effort entailed a drop of 60 per cent in international rates since 1998, of which 42 per cent occurred in the year 2000 alone.

in the number of cellular network subscribers and thereby increasing Internet traffic. However, despite these rates, the time required and the costs involved in connection and in reopening telephone lines makes service prohibitive for many potential users.

Reduced communication and connectivity costs will allow for increased markets for new information and communications technologies by increasing the number of users. The high prevailing telecommunications costs are a result of major investments realized over a relatively short time period, high taxation on SONATEL equipment and services, and the company's financial policy designed to provide self-financing for its investments.⁹³

There are additional factors that make telecommunications services inaccessible to many users. These include insufficient telecommunications infrastructure in rural areas, hampered by the lack of financial resources in rural communities. The low demographic density of most urban localities and the long distances between cities make it particularly costly to provide telephone access.

The development of information and communications technologies is also affected by the disparities between urban and rural areas, in terms of telecommunications and electric-power infrastructure.

SONATEL's investment programs will not be able to maintain the pace of growth required to keep up with demand. In addition, there is the problem of saturation in certain urban areas, making real-time access increasingly difficult, while many rural areas remain poorly covered. The planned development of cellular telephony will not be sufficient to reverse this dual trend.

The growing inter-dependence between the information technology and telecommunications sub-sectors mean that the development of one relies increasingly on the development of the other. The lack of connectivity between computer systems – since many projects were conceived independently – represents an obstacle to expanding information and communications technologies.

Conclusion

New information and communications technologies are expanding rapidly in Senegal. However, while this expansion has certainly created opportunities for stimulating the economy, it is not without uncertainties and risks, in terms of the methods and means of incorporating these technologies in what Castells calls "the completely new international division of labor" created by the technological revolution. The major risk of relying on the success of the new information and communications technologies is that it will eliminate the old complementarities and comparative benefits of the Senegalese economy without creating anything to take their place. Such reliance raises other problems, in terms of the capacity of economic institutions and actors to assimilate and appropriate applications and tools, and the conditions under which this is done.

Beginning with the Fifth Economic and Social Development Plan (1977-80), the State decided to make telecommunications a priority sector of the economy. With the Ninth Plan (1996-2001), the objective of transforming Senegal's economy into a service economy made the dissemination of information and communications technologies "an absolute necessity for development." Relying on the public provider, the State, beginning in the 1980s, made massive investments in telecommunications infrastructure.

However, while this series of investments led to a major transfer of technologies to Senegal and to building a foundation for the dissemination and application of these new information and communications technologies to various segments and activities, it has not yet solved all of the problems involved in assimilating them. The privatizations and investments carried out, rather than setting off the economic growth expected to result from the development of telecommunications infrastructure, actually reinforced the country's technological dependence on large international operators (called "strategic" partners).

It is now recognized that technology transfer is no substitute for the long and costly process of scientific innovation and technological training. More specifically, the accumulation of scientific and technological capital, expanded capital initiatives for research and development by enterprises, and strengthening the network of innovative firms – all these are prerequisites to the effective use of these tools.

⁹³ Ministry of Economy, Finance and Planning, Planning Office (1997).

The appropriation of new information and communications technologies requires the implementation of voluntary policies in the education sector, particularly regarding the installation of telecommunications infrastructure and the necessary electric-power network in remote regions. It is not clear that the sudden dismantling of communications or electric-power distribution monopolies is the most appropriate approach for developing an economy based on new information and communications technologies. The situation is all the more paradoxical given that the government that gained power in the most recent legislative elections of May 2001 no longer has a Ministry of Information, nor even the bodies needed to oversee and promote the development of teleservices – an area to which Senegal has assigned priority importance.

While liberalization may promote the creation of enterprises, it also tends to limit access to new information and communications technologies to profitable sectors of the economy; it also tends to increase the gap between the well-to-do urban population and the population at large. There is little point in investing in the information superhighway if there are no access routes, vehicles or drivers. Likewise, access to the Internet and to foreign markets will have zero impact on agricultural revenue without roads, ports, airports or means of moving and delivering the crops.

