Out of South Africa: Some Recent Developments in the South African Telecommunications Equipment Industry

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OUT OF SOUTH AFRICA: SOUTH AFRICA'S TELECOMMUNICATIONS EQUIPMENT INDUSTRY

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1.0 INTRODUCTION

South Africa has a long-established and diversified telecommunications manufacturing industry, which is currently undergoing significant changes. From an industry almost entirely dependent on the domestic market, it has very recently become far more export-oriented--with Africa emerging as a particularly important market. This chapter briefly surveys the history of the South African telecommunications equipment manufacturing industry and focuses on current developments with particular emphasis on the industry's export trajectory.

2.0 HISTORICAL BACKGROUND

In the mid-1950s, the South African defense establishment was concerned that international hostility to the policies of apartheid might lead to the disruption of supplies of vital communications equipment. With military and strategic considerations predominant, the South African government decided to utilize the

monopsonistic power of the postal and telecommunications authority--the South African "Post Office" (SAPT)--to establish extensive local production of telecommunications equipment.

Following the British example, at the end of 1957 SAPT signed a series of ten-year manufacture and supply agreements with its principal suppliers of telecommunications equipment: Automatic Telephone Electric Company, Siemens (UK), and Standard Telephone and Cables. At the time, these companies were supplying similar equipment to the British Post Office. These agreements (known as "the long-term agreements") were extended for another ten years in 1968. Then in 1979, with the advent of digital technology, these agreements were extended for another fifteen years. The latter extension of the long-term agreements expired early in 1995.

The long-term agreements stipulate that SAPT will satisfy its requirements for specified equipment over the entire period only from the agreement companies. In turn, the contracting companies agree to undertake local manufacture and to progressively increase their products' local content. Prices are established according to a complex formula of cost recovery plus an allowance for profit, the latter being dependent mainly on the quantity ordered and the return on capital invested. Profits earned on items supplied under the long-term agreements are

shared with Telkom SA, the government-owned company in charge of South Africa's telecommunications since (see Kaplan, 1990, p. 90).

With the advent of digital technology, political and strategic considerations became critical factors in the choice of equipment suppliers to SAPT. For example, in one case the choice of three local suppliers of digital-switching equipment with two foreign technology sources was politically rather than economically motivated.

For the first two decades into the mid-1970s, South Africa's local telecommunications industry developed rapidly. The manufacture of electromechanical telecommunications equipment had two key features. First, it required considerable direct labor inputs. In South Africa, this was initially provided primarily by white male labor, but the rapid and progressive substitution of lower-paid labor (that of women and especially of nonwhite racial groups) allowed local telecommunications companies to reap considerable profits and was a principal reason for the industry's expansion. Second, electromechanical technology was a mature technology, evolving slowly and predictably. Research and development (R&D) expenditures were therefore low, and local telecommunications producers could easily acquire the requisite technology from any one of a number of foreign firms.

In this context, SAPT was able to support local production through

guaranteed orders for a small, select number of companies that manufactured telecommunications equipment locally. Output and employment in the telecommunications equipment manufacturing industry expanded rapidly. Moreover, this equipment was generally of high quality, "up to date," and not much more expensive than equipment available on the international market.

In late 1977, however, SAPT decided henceforth to only enter into new contracts for digital telecommunications equipment. Digital technology completely revolutionized the production and R&D requirements of telecommunications equipment because the manufacture of digital telecommunications equipment is far more capital - and R&D - intensive.

South Africa's local telecommunications industry did not adjust adequately to these changes. The extent of SAPT support increased but, at the same time, this support proved to be less effective at sustaining the local telecommunications industry, now operating under the new digital dispensation. By the mid-1980s, measured in terms of its local content, its exports, or its technological capability, the telecommunications equipment industry was performing poorly. Moreover, SAPT began to reduce its capital expenditure considerably with the onset of the debt standstill, and this, combined with declining orders from the military (many of South Africa's telecommunications companies also produce electronic equipment

for the military), further undermined the industry.

Furthermore, in October 1991 the postal and telecommunications operations of SAPT were separated. Telkom SA was assigned responsibility for telecommunications and registered as a commercial company (with the government as sole shareholder). The pursuit of bottom-line profitability called into question the support and preferences traditionally offered by Telkom to the local manufactures of telecommunications equipment. As a result, it was expected that the long-term agreements would be substantially modified or even eradicated altogether when they were due for renewal in 1995.

