

7

Rwanda

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Rwanda is a landlocked country located at the heart of the African continent, 1,700 kilometers from the Indian Ocean and 2,000 kilometers from the Atlantic, and surrounded by the Sahara, Zaire, Burundi, Tanzania, and Uganda. The topography of its 26,338 square kilometer area is dominated by mountainous regions and large lakes: Lake Kivu to the west, Lake Tanganyika to the south, and Lake Victoria to the east. The country has an average annual temperature of 18 degrees Celsius.

Rwanda, whose capital is Kigali, has a population of 8.3 million inhabitants, the majority of whom are under sixteen years of age. Rwanda's three ethnic groups are the Hutu (90 percent of the population), the Tutsi (9 percent of the population), and the Twa (1 percent). In the early 1990s, Rwanda's gross national product was U.S.\$1.813 billion, or U.S.\$250 per capita. Coffee exports served as its main source of hard currency, but the economy also relied on exports of tea, pyrethrum, tin ores and concentrates, and wolframite.

Until 1991, Rwanda's political regime was based on single-party rule. However, since then Rwanda has had sixteen political parties, of which five were part of the transitional coalition government of the early 1990s. The Rwandan Patriotic Front (FPR), a Tutsi-dominated rebel organization, invaded from Uganda in 1990, and the conflict intensified as the coalition government was formed. A peace treaty was signed in August of 1993, but before the peace could be implemented, the head of state, Major General Juvénal Habyarimana, was killed in a plane crash. Almost immediately, the Hutu government forces and militia slaughtered between 500,000 and 1,000,000 Tutsi civilians in an orgy of blood that shocked the world. The FPR resumed its status in an active rebellion and eventually won in July of 1994. They then set up a new Tutsi-dominated government headed by a moderate Hutu. Many other Hutus fled the country, and in the process the entire region's stability suffered. All this affected the telecommunications system of the country in a serious way.

7.1 The Past

Originally a monarchy ruled by the Tutsi tribes in 1899, Rwanda was part of a German protectorate until 1916. It then became a Belgian trust territory in 1916,

as part of Ruanda-Urundi, and gained its independence on July 1, 1962. Its first republic lasted for eleven years, until July 5, 1973, when the military deposed President Grégoire Kayibanda, a civilian-military government was set up, and Major General Juvénal Habyarimana became head of state. In 1991, a multiparty system was declared legal, and elections were announced. Unfortunately, in 1990 a civil war broke out between the FPR and the government, and it was not until 1993 that an accord was reached. This proved to be a temporary peace, however, and the FPR eventually won the civil war in July 1994.

7.1.1 The Colonial Period

It was only in 1924 that the first automobiles began crossing Rwanda's few passable roads, which had been completed just two years earlier. Mail that previously could be delivered only by messengers walking at an average speed of six miles an hour could now be transported by motor vehicle within a day to its final destination—but only in locations served by Rwanda's scant road system.

By 1930, the first wireless telegraphy station (TSF) was established linking Kigali to Bujumbura, the capital city of the territories under Belgium's guardianship (now the capital of Burundi). Its primary purpose was the processing or forwarding of official correspondence. Within the next quarter century, each prefecture's capital city was equipped with similar TSF stations. Each TSF station communicated exclusively with Bujumbura by telegraph, using manual transmission and audio reception of Morse code signals. The connection linking Bujumbura and Bukavu (The Congo) was the only outlet for international traffic. International-bound messages had to be retransmitted from Bukavu to Leopoldville (Kinshasa) before accessing international connections.

In 1956, Rwanda and Burundi set up their own provincial administration at Bujumbura-Kigali, and the first local telephone networks—served by small manual telephone exchanges—were established in Gisenyi, Butare, and Kigali. In 1958, local telephone networks were created for Cyangugu, Nyanza (Nyabisindu), and Gitarma. Gisenyi, Cyangugu, and Butare maintained their direct connection with Bujumbura while the other inland stations were linked to Kigali, forming the embryo of a truly Rwandan national telecommunications network. The forwarding of international traffic was enhanced by the opening of a connection between Bujumbura and Kinshasa. In 1959, an aerial line was installed between Kigali and Butare. Rwanda's telecommunications system experienced radical changes between 1956 and 1962, from the first successful attempt to forward telephone messages directly without routing them through Zaire to acquiring modern Philips-brand telecommunications equipment from Holland.