In short, it is evident that the link between technological innovation and economic growth is not automatic. Technological innovation is undoubtedly a vital condition for growth. However, for growth to be strong and lasting, effective macroeconomic, social and political regulation is at least as important as the possibilities that technology promises.

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Table 1 : Macroeconomic indicators, 1960-69 to 1994-2000

	1960-1969	1970-1979	1960-1979	1980-1984	1985-1993	1994-2000
A. Rate of growth of GDP in real terms (%)						
GDP	2,2	3,0	2,6	1,8	2,2	4,9
Per-capita GDP	-0,0	-0,5	-0,3	-0,9	-0,4	2,1
B. Rate of growth of different sectors in real terms (%)						
Primary	3,0	3,6	3,3	-2,4	2,2	4,3
Agriculture	0,0	9,3	4,9	-4,9	2,4	5,4
Secondary	4,2	4,3	4,3	3,6	3,1	6,6
Tertiary	2,8	2,4	2,6	2,4	2,4	5,3
B. Share of GDP (as %)						
Primary	24,4	24,6	23,3	19,4	20,2	19,3
Agriculture	16,9	13,9	14,6	10,6	10,5	10,0
Secondary	12,1	14,1	12,5	15,7	18,4	20,4
Tertiary	49,3	48,2	46,2	47,4	49,2	50,8
Total commercial GDP	85,8	86,9	82,1	82,5	87,7	90,4
C. Investment, savings (as % of GDP)						
Investment	7,9	14,6	11,2	12,5	12,6	19,0
- Private	3,4	10,6	7,0	8,2	8,5	12,7
- Public	4,4	4,0	4,2	4,3	4,1	6,3
Savings	5,5	7,8	6,6	-3,5	5,9	11,6
- Private	-	-	-	-4,6	2,0	5,9
- Public	-	-	-	1,0	3,9	4,9

Source: Office of Forecasting and Statistics

Table 2 : Contributors to GDP in real terms 1987 (as % of annual change)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Aver. , 90- 00	Aver. , 94- 00
GDP	3,9	-0,4	2,2	-2,2	2,9	5,2	5,1	5	5,7	5,1	5,5	3,5	4,9
PRIMARY	9,4	-5,1	1,7	-5,2	9,3	2,2	6,1	-2,5	-3,2	6,3	11,5	2,8	4,2
Agriculture	21,8	-11,4	1,7	-10,6	15,9	0,5	10,6	-10,6	-8	8,5	21,2	3,6	5,4
Fishing	-7,6	4,3	7,1	-6,4	6,7	3,1	4,8	11,8	-3,4	4,1	2,5	2,5	4,2
SECONDARY	5,7	-1,2	5,1	-2,5	-0,5	11,7	5,3	5,9	8,4	7,2	7,8	4,8	6,5
Oil	14,4	-33,7	0,4	-6	15,4	18,1	-5,1	-20,9	28,4	7,1	24,9	3,9	9,7
Energy	5	2,7	-7,3	-4,8	10	2,4	8,8	6,5	5,5	0,5	7,9	3,4	5,9
Building & Public Works	15,6	1,9	14,7	-1	10,8	-3,1	9,6	14,9	12,7	15,7	15	9,7	10,8
TERTIAIRE	1,2	2,1	1,9	-2,1	2,2	5,1	5,7	8,7	8,5	4,3	2,5	3,6	5,3
Transp. & telecommun.	4,2	0,4	4,7	1,8	3,2	3,7	6	12	7,5	6,6	3,2	4,8	6,0
Trade	1,4	2,7	-0,7	-5,8	-1,8	6	8,7	7,4	7,8	4,1	2	2,9	4,9
Other services	-0,9	2,5	3,6	0,4	6,7	4,8	2,1	8,3	10	3,1	2,6	3,9	5,4