Over the last few years, however, there have been some signs that the industry has begun to respond more positively to the new dispensation. In particular, the exposure of the industry to international markets has recently increased markedly. This has been accompanied, in a number of cases, by enhanced technological capability. In addition, the industry has undergone considerable rationalization internally and has attracted important additional sources of foreign investment. The professed intent of all the major telecommunications equipment producers in the mid-1990s was to progressively detach themselves from reliance on the domestic market, and more particularly reliance on orders from Telkom, and to continue to expand the proportion of their

turnover that is exported.

3.0 SIZE AND COMPOSITION OF THE TELECOMMUNICATIONS MARKET AND INDUSTRY

The South African telecommunications market has traditionally mirrored the structure evident in a wide range of developed countries, namely, a single dominant purchaser and, on the supply side, a small number of exclusive suppliers. While both sides of the market were undergoing change in the mid-1990s, this structure had so far been modified rather than transformed.

3.1 Market Size and Composition

The South African market for telecommunications equipment is quite large by international standards. In 1986, South Africa was assessed to be the fifteenth-largest market in the world--somewhat smaller than India and Australia and somewhat larger than Brazil. (Financial Times, 1987, p. xxiv; and 1989, p. ii).

The market for telecommunications equipment actually shrunk in real terms between 1989 and 1993 (see table 1). No data was collected for 1993, but Telkom's capital expenditure for that year - a fair proxy for the size of the overall market - was only some 7% higher in nominal terms than for 1992 ie. a 5%

reduction in real terms (Cape Times [Cape Town], 17 May 1993, p. 12).

[INSERT TABLE 1 ABOUT HERE]

TABLE .1 TELECOMMUNICATIONS EQUIPMENT MARKET IN SOUTH AFRICA

Current values in millions of rand

Product Description	1988	1989	1990	1991	1992
Switching Equipment	411	404	283	316	341
Transmission Equipment	562	623	684	730	787
Subscriber Equipment	586	706	768	879	937
Broadcast Equipment 8	12	15	19	26	
Radio Communication Equipment	156	209	251	277	312
Communication Peripherals	31	55	73	85	110
Satellite Communication					

Devices	3	9	12	18	25
TOTAL	1757	2019	2087	2322	2537
Percentage growth in previous year	22	15	3	11	9

Source: Business and Marketing Intelligence (BMI), Sandton.

The principal reason for the decline in the market is the cutbacks in Telkom expenditures, which have declined precipitously. In 1994, Telkom purchases account for less than one-half of the total telecommunications market. This is down from about 70 percent in 1990 (Kaplan, 1990, p.85).

However, there are now indications that the situation is changing. The new Government of National Unity is determined to accelerate the provision of telephony to disadvantaged communities. The number of working lines is expected to rise from 3.9 million in March 1995 to 5.3 million by March 2,000. Telkom accordingly expects to increase its annual ordering level from the current 200,000 exchange user ports to 330,000 exchange user ports per annum.

In addition, the introduction of cellular telephony in 1994, has been a major shot in the arm for the South African market. There are two licensed cellular operators. By the end of 1995, estimates are that there will be at least 400,000 subscribers and that this will bottom out at about 800,000 subscribers by the end of the century. Outside of Europe, South Africa is currently the largest user of the GSM standard network. By the end of 1995, investment in mobile telephony will exceed R1.6 billion.

3.2 Telecommunications Equipment Producers

On the supply side, the industry is dominated by four large companies. These are the exclusive suppliers to Telkom of a range of telecommunications equipment, particularly "the big ticket items" of switching, transmission, and receiving equipment. Table 2 details the ownership structure of the five principal telecommunications equipment producers. The first four companies have had long term supply agreements with Telkom. Together, the five companies constitute more than 85 percent of the industry.

TABLE 2. PROFILE OF THE PRINCIPAL TELECOMMUNICATIONS EQUIPMENT COMPANIES

Company	Principal Local Shareholder	Principal Foreign Shareholder
Alcatel Altech Telecomms (Pty) ltd	Altron (50%) S.A.(50%)	Alcatel CIT
Siemens Telecommunications (SITEL)	Siemens SA (51%) Reunert (27.5%)	GEC Plc(21.5%)
Plessey Tellumat	Sankorp (100%)	-----
Telephone Manufacturers of South Africa	Siemens SA (26%) Reunert (40.6%)	GEC Plc(33.33%)
SA Philips Pty (Ltd)	Unspecified (25%)	Philips BV Eindhoven(75%)

Source: Company annual reports.