7.1.2 The Postindependence Period

At this stage of telecommunications development—July 1962—Rwanda gained national sovereignty. During its first transitional year of independence, Rwanda's telecommunications system operated within the Common Telecommunications Agency of Burundi and Rwanda (ATCBR), and the country

focused on creating new national and international direct telecommunications lines. For example, by the end of 1962 telephone services between Kigali and Bujumbura had been opened, and in February 1963 a Morse code link between Kigali and Kampala was established. By March–April 1963, telegraph, telephone, and telex services were opened between Kigali and Brussels, and by mid-year the first radiotelegraph operators trained in Rwanda were graduating in Kigali. Also in 1963 an international telex network and a manual telephone switchboard center with seventy-five numbers were installed at Kigali, and Rwanda began serving its first manual table telex customers.

In 1965, telegraph services (by teleprinter) were opened between Kigali and Nairobi, and the Morse code manual radio connection between Kigali and Kampala was ended. Several milestones occurred in 1969: TSF stations at Gikongoro and Gitarama were opened, the telex connection between Bujumbura and Kigali was established, automated telephone switchboard centers at Cyangugu were installed, and construction work for a Hertzian frequency band network was begun.

Expansion continued in the 1970s. In 1970, the automated telephone switchboard center at Kigali was extended, radiotelephone connections between Kigali and Cyangugu, Butare, and Ruhengeri were inaugurated, and automated telephone switchboard centers were installed at Butare, Gisenyi, and Ruhengeri. A radiotelephone connection was established between Kigali, Abibjan, and Brazzaville the following year, and in 1972 telex connections between Kigali, Frankfurt, and Kampala were established and a radiotelephone connection was opened with Paris. In the next four years, five more TSF stations were opened (1973), a telex was installed at four locations (1974), and a radio transmission center was created at Nyanza-Kicukiro (1975).

The late 1970s and early 1980s witnessed further expansions and changes in Rwanda's telecommunications network. In 1977, the switchboard center at Kigali was extended from 2,000 to 3,000 customers and then in 1979 from 3,000 to 5,000 customers. The year 1979 also saw the installation of an automated telex center and the inauguration of the Ecole Nationale Mixte des Postes et Télécommunications at Kigali. In 1980, fourteen linkages of a rural telecommunications network were established, and in November of the following year, the high-frequency connection between Kigali and Ruhengeri was replaced by a connection in the one Hertz frequency band. In 1982, the first Intelsat tests on the Nyanza-Kicukiro Terrestrial Station were performed. A new TSF station was opened at Karengeras, and the new automated switchboard at Kigali was established.

7.2 The Present

When the civil war of the 1990s stopped many projects, Rwanda's domestic telecommunications network consisted of the following facilities:

- Twenty-six telegraph stations, which aside from the Central Radio-Telegraph Bureau of Kigali, include stations in Gitarama, Butare, Gikongoro, Cyangugu, Kibuye, Gisenyi, Ruhengeri, Byumba, Kibungo, Nyabisindu, Rwama-

gana, Kansenze, Ruheango, Gatsibo, Nyamasheke, Nyange, Kabaya, Vunga, Kirambo, Rushashi, Karengera, Kiyuhba, Garenke, Rubengera, Kaduha, and Masango.

- Twelve automated telephone switchboard centers, six of which were launched in February 1987 for Kigali and its satellites, with the remaining six launched in March 1987 for the capital cities of the prefectures: Butare, Nyabisindu, Gikongoro, Cyangugu, Ruhengeri, and Gisenyi.
- The telex center of Kigali.
- Connections between Rwanda and other countries—either by telex, telegraph, or telephone: Kigali/Brussels, Paris, Frankfurt, Amsterdam, Nairobi, and Bujumbura.
- Two earth stations for satellite communications, one Intelsat and one Symphonie, both located in Kigali.