Source: Office of Forecasting and Statistics

Table 3 : Contributors to GDP in real terms 1987 (as % of GDP)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 estim	1998 estim	1999 estim	2000 estim
PPRIMARY	22,6	20,3	21,4	20,4	20,3	19,7	20,9	20,1	20,5	19	17,4	17,6	18,6
Agriculture	12,7	10,1	11,8	10,5	10,5	9,6	10,8	10	10,5	8,9	8,0	8,3	9,5
Livestock	6,5	6,9	6,7	7	6,9	7,3	7,2	7,2	7	7,1	7,6	6,7	6,6
Fishing	2,2	2,3	2	2,1	2,2	2,1	2,2	2,2	2,2	2,4	2,1	2,1	2,0
Forestry	1	1,1	0,9	0,8	0,8	0,7	0,7	0,7	0,7	0,7	0,6	0,6	0,6
SECONDARY	18,4	18,3	18,6	18,5	19	18,9	18,3	19,2	19,5	19,7	20,6	20,6	21,0
- Extractive industries	0,3	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
-Oil	0,7	0,7	0,9	0,5	0,5	0,5	0,5	0,5	0,5	0,4	0,5	0,5	0,6
-Energy	1,7	1,9	1,9	1,9	2	1,8	1,9	1,9	1,9	1,9	1,9	1,8	1,9
-Building & Public Works	2,9	2,8	3,1	3,1	3,5	3,6	3,8	4,1	4,5	5	4,3	4,7	5,2
-Other indust.	12,6	12,7	12,6	12,6	12,9	12,9	11,9	12,4	12,1	12,3	13,2	13,2	13,1
TERTIARY (excluding non-market services)	47,4	49,1	47,9	49,1	48,9	49	48,6	48,9	48,8	50,6	51,9	51,5	50,0
TERTIARY (including non-market services)	59,1	61,3	60	61,2	60,7	61,4	60,7	60,7	60,1	61,4	62,4	61,8	60,4
Transp. & telecomm.	9,7	10,2	10,2	10,3	10,5	11	11	11	10,9	11,6	11,9	12,1	11,8
Trade	21,9	22,6	22,1	22,5	22,1	21,3	20,3	20,4	20,1	20,9	22,1	21,9	21,1
Other services	15,7	15,3	15,5	16	16,2	15,6	17,3	17,5	17,5	18	17,9	17,6	17,1
Non-market services	11,7	12,2	12,1	12,1	11,8	12,4	12,1	11,8	11,3	10,8	10,5	10,3	10,4
GDP	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Office of Forecasting and Statistics

Table 4 : Changes in public investment in the tertiary sector (billions of CFA francs)

	1973- 1977	1978 1978 - 1981	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
GRAND TOTAL	137,94	94,49	409,60	130,90	78,60	114,90	103,70	112,91	117,31	147,81	123,21	102,56	176,10	178,68	200,74	216,67
Tertiary	34,59	13,87	75,66	33,70	29,20	39,70	24,40	23,34	15,07	27,14	28,75	25,40	13,70	27,20	23,86	45,64
Telecommunications	3,50	5,39	13,32	5,10	6,30	6,10	10,70	13,03	5,17	5,85	6,22	3,50	2,10	2,50	0,00	0,40
as % of grand total	2,5	5,7	3,3	3,9	8,0	5,3	10,3	11,5	4,4	4,0	5,0	3,4	1,5	1,4	0,0	0,2
as % of tertiary sector	10,1	38,9	17,6	15,1	21,6	15,4	43,9	55,8	34,3	21,6	21,6	13,8	15,3	9,2	0,9	0,0
Trade	4,52	0,06	1,10	0,50	0,20	0,20	0,90	0,09	0,10	0,00	0,00	0,00	0,00	0,00	0,11	0,91
as % of tertiary sector	13,1	0,4	1,5	1,5	0,7	0,5	3,7	0,4	0,7	0,0	0,0	0,0	0,0	0,0	0,5	2,0
Tourism	20,07	3,71	21,35	0,60	0,00	0,00	1,90	0,02	0,09	0,24	0,17	0,03	0,00	0,50	0,18	0,00
as % of tertiary sector	58,0	26,8	28,2	1,8	0,0	0,0	7,8	0,1	0,6	0,9	0,6	0,1	0,0	1,8	0,8	0,0
Transportation	6,51	4,71	39,90	27,50	22,20	33,30	11,00	10,02	9,32	20,68	21,67	18,60	9,80	22,70	21,77	43,56
as % of tertiary sector	18,8	34,0	52,7	81,6	76,0	83,9	45,1	42,9	61,8	76,2	75,4	73,2	71,5	83,5	91,2	95,4
Miscellaneous	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,18	0,39	0,37	0,69	3,27	1,80	1,50	0,00	0,77
as % of tertiary sector	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,8	2,6	1,4	2,4	12,9	13,1	5,5	0,0	1,1