The ownership structures of all the South African telecommunications equipment companies have undergone major changes recently. Changes in share ownership have been accompanied by a rationalisation of production. Larger and more focussed South African companies are now better able to compete in more open markets.

Two significant features of the new ownership structure should be noted:

- the local telecommunications companies are all integrally linked to one of the major conglomerates that dominate the South African economy. Anglo-American has a minority shareholding (20%) in Altron, the holding company of Altech; Sanlam (16%) and Gencor (16%) have minority holdings in Siemens SA and therefore an interest in Telephone Manufacturers of South Africa and Plessey is a wholly owned subsidiary of Sankorp, a subsidiary of Sanlam. Reunert was, until recently, part of Barlow Rand, which has recently 'unbundled', but Old Mutual remains its principal shareholder.
- Siemens and CIT-Alcatel have emerged as the key foreign firms with a strong presence in the local telecommunications equipment industry. The "European orientation" of the local industry is pronounced.

Production of different telecommunications items in South Africa tends to be highly concentrated, frequently with a single local producer. Alcatel Altech in

transmission; Telephone Manufacturers in telephone sets, card phones and public telephones; Siemens in telex and teletex terminals; and Plessey in test equipment and as sole supplier of small business telephone systems to Telkom.

Siemens and Alcatel Altech produce digital exchanges - with Siemens having two-thirds of the market. Philips, Siemens and Plessey produce mobile telephones. Only in the unregulated PABX (private automatic branch exchange) market is there fierce competition between a much larger number of local suppliers.

Moreover, the larger companies (particularly Altech Alcatel) tend also to be significant players in the importation of components and in component production.

There were two new significant entrants into the industry in 1994 - AT&T and Ericson. The former is said to be "on a poaching path" (Business Day, 20 October 1994). It has joined forces with Telkom to provide services such as a managed telecommunications network for multinational companies and is said to be investigating a partnership with Afritel Systems, South Africa's only black owned telecommunications company, possibly in the cellular market. Ericson Radio Systems formed a joint venture with Plessey Tellumat SA to supply and install new cellular equipment.

4.0 THE STATE OF THE INDUSTRY

High levels of market power make profitability a poor guide to the efficiency and competitive international position of the South African telecommunications equipment industry. This is particularly true given that, in South Africa, the principal customer determines the price paid and the telecommunications equipment companies are backwardly integrated (for example into the manufacture and importation of components). Two more significant (and interrelated) indicators of the industry's efficiency and competitive international position are the technological capability of the industry and the industry's export performance.

4.1 Technological Capabilities

One index of well-being and viability is the extent to which the industry is capable of designing and developing new products, or at least of making significant adaptations to imported designs. Telecommunications is, of course, a technologically dynamic industry and the development of technological capability is therefore likely to be indispensable to future success in internationally competitive markets. Technological capability is both an index and a symptom of well-being.

With some exceptions, for example in small PABXs, the South African telecommunications equipment industry derives its products and production

processes from foreign companies--often with only minor modifications. Technology is generally secured via license agreements. An analysis of the license agreements operative in 1990 by one of the largest telecommunications equipment producers revealed the following features:[1]

1. Licenses are of long duration--a median period of ten years--and are very often extended for a further period. Long duration in a license agreement indicates that the local company is not making any real headway in genuinely learning or assimilating the licenser's technology. Local companies must therefore continue to rely on the extension of the license agreement. This non-assimilation of or inability to learn the licenser's technology is further evidenced by the fact that the license agreements very rarely stipulate any training of local personnel in the licensers' technology. In sum, the import of technology from abroad is often a substitute for local technological capabilities and not, as it has been elsewhere in some of the newly industrialized countries, for example, a facilitator of the development of local technological capability.

2. License agreements contain significant restrictive clauses. For example, the license agreements often stipulate the use of imported inputs (frequently from the licenser or an affiliate). Such "tied" purchasing clauses severely limit backward

linkages and hence local content. But, most critical (and most common) are clauses in the license agreements that restrict the export activity of local companies. Out of eight license agreements surveyed, seven expressly limited exports to the immediate southern African region and in some cases only to Namibia or to Botswana, Lesotho, and Swaziland.

3. Royalty payments are high. Typically, they are 4.5 percent of ex-factory price, but, in addition, they often entail a front-end charge. These charges are heavy--the front-end charge in one case exceeded R 1.7 million. Overall, a royalty of 7 percent per year is not uncommon. The sums paid by local companies in license fees are large by comparison with expenditures on R&D.[2] Indeed, for most of the large telecommunications companies, payments to import product technology exceed payments to develop local product technology by a large margin.