7.2.1 The Domestic Network

Rwanda has four major telecommunications centers—in Butare, Cyangugu, Gisenyi, and Ruhengeri—and seven local centers in Gitarama, Nyabisindu, Gikongoro, Kibuye, Byumba, Rwamagana, and Kibungo. Each major telecommunications center is headed by a center manager who is responsible for the center's administration, and each local center is under the authority of a local center manager who controls production and management.

The infrastructure of Rwanda's telecommunications network consists of the following elements: a telephone exchange, a telegraph switchboard, rural telephony, transmission by microwave links, an earth station, and local networks. The telephone exchange consists of modern digital switches. In Kigali, a telephone exchange operates as an international transit center, a national transit center, a grouping center, and a manual center facility with operators' transmitters.

In the other regions, four grouping centers were installed in Gisenyi, Butare, Cyangugu, and Ruhengeri. These automatic switchboards are modern digital systems and serve 500 to 5,000 subscribers. Through the regional exchanges and the Kigali grouping center, with its distant concentrators, twelve major towns in Rwanda have telephone networks. All the regional telephone exchanges are connected to the Kigali center with interurban lines.

Rwanda's telex network initially consisted of a Siemens TWKN-type autoconverter installed in 1979 and was equipped with sixty-five channels. In 1988, Rwanda's only telex exchange was in Kigali. This switchboard served Kigali's subscribers and twenty-one consumers spread over different regions of the country. However, because the exchange was old and had reached the saturation point, the Rwandan administration decided in 1987 to replace it with a Japanese NEC automatic switchboard with a capacity of 200 local channels and 120 international channels. Additionally, a French Sagem Eltex U Alpha switchboard was installed in 1987.

The microwave system, which is mostly digital, is used to support the interurban communications. The Kigali exchange employs transmitters that can function manually for both regional and international communications. Rwanda's basic

transmission network has a star-shaped structure for both analog and digital connections. The central nerve of this star is in Kigali, and connections link Kigali to other important towns. Rwanda's analog microwave system interconnects the following centers: Kigali-Butare, Kigali-Gisenyi, and Kigali-Cyangugu. The total length of the connections is 290 kilometers, and the total number of microwave links is six.

7.2.2 The International Network

Before the launching of the earth station in 1982, Rwanda used to process international traffic through high-frequency connections to Brussels (one phone line plus one graph line), Paris (one phone line plus one graph line), and Frankfurt (one phone line). A high-frequency connection with Nairobi, Kenya, was created. In addition, two international connections by Hertzian frequency bands were established to link Bujumbura and Kampala.

There are two types of international microwave links in Rwanda: ground communication microwaves and microwaves forwarded by the two earth stations. In the early 1990s, the Kigali-Butare connections were being used to forward the Kigali international channels to Bujumbura (Burundi) and were also intended for use as a means of emergency communication between Butare and Gisenyi.

The ground traffic centers on Uganda and Burundi, although communication with other countries is possible through the earth station and satellite. International traffic, however, is of less economic importance because there are simply not enough channels.

7.2.3 Organizational Structure

The organizational structure of Rwanda's Telecommunications General Administration, which dates back to 1984, is as follows: at the top of the hierarchy is the General Management Board, followed by two management boards—one technical, the other operational—beneath which are five departments (commutation, transmission, terrestrial station, research, and operations), and then nine bureaus (accounting, consumer service, cables, telephone and telex switchboards, transmission, radiotelegraph, maintenance, internal taxation service, and logistics and supplies).

A general directorate of telecommunications is in charge of the country's telecommunications system. This general directorate is in turn controlled by the Ministry of Transports and Telecommunications. Through the early 1990s, Rwanda's telecommunications had neither financial autonomy nor self-sufficiency, although the World Bank was sponsoring a program meant to put national telecommunications under the control of a limited company called Rwandatel.

In the early 1990s, an appropriate national law or set of laws relative to telecommunications was nonexistent in Rwanda. For relevant legislation one had to refer to the laws and recommendations of both the International Telecommunications Union (CCITT-IFRB and the like) and Intelsat. All potential investors in Rwanda's telecommunications must sign a contract with the general directorate of telecommunications.