Sources : - 1973 - 1977 : Fourth Economic and Social Development Plan; Ministry of Cooperation (July 1976)

- 1985 - 1988 : Eighth Master Plan 1989-1995; Ministry of Cooperation (October 1989)

- 1989 -1998 : Directorate of Economic and Financial Cooperation (DCEF), Ministry of Economy and Finance (October 1999)

Table 5 : Telecommunications investment program 1977-81

Program	In CFA francs (billions)
1. OPT	
Dakar-North axis	4,6
Other projects	0,3
2. TELESNEGAL	
Central TELEX INTERNATIONAL Dakar	0,5
Link : Dakar-Casablanca Antinéa	3,8
Links: Dakar-Bissau, Dakar-Praya,	0,1
Ziguinchor-Bissau	
Links: Dakar-Abidjan undersea cables	3,7
International Telex Center	0,3
Automatic message switching center	0,3

Source : Fifth Plan (1977-1981)

Table 6: Number of switching centers established per region, 1977-1981

Regions	Number of switching centers
Casamance	6
Eastern Senegal	4
Sine Saloum	8
Diourbel	4
Thiès	6
Cap-Vert	3

Source : Fifth Plan (1977-1981)

Table 7 : SONATEL investment expenditures in CFA francs (billions)

	1995	1996	1997	1998	1999	2000
National projects (as % of total)	32,8 (87,0 %)	51,2 (88,4 %)				
Regional projects (as % of total)	4,8 (12,7 %)	6,7 (11,6 %)				
TOTAL	37,7	57,9	21,3	48	54,6	55
Self-financing (as % of total)	32,2 (85,4 %)	9,4 (90,6 %)				
External financing (as % of total)	5,5 (14,6 %)	5,3 (9,4 %)				

Sources : SONATEL (1995,1996,1997, 1998,1999).

Table 8: SONATEL fixed assets in CFA francs (billions)

	1997	1998	1999
Total fixed assets	190,9	237,1	277,2
Operating equipment:	151,8	175,3	190,2
SONATEL switching	36,2	43,4	47,0
Public switching	0,4	0,4	0,4
Transmission	54,3	62,4	67,9
Public networks and lines	45,5	50,2	55,1
SONATEL networks and lines	2,3	2,4	2,4
Energy	9,3	12,0	12,5
Equipment		0,7	1
Other	3,6	3,7	3,8

Source: SONATEL (1997, 1999)

Table 9: Training costs in 1995 and 1996

	1995		1996	
	Number of employees	Amount in CFA francs (millions)	Number of employees	Amount in CFA francs (millions)
Initial training	23	17	44	32
Ongoing training	623	184	394	73
TOTAL	646	201	438	105
% of total jobs	38%		24,1%	

Source: SONATEL Annual Reports for 1995 and 1996

Table 10: Comparative level of teledensity, 1990 and 1997

Country	Teledensity (per inhabitants) 100		Change 1990-97 (as %)	Telecommunications earnings as % of real GDP
	1990	1997		
Senegal	0,6	1,11	85	2,2
Côte d'Ivoire	0,61	0,88	44	1,4
Ghana	0,29	0,44	52	1,1
Cameroon	0,35	0,52	49	0,9
Philippines	1	2,49	149	1,3
India	0,6	1,54	157	1,1

Source : Forestier (1999)

Table 11: Change in lines and in teledensity (per 1000 inhabitants) by region, 1988 to 1998

	1988		1998	
	Number of lines	Teledensity	Number of lines	Teledensity
Dakar	29 850	19,9	77 000	36,7
Thiès	1 694	1,8	8 000	6,8
Diourbel	nd	Nd	13 100	15,9
Fatick	204	0,4	nd	nd
Louga	nd	nd	4 000	7,3
Kaolack	1 623	2,0	4 800	4,7
St.-Louis	1 571	2,4	5 300	6,7
Ziguinchor	1 099	2,8	3 800	7,6
Kolda	367	0,6	nd	nd
Tambacounda	401	1,0	2 000	4,2