The long-term agreements expressly attempted to encourage Telkom's contractors to design and develop new products by ensuring that Telkom would pay for any expenditures (plus an allowance for profit) that the contractors incurred in this regard. But despite the very clear objective of the long-term supply agreements to encourage R&D on the part of the suppliers, the evidence is clear that they did not have the desired effect.

The reasons for this are complex.[3] The long-term agreements exclude the

entry of new smaller companies that might be highly innovative. Furthermore, the agreements provide alternative and often less risky routes to achieving high levels of profitability. For example, contractors have often found it to be more profitable to establish a monopoly on the production or importation of certain inputs and to utilize this monopoly position to raise the price at which it supplies those inputs to the telecommunications industry. (The profits of component suppliers, unlike those of the telecommunications equipment producers, are not subject to the same profit-sharing arrangements with Telkom). Profits earned through such a form of monopoly pricing would be akin to a rent. Finally, the agreements allow for any license fees paid abroad to be recouped as a cost item by the contractors.

Local telecommunications producers therefore have an incentive to simply adapt designs (especially where these have been acquired from a parent company) sufficiently so as to meet Telkom specifications. Moreover, where Telkom sets very high "specs" (and this was and is characteristic of SAPT/Telkom), the effect may also be to discourage local product design. Cost-plus pricing under the long-term agreements makes it advantageous for Telkom's contractors to focus on expanding the breadth of their product range as opposed to the depth of product design and development. Not only are Telkom's contractors therefore devoting fewer resources to R&D, but these resources also tend to be spread over a very

wide range of products. Finally, the requirement that Telkom approve new product development prior to a project's being undertaken imposes substantial delays in the design cycle. Because Telkom is required to pay the full costs of such development up front, it may also be more cautious than the contractors with respect to new product development. As a user of telecommunications equipment, Telkom has little appreciation for the potential advantages and pitfalls on the manufacturing side. Development efforts will be slanted toward products needed by Telkom, and this may well have contributed to the past poor export performance of Telkom's contractors.

The expansion of exporting, a very recent phenomenon (see below) holds much more promise for the enhancement of technological capabilities in the South African telecommunications equipment industry. While precise data are lacking, there does seem to be a link between expenditure on R&D and success in export markets. According to information supplied by Business and Marketing Intelligence (BMI), which monitors the industry,

"There is a definite correlation between the export successes of companies (in telecommunications) . . . as well as in the broader context of the local electronics industry, to their R&D activity). . . . Own technology in product design has proven to be a winning factor in several sectors of the local industry, and

communications products are but one example."

(BMI Report, 1991, p. 4).

While precise data are not available, quantitative investigations into R&D activity by local companies in the electronics and telecommunications sectors over the last three years has shown that "own design is essential to company export hopes in a global market." (BMI Report, 1991 p. 5).

Not only is the local telecommunications industry now becoming significantly more export-oriented, it seems quite possible that the South African subsidiaries of large multinational telecommunications equipment producers may undertake product development for the entire region. In particular, there are indications that both Siemens and Alcatel see their South African operations as a launching pad into Africa and their South African companies as undertaking product design and development so as to provide products appropriate for the entire African market.[4] AT&T have similarly stated that they see their South African operations "as a springboard into Africa,"(Finansie and Tegniek, 17 November 1994).

4.2 Export Performance

Traditionally, South African telecommunications equipment producers have been

almost exclusively focused on the domestic market and have performed very poorly in export markets. The Board of Trade and Industry reported that in 1984 the industry only exported 1.5 percent of its product, equivalent to only 3 percent of telecommunications equipment imports.[5]

Exports grew very slowly until 1988. However, since 1988, there has been a pronounced growth in exports. Measured in constant Rands, exports almost quadrupled between 1988 and 1993 (figure 1). Measured in current dollars, a similar rate of growth is evident (figure 2).

[INSERT FIGURES 1 AND 2 ABOUT HERE]

Moreover, exports have risen much more rapidly than imports so that the import/export ratio has declined from 24 in 1988 to 6 in 1993 (see figure 3.)[6].

[INSERT FIGURE 3 ABOUT HERE]

In 1994, with the introduction of cellular telephony, there was a massive increase in the importation of telecommunications products (imports rose from R1.4 billion in 1993 to R2.6 billion in 1994). Moreover, exports declined as local companies sought to meet burgeoning domestic needs. Nevertheless, in 1994,

exports were still more than three times larger than in 1988.