The general directorate is structured as follows:

1. General Directorate.
2. Directorate of Equipment and Maintenance.
3. Directorate of Exploitation.
4. Seven departments: administration and finances; inspection and control; planning and programming; exchanges and cable network; energy and transmission; earth station; and data processing.

Each department is in turn divided into sections. In the early 1990s, Rwanda's telecommunications personnel consisted of 615 agents, with 400 in Kigali and the remainder spread throughout the other regions.

7.2.4 Tariff Structures

7.2.4.1 Telecommunications Tariffs

Local communications in Rwanda are not charged by time—only a fixed rate is applied. For interurban communications, charges depend on the amount of time used, but both daily and night tariffs are the same. In the early 1990s, interurban communications were charged 3 Rwandan francs, and the charging system was divided into fifteen-second periods.

Charges for international communications depend on both the length of communication and the distance between countries. Communication with certain specific services are not charged (these include national and international registrations, the state police force, and the fire brigade).

In 1992, the efficiency of Kigali's local traffic was only 49 percent, which is below expected performance levels based on the general efficiency trend of telecommunications (65 percent). Of the total number of local calls not completed, 74 percent received busy signals and 17 percent received a "no response" from the call's intended recipient. Rwanda's international traffic also shows a significant level of inefficiency.

To solve Rwanda's traffic flow problems, tariff arrangements were planned to motivate subscribers to adjust their telephone usage with respect to the importance and type of traffic.

Eighty-one percent of Rwanda's telephone traffic is consumed during the busiest hours of the day. In particular, 51 percent is consumed between 7 A.M. and noon. Thirty percent of the traffic is consumed during the working hours in the afternoon (2 P.M. to 5 P.M.), but between 1 P.M. and 3 P.M. the traffic decreases to only 4 percent of total daily traffic. Only 5 percent of Rwanda's telephone traffic occurs after 8 P.M. Saturday mornings represent an important traffic period, but such traffic occurs only at long intervals. The average duration of telephone calls in Rwanda depends on the distance of the call.

Rwanda uses a lump tariff system for local calls, which constitute nearly 80 percent of the calls made by the system's consumers. However, because local calls represent only 13 percent of the incoming traffic, they are undercharged.

Incoming international traffic dominates the total incoming traffic in Rwanda's telecommunications system, just as in most African countries. This reflects the

fragile character of the management of this service. Generally speaking, the quality of Rwanda's international service is unsatisfactory, resulting in dissatisfied customers and losses of incoming traffic, with a resultant loss of revenue for the general directorate of telecommunications. The reasons for the inefficiency of the international service include busyness of lines, nonresponse, and line congestion.

A close study of the international tariffs to and from Rwanda in the early 1990s revealed an important asymmetry: there was a tendency for traffic to be reversed because subscribers preferred to be called from abroad rather to call from Rwanda. Tariffs therefore need to be adjusted gradually to compensate for the asymmetric network traffic.

7.2.4.2 Tariffs for Other Services

The use of telegraph services for international traffic decreased in Rwanda in the early 1990s due to the growing use of the telephone and fax services. The international traffic, however, brings substantial incoming revenues. Because the telegraph remains the only means of communication for most people in Rwanda, the institution of a flexible tariff seemed called for.

Although telex services are often used within Rwanda, gross budgets were decreasing in the early 1990s. However, the international telex traffic has increased in recent years—accounting in the early 1990s for about 90 percent of the incoming telex traffic. Telex services may face stiffer competition from the increased use of faxes in the near future. Although fax service is quite new in Rwanda, by the early 1990s it was in full use, primarily by the business sector. It is therefore likely to generate an important level of telephone traffic and should continue to attract great interest.

7.2.5 Quality of Service

Rwanda's rate of efficiency in 1992 was 58 percent call completion for domestic calls and 35 percent for international calls.

With a telephone density of 0.11 main lines per 100 inhabitants in 1988, Rwanda ranked last among African nations. However, the telephone exchanges installed in 1987 were all digital and constitute a strong framework for the network's future. Nevertheless, it should be pointed out that the distribution of telephones between Kigali and the rest of the country is not proportional to the breakdown of the population by location. Kigali, for example, represents 4 percent of Rwanda's population but possesses 58 percent of its telephone lines. In addition, several telephone exchanges have already reached the point of saturation (Butare, Gisenyi, Nyabisindu, Byumba, and Gitarama).