Table 12 : Number of telecenter lines by region, 1999

Regions	Number
Dakar	4698
Thiès	857
St.-Louis	619
Ziguinchor	536
Tambacounda	346
Kaolack	871
Kolda	128
Diourbel	1041
Louga	342

Table 13: Rates for specialized Internet links (excluding VAT)

Capacity in kbps	Installation charges (in CFA francs)	Monthly fees (in CFA francs)
19,2	374.000	285.000
28,8	374.000	310.000
33,6	374.000	325.000
64	650.000	480.000
128	650.000	796.000
256	650.000	930.000
512	1.000.000	1.530.000
1024	1.000.000	1.920.000
2048	1.000.000	2.520.000

Source : www.osiris.sn/chiffres1.htm

Table 14: Internet access rates of a number of providers (in CFA francs)

Access providers	Installation/ membership	Monthly subscription
Télécomplus	30.000 (incl. tax)	12.000 (incl. tax)
Arc Informatique	20.000(excl. VAT)	10.000(excl. tax)
Métissacana	25.000 (excl. tax)	8.000 (excl. tax)
UCAD	Free	2.500
AUPELF-UREF	20.000 (incl. tax)	5.000 (incl. tax)
Trade Point Senegal	30.000 (incl. tax)	9.600 (incl. tax)
Cyber Business Center	30.000 (incl. tax)	12.000 (incl. tax)

Source : www.osiris.sn/chiffres2.htm

Table 15: Changes in telecommunications production 1987-1997 in CFA francs (millions)

Production account	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Change 87-97 (as %)
Telecommunications												
Production	24 097	26 422	29 390	30 953	35 780	40 097	45 489	64 565	60 157	71 776	91 736	281
Inputs	6 055	6 242	5 724	5 568	4 990	7 094	6 689	10 727	10 985	12 522	16 442	172
Value added	18 042	20 180	23 666	25 385	30 791	33 003	38 800	53 838	49 173	59 253	75 294	317
Wages	7 739	9 970	8 635	9 775	9 872	11 574	11 839	13 823	13 843	21 456	16 935	119
Indirect taxes	470	536	547	1 141	660	1 213	1 056	1 331	835	2 887	2 051	336
Subsidies	1 532	1 360	1 241	1 241	1 020	867	765	695	620	1 584	1 936	26
Operating surplus	11 365	11 034	15 725	15 710	21 279	21 084	26 670	39 378	35 115	36 494	58 243	412
Tertiary sector												
Production	932 281	977 218	1 032 859	1 058 623	1 055 677	1 104 423	1 067 164	1 351 375	1 468 731	1 542 468	1 644 693	76%
Value added	709 962	746 339	785 426	807 401	813 031	836 127	812 251	1 035 114	1 111 382	1 164 288	1 232 091	74%
Wages	266 258	275 528	286 600	287 116	292 931	306 637	302 052	353 909	368 032	390 992	399 321	50%
TOTAL ALL SECTORS												
Production	1 944 890	2 081 433	2 129 586	2 212 186	2 182 543	2 250 401	2 169 735	2 922 991	3 316 712	3 506 796	3 704 012	90%
Value added	1 256 371	1 352 588	1 348 512	1 406 642	1 397 466	1 438 302	1 397 988	1 839 709	2 004 108	2 116 933	2 185 206	74%
Wages	385 221	394 946	408 745	415 779	423 079	444 611	436 960	517 671	541 993	581 247	598 998	55%

Source: Office of Forecasting and Statistics

Table 16: Contribution of telecommunications to production of the tertiary sector and to total production (as %).