The indications are that the major companies like Altech and Plessey have substantially increased their exposure to international markets and are looking to further increase the proportion of their product marketed abroad. (Altech: Business Day [Johannesburg], 3 July 1992; Plessey: The Star [Johannesburg], 12 January 1992.)

South Africa's export expansion after 1988 coincided with a significant decline in Telkom orders and a general contraction of the domestic market (see table 1). Exports increased significantly only when it was clear that the domestic market was contracting and that this contraction was likely to continue.

Unfortunately, the trade data do not indicate the destination of telecommunications equipment exports. There are reports of significant export sales to a wide range of markets as far afield as Belgium and Indonesia. However, two markets seem to be particularly important--Eastern Europe and Africa.

Some major export orders to Eastern Europe were secured on the basis of product-appropriate characteristics developed in-house by South African companies. The most significant example here is that of Telkor (a Reunert company whose public pay phones operation is now part of Telephone Manufacturers of SA). Telkor was able to export coin and card operated payphones

very successfully, particularly to Eastern Europe, based partly on licensed technology but also on considerable in-house product development. Exports rose from 5.7% of company sales in 1991 to over 40% in 1993 and the company captured more than 12% of the payphone market in Europe (Financial Mail [Johannesburg] 25 March 1994 p. 98). In early 1994, Telkor designed the world's first GSM cellular payphone.

Also important in the movement towards exporting, has been the impact of the reunification of Germany. With Siemens in Germany producing to full capacity and with the high level "specs" required of Siemens (SA) by Telkom, Siemens (SA) was selected to become a major supplier of Siemens equipment for the rebuilding of the telecommunications infrastructure in the former East Germany. Siemens (SA) subsystems supplied to Siemens (Germany), have also been marketed throughout Europe.

With respect to Africa, postapartheid South Africa is exceptionally well positioned for the African market. The African market is expected to grow rapidly. Its small size makes it unlikely that the major international companies will develop products specifically designed to serve Africa's needs and environment. Moreover, South African telecommunications companies have a long history of supplying a demanding client. (SAPT/Telkom "specs" have always been high, and the network

operator has long been recognized as demanding high performance levels [Kaplan, 1990 p. 132-33]). South African companies can offer not merely telecommunications products developed and adapted for African conditions but also the market support, maintenance, installation, and network configuration skills that are frequently lacking in African countries.

Local telecommunications companies began targeting the African market particularly in the early 1990s. This is especially true of Siemens and Altech. Announcing their new joint venture with Altech in 1993, Alcatel's chairman and chief executive officer, Pierre Cuichet, stated that this "will enable Alcatel to "spread its wings" into the rest of Africa" (Business Day [Johannesburg], 6 May 1993). Bill Venter, the executive chairman of Altron (Altech's holding company), stated in 1992 that the group had registered with world aid agencies and had "devoted much effort to penetrating selected markets on the African continent." (Business Day [Johannesburg], 3 March 1992). A little later it was reported that Altech had won a R 7 million contract that could result in overall orders of R 34 million to supply a radio-based rural telecommunications system to Burundi. The World Bank provided the funding (Business Day [Johannesburg], 23 September 1992). In his 1992 review, Altech's executive chairman declared "While we will still take advantage of every opportunity that presents itself in the developed

western world for some of our advanced systems, we will also continue to search for opportunities in Eastern Europe. However, our main thrust will be in Africa, providing African solutions to African problems." (Altech annual report, 1992, 9). In 1993, Altech's Chairman reported that the joint venture with Alcatel CIT has meant that "...Altech secured access to the technology of the world's foremost telecommunications multinational, which has opened the door to exports, particularly to the southern sub-continent of Africa." (Allied Technologies Ltd. Annual Report, 1993 p. 13). Furthermore, " ...selected markets in sub-Saharan Africa are being investigated in close cooperation with Alcatel Trade International," (Allied Technologies (Altech) Annual Report, 1993 p. 24).

Similarly, in the early 1990s Siemens (South Africa) aggressively marketed the Siemens D900 digital mobile communications system throughout Africa. Cameroon was its first customer (Business Day [Johannesburg], 21 January 1993).

There have also been increased exports in some related products. In telecommunications cable, for example, one of the two major local producers recently reported an annual growth of 15% in exports and new export contracts from Hong Kong, Singapore and Central Europe. (Business Day [Johannesburg], 6 December 1993).