In the early 1990s, Rwanda's telephone system faced high installation costs, which are calculated according to the length of the line from the applicant's property limits to the connecting box of the cable (20 meters or more). At the same time, the low number of functioning lines per month discourages potential subscribers.

Most of Rwanda's telex consumers live in Kigali. By the early 1990s, the telex system, with 100 teleprinters, had reached the point of saturation. The initiation of

the NEDIX exchange in 1988 allowed for an extension of the park, and another telex exchange, ELTEX, was put into service in 1989. However, low traffic prohibits the installation of an interurban telex exchange, and the increased interest in new services such as telecopy has reduced the importance of telex in the system.

Rwanda's telephone network is small, but it does possess modern digital exchanges that make possible the evaluation of traffic. In the early 1990s, Rwanda's telecommunications authorities acknowledged that increases in demand were possible and that the network might therefore be extended.

In Rwanda, consumers may buy both the receivers and their accessories themselves and may also purchase telex and fax machines together with their accessories provided that they inform the general directorate of telecommunications. Private companies in Rwanda are also entitled to purchase private exchanges under three types of arrangements in which: (1) the equipment belongs to the subscriber but is maintained by the general directorate of telecommunications, (2) the equipment belongs to the subscriber but is maintained by the general directorate of consumers, or (3) the equipment belongs to the subscriber and is maintained by the subscriber.

7.2.6 Government Control

Rwanda's telecommunications are under the total monopoly control of the state, and the government is the only operator and service supplier. The general directorate of telecommunications is in charge of both international and domestic telecommunications. Except for the circuit leased by SITA (an international company for aeronautical telecommunications), leased circuits do not actually exist in Rwanda. Furthermore, as part of a public telecommunications administration, the general directorate of telecommunications has no relationships with specific national groups such as enterprises, syndicates, and businesspeople. The only relationships so far have been those between customers and suppliers.

The general directorate of telecommunications, however, maintains close relationships with such international institutions as the International Telecommunications Union (ITU), Intelsat, and Inmarsat. Because the Rwandan government has sought to free itself from telecommunications policy, in the early 1990s a limited company, Rwandatel, was expected to eventually assume control of national and international telecommunications with the assistance of various economic operators (investors, businesspeople, and national security agencies).

Insofar as the general directorate of telecommunications is under the control of the Ministry of Transports and Communications, the Rwandan government is the only investor in the country's telecommunications sector. Telecommunications bills are paid via the account of the Ministry of Finances and contribute toward the state's gross budget. A budget totaling approximately U.S.\$2.5 million is approved by vote each year. Although the government is aware that this amount is insufficient and requires adjustment, the telecommunications budget is not likely to increase the national budget substantially, which itself consistently shows a chronic deficit. Moreover, the development of Rwanda's telecommunications sector could have proceeded at a faster pace if the civil war had not intervened.

7.2.7 Telecommunications Modernization Programs

7.2.7.1 The Terrestrial Station of Kicukiro-Nyanza

To eliminate Rwanda's telecommunications bottlenecks, it became urgent to improve its intercontinental telecommunications, and the direct connections with correspondent countries that were needed could only be obtained via satellite. In contrast to the high-frequency circuits used previously, satellite circuits would improve the quality and reliability of the international service and make possible connections with nonadjacent African nations.

Rwanda thus presented the Japanese government with a general program that consisted of a terrestrial station, an international transit center, an international telex center, and Hertzian frequency band connections between various cities. Following negotiations, Japan agreed to finance only the international telecommunications portion of the project and granted funds of 1.35 billion yen. The project was awarded to joint affiliate of the Sumitomo Corporation and NEC Ltd. (Nippon Electric Company Limited), and on July 15, 1980, Sumitomo and the Rwandan government signed the project agreement. The funds were divided into two categories: 160 million yen were allocated for financing the installation and 1.183 billion yen for purchasing the equipment. For its part, Rwanda was to provide the construction of facilities made to house the new equipment, as well as the customs clearance and shipping of the equipment to the project sites.