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Monthly average
Telecommunications/Tertiary												
Production	2,6	2,7	2,8	2,9	3,4	3,6	4,3	4,8	4,1	4,7	5,6	3,8
Value added	2,5	2,7	3,0	3,1	3,8	3,9	4,8	5,2	4,4	5,1	6,1	4,1
Wages	2,9	3,6	3,0	3,4	3,4	3,8	3,9	3,9	3,8	5,5	4,2	3,8
Telecommunications/Total												0,0
Production	1,2	1,3	1,4	1,4	1,6	1,8	2,1	2,2	1,8	2,0	2,5	1,8
Value added	1,4	1,5	1,8	1,8	2,2	2,3	2,8	2,9	2,5	2,8	3,4	2,3
Wages	2,0	2,5	2,1	2,4	2,3	2,6	2,7	2,7	2,6	3,7	2,8	2,6
Telecommunications/GDP	1,3	1,4	1,6	1,6	2,0	2,1	2,5	2,7	2,2	2,5	3,1	2,1

Source: Office of Forecasting and Statistics

Table 17: Comparative growth rate of GDP and of value added for the telecommunications and tertiary sectors (as %)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Annual average
Telecommunications	11,9	17,3	7,3	21,3	7,2	17,6	38,8	-8,7	20,5	27,1	16,0
Tertiary sector	5,7	4,2	5,2	1,6	2,3	-4,8	30,9	11,3	6,9	6,9	7,0
GDP	7,3	-0,5	5,1	0,0	2,8	-3,6	31,5	10,5	6,5	3,7	6,3

Source: Office of Forecasting and Statistics

Table 18: Input-output Table 1996 in CFA francs (millions)

RESOURCES						SECTORS							USES		
PROD.	IMPOR T.	IDT	VAT	TOTAL RES.	PROD.	1, 3	5 21	- 22- 24	25	26- 29	TOTAL	FIN. CON S.	EXP.	TOTAL USES	
502 959	433 211	89 119	52 183	1 077 472	15-17, 19-20				5293						
890 052	120 376	-	46	1 010 474	22-24				984						
69 838	1 640		237	71 715	25	160	5 898	6 069	240	8 406	20 773	32 572	18 370	71 715	
468 894	62 974	-	-	531 868	26-28				5681						
1 931 743	618 201	89 119	52 465	2 691 528	SUB- TOTAL			TOTAL	12 198						
2 038 787	353 708	68 696	29 270	2 490 460	OTHER			PROD.	69 838						
3 970 530	971 909	157 815	81 735	5 181 988	TOTAL			V. A.	57 640						
Source: Office of Forecasting and Statistics					Wages			21 066							
						2									
						15-17, 19-20									

Source: Office of Forecasting and Statistics

*Table 19: Intermediate inputs
of telecommunications industry*

PRODUCT S	CFA francs (million s)	As % of total
15	184	1,5
16	661	5,4
17	2	0,0
19.	³ 591	29,4
20	855	7,0
22	402	3,3
23	77	0,6
24	505	4,1
25	240	2,0
26	426	3,5
27	65	0,5
28	⁵ 190	42,5
TOTAL INPUTS	¹² 198	100,0

Source: Office of Forecasting and Statistics

Table 20: Operating account of telecommunications industry

	CFA francs (millions)	as %
VALUE ADDED	57 640	100,0
Wages	21 066	36,5
Taxes on production	2 745	4,8
Subsidies received	—	0,0
Gross operating surplus	829	58,7
AVAIL. PROD.	69 838	
IMPORT.	1 640	
VAT	237	
TOTAL RESOURCES	71 715	

Source: Office of Forecasting and Statistics

Table 21: Intermediate uses of telecommunications services

Industries	CFA francs (millions)	As % of total	Industries	CFA francs (millions)	As % of total
1	22	0,1	16	68	0,3
3	138	0,7	17	731	3,5
5	290	1,4	18	95	0,5
6	162	0,8	19,	560	2,7
7	316	1,5	20	646	3,1
8	145	0,7	21	1 353	6,5
9	159	0,8	22	3 386	16,3
10	121	0,6	23	1 189	5,7
11	206	1,0	24	1 494	7,2
12	185	0,9	25	240	1,2
13	387	1,9	26	1 728	8,3
14	357	1,7	27	373	1,8
15	117	0,6	28	3 874	18,6
16	68	0,3	29	2 431	11,7
			TOTAL	20 773	100,0

Source: Office of Forecasting and Statistics

Table 22: Comparative uses of telecommunications services, tertiary-sector resources and total resources in CFA francs (millions)