5.0 CONCLUSION

The South African telecommunications industry is currently undergoing a significant transformation. There have been major changes in corporate ownership that have brought about a rationalization of the industry, and the industry has been far more successful in securing export orders. These changes are in part a response to adverse factors--specifically the decline in Telkom orders and the likely curtailment of the long-term agreements--and in part a response to positive factors--in particular the opening up of new possibilities in the export market, especially in Eastern Europe and Africa. There are indications that greater exposure in international markets is beginning to positively affect the industry's technological capabilities and that, in addition, some of the major international telecommunications companies--in particular, Siemens and Alcatel--now intend their South African operations to perform much of the product adaptation and product support for the entire African continent.

On the domestic front, the industry is almost certainly likely to experience increased competition. A recent report on a strategy for the telecommunications sector, for example, has recommended that Telkom's right to provide the first telephone instrument on customers' premises (which are supplied exclusively to Telkom by Telephone Manufacturers of South Africa) should be rescinded.

This would allow customers to purchase telephone instruments from any supplier. Maintenance of local content standards would still support local production, but the report recommends that after a period of three to five years, local content regulations should be relaxed to allow for competition from imports. (Coopers and Lybrand, 1992, pp. 78-79.)

While the future of the long-term agreements is currently unknown, they will almost certainly be substantially modified, for example, to cover fewer products with more competitive tendering and to be of much shorter duration. There have been a number of calls for the substantial modification of the system of support for the local telecommunications industry from outside the industry -- and even from within.[7]

But while the South African telecommunications producers will face far more competition in the domestic market than they have hitherto, there are strong indications that the new government will attempt to increase the rate of growth of the telecommunications infrastructure, particularly to serve the needs of previously disadvantaged communities. A prima facie case can be made that on the grounds of economic growth (i.e., the positive impact of access to telecommunications on output and employment) and on the grounds of equity (i.e., access to telecommunications is severely skewed), the postapartheid government should

contemplate a far more rapid rate of development of the telecommunications network. (See Kaplan, 1992, pp. 96-97).

A more rapid rate of expansion of the domestic network, targeted particularly at the needs of poorly served communities such as those in the rural areas, might provide a further springboard for the export of similar products elsewhere in Africa[8]. The development of a common infrastructure in the southern African region would give a further impetus to the export activity of the South African telecommunications industry. These two developments would moreover significantly enhance the capacities of the South African telecommunications equipment producers to adapt, develop, maintain, and support telecommunications equipment that is appropriate for African conditions and markets. This would enable South African telecommunications producers to be increasingly active and successful in African markets in the future.

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1. All license agreements that entail the payment of royalties abroad are deposited with the Department of Trade and Industry. The license agreements surveyed were those in force in 1990.

2. In 1991, R&D expenditure on the part of the large agreement companies was of the order of 1 percent of turnover (data supplied by Business and Marketing Intelligence).

3. Kaplan, 1990, chapter 7, analyses in some detail why the long-term agreements were not successful in enhancing technological capabilities in the local telecommunications equipment industry.

4. In a recent talk, a Siemens executive stated that Siemens was utilizing its South African operations to make modifications to their switching and rural telephony products for the entire continental African market. Siemens's local managing director has said that "the company has developed technology geared to deal with specific African conditions." (Business Day [Johannesburg], 21 January 1993, p. 9). The chairman of Altech has stated that the company "would become the center for Alcatel's interests in Africa." (Cape Times [Cape Town], 18 January 1993, p. 12).

5. This was the lowest of all products of the electronics sector. (BTI, 1986, p.11, par. 32 and p.14, par. 42).

6. Data for exports and imports are from the Industrial Development Corporation trade database. The 1991 and 1992 import and export figures are unaudited. The 1984 ratio is from the BTI, 1986, p.14, par. 42.

7. "With Telkom moving into a new commercialized environment, all incentives in supply

agreements must be changed to keep up with the changing order." John Temple, managing director of Plessey Tellumat. (Business Day [Johannesburg], 4 February 1993). Only a small proportion of Plessey's sales are with Telkom under the long-term agreements. The long-term agreements are much more important for the other agreement companies, and they tend to favor a retention of the long-term agreements.

8. By way of illustration, at the time of writing, it has been announced that Plessey Tellumat will begin manufacturing rural telecommunications systems in an agreement with NEC. This is designed to meet the forecast needs of government to extend telephones to disadvantaged communities under the Reconstruction and Development Program and simultaneously to generate significant new export earnings (Cape Times, Cape Town, March 7, 1995 p.9)