7.2.7.2 Modernization Projects Financed by France

Rwanda's telecommunications modernization projects financed by France included the installation of new switches, a billing and invoicing center, a technical facility at Kigali, two other facilities in the provinces, and the replacement of the Philips UR 49 A central of Kigali with an electronic central (the E-10B).

Rwanda's old communications network was equipped with rotary telephone switchboard centers of very small capacity and was hampered by technical problems related to spare parts, maintenance, and the like. Moreover, it simply did not represent a harmonious fit in Rwanda's modernization program. As a result, the rotary telephone switchboard centers were replaced by telephone switchboard centers of a more recent design.

The establishment of a modern billing and invoicing center using recording tapes made it possible to handle delays and larger traffic volumes. Its construction cost (12 million French francs) was more than twice that of the technical facility built in Kigali (5 million French francs or 65 million Rwandan francs). Between 1978 and 1986, the number of telephone customers in the urban center of Kigali grew at a rate of 6 to 15 percent, necessitating the replacement of the Philips UR 49 A central with a larger electronic central—at a cost of 5 million French francs.

Overall, of the 75 million French francs financed by France, 60 million came from a loan from the Caisse Centrale (CCCE) and the remaining 15 million from a subsidy of the French Aid and Cooperation Fund (FAC). Of this 75 million total, 45 million francs were allocated for supplies, installation, and maintenance, as well as miscellaneous or unexpected costs.

7.2.8 Optimizing Rwanda's Telecommunications System

Some of the major objectives—or aspirations—of Rwanda's policy to establish a modern and reliable national and international telecommunications network were the following:

- To draw up a plan—recruiting and training system—for highly qualified individuals capable of utilizing and maintaining the system's technical equipment.
- To restructure the system's organization to eliminate the confusion of tasks and the absence of functional separations between the managerial and operational services.
- To introduce high quality and large capacity into the telecommunications service in order to make possible the substantial expansion of the networks and the automation of national and international connections.
- To overcome the impediments to the functioning of the system caused by the fact that management and its budgetary decisions must still answer to the ministry.

7.2.8.1 Independence of the Telecommunications Service

In spite of the financial and political difficulties and the demands of other projects, the Rwandan government was forced in the 1990s to consider giving financial and administrative independence to the telecommunications sector in acknowledgment of the growing importance of telecommunications to the future development of the country as a whole. Without financial and managerial independence, the telecommunications sector will not be able to perform its tasks within the new infrastructures emerging in Rwanda. Moreover, independence in and of itself will lead to increased income and improved customer service. Thus, starting in 1996, the government gave serious consideration to privatize the national system of Rwandatel.

7.2.8.2 Extension of the Rural Network

As we have seen, the continued expansion of Rwanda's rural telecommunications system—particularly the communal administrative centers and the socioeconomic, industrial, and health centers—is vital to the country's economic future. The goal of the third phase of the rural development program was to establish a target structure by transforming the local centers into rural zones. The equipment ordered in this phase was expected to satisfy Rwanda's rural telecommunications needs for approximately five years. Unfortunately, the civil war delayed or stopped much of the planned development.

7.3 The Future

Since 1987, Rwanda's telecommunications sector has experienced considerable shocks as well as progress, including the installation of new modern telephone

exchanges and digital telex systems that have made possible automatic international communications. In the 1990s, Rwandan telecommunications remained a state property, and the absence of judicial, financial, and management autonomy left it with no particular way to develop meaningfully. The creation of the limited telecommunications company Rwandatel should thus result in greater power with which to exploit and control the entire field of Rwandan telecommunications. Such restructuring can only proceed, however, with a clear definition of the roles of both the government and the limited telecommunications company.

7.4 Conclusion

Most of the planned changes were negatively affected by the country's political situation. Since the civil war intensified in 1992, the situation in Rwanda deteriorated. The telecommunications system was destroyed in many places, repairs to the system have been slow. The telecommunications system has been a low priority for the government as it struggles to hold together the country. With stability returning, telecommunications will again become a focus for economic development efforts.