	TELECO M.	AS %	SERVICE S	AS %	OVERAL L	AS %
INPUTS	20 773	29,0	648 277	17,6	1 830 416	35,3
FINAL CONSUMPTION	32 572	45,4	1 832 297	49,8	2 202 300	42,5
GFCF	-	-	17 387	0,5	416 582	8,0
CHANGES IN INVENTORY	-	-	-	-	32 586	0,6
EXPORTS	18 370	25,6	1 020 184	32,2	700 103	13,5
TOTAL USES	71 715	100	3 981 681	100,0	5 181 987	100,0

Source: Office of Forecasting and Statistics

Table 23: Distribution of added value

	TELECO M.	AS %	SERVICES	AS %	ALL INDUSTRI ES	AS %
Wages	21 066	36,5	352 443	29,8	543 264	25,4
TP	2 745	4,8	23 511	2,0	41 875	2,0
Subsidies	-	0,0	4 186	0,4	11 342	0,5
GOS	33 829	58,7	812 252	68,6	1 566 317	73,2
VALUE ADDED	57 640	100,0	1 184 020	100,0	2 140 114	100,0

Source: Office of Forecasting and Statistics

Table 24: Productive contribution of telecommunications in CFA francs (millions)

	TELECOM.	SERVICES	TEL./SERV (as %)	ALL SECTORS	TEL./TOTAL (as %)
INPUTS	12 198	648 277	1,9	1 830 416	0,7
PRODUCTION	69 838	1 832 297	3,8	3 970 530	1,8
VALUE ADDED	57 640	1 184 020	4,9	2 140 114	2,7
Wages	21 066	352 443	6,0	543 264	3,9
TP	2 745	23 511	11,7	41 875	6,6
Subsidies	0	4 186	0,0	11 342	0,0
GOS	33 829	812 252	4,2	1 566 317	2,2
IMPORTS	1 640	184 990	0,9	971 909	0,2
TOTAL RESOURCES	71 478	2 017 287	3,5	5 181 958	1,4

Source: Office of Forecasting and Statistics

Table 25: Trade balance

	TELECO M	SERVIC ES	ALL INDUSTRI ES
EXPORTS	18 370	248 745	700 103
IMPORTS	1 640	184 990	971 909
BALANCE	16 730	63 755	- 271 806

Source: Office of Forecasting and Statistics

Table 26: Local inputs of telecommunications sector and of telecommunications services in CFA francs (millions)

	Industries					
	1,3	5 to 21	22 to 24	25 to 26	26 to 29	TOTAL
Products						
15 to 17				484		
19 to 20				2 562		
23 to 24				425		
25	159	5 837	6 008	238	8 320	20 562
26 to 28				4 641		
			TOTAL			
			L	8 350		

Source: Office of Forecasting and Statistics

Table 27: Imported inputs of telecommunications sector in CFA francs (in millions)

	Industries					
Products	1,3	5 to 21	22 to 24	25	26 to 29	TOTAL
15 to 17				522		
19 to 20				2 125		
23 to 24				157		
25	4	137	142	6	196	485
26 to 28				1 038		
			TOTAL	3 848		

Source: Office of Forecasting and Statistics

LEGEND :

Agriculture = 1; Fishing = 3; Extractive industries = 5; Slaughtering, other canning industries = 6; Fish canning industries = 7; Fat processing industries = 8; Grains and flour works = 9; Sugar and candy industries = 10; Beverages and tobacco = 11; Other food industries = 12; Textiles and leather = 13; Wood = 14; Paper, publishing and printing = 15; Oil = 16; Other chemical industries = 17; Construction materials = 18; Metallic and mechanical industries = 19; Energy = 20; Building and construction = 21; Trade = 22 ; Hotels, bars, restaurants = 23; Transportation = 24; Post and telecommunications = 25; Insurance and financial institutions = 26; Real estate services = 27; Enterprise services = 28; Domestic services = 29; GFCF = Gross fixed capital formation; Prod.: production; Export. = exports; Import. = imports; GOS = Gross operating surplus; AV = Value added; TP = Taxes related to production; IDT = Import duties and taxes; Subsid. = Operating subsidies received