THE EFFECTIVENESS OF STATE INTERVENTION

IN THE SOUTH AFRICAN ELECTRONICS INDUSTRY

BY

ROBERT MELVIN ASPIN

Submitted in fulfilment of the requirements for the degree of Master of Commerce at the School of Economics, University of Cape Town

Cape Town 1991

"Many factors contribute to the general quality of life in a country. One of the most important is the success of official economic policy"

- Abedian, I and Standish, B in Macro Economic Policy: Goals and Limitations in Schrire (ed): Critical Choices for South Africa, an agenda for the 1990s, Oxford University press, 1990:326.

PREFACE

This study is based on a nationwide survey of the electronics industry, conducted under the supervision of Mr Anthony Black.

The dissertation represents original work by the author and has not been submitted in any form to another university. Where use has been made of the work of others it has been duly acknowledged in the text.

Robert Aspin

University of Cape Town
Cape Town

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to my supervisor, Mr Anthony Black, for his considerable interest and encouragement throughout this study. I would also like to express my thanks to Professor David Kaplan whose knowledge of the electronics industry provided the opportunity for valuable discussion.

Thanks are also due to:

All those who responded to the questionnaire especially those with whom I had interviews.

The Industrial Development Corporation of South Africa, and particularly Mr P. Kotzé and Mr T. Stacey whose kindness and frank discussion was very much appreciated.

The Business and Marketing Intelligence (Pty) Ltd, and specifically Mr Alan Paul, for allowing me to use their valuable data base.

Family and friends.

ABSTRACT

The objective of this dissertation is to assess the effectiveness of state intervention in the South African electronics industry. In order to assess the impact of the various policies implemented by the government, a nation wide survey, which encompassed 270 firms in the industry, was undertaken.

The data collected suggests that the state has been unsuccessful in its attempt to develop the industry. It was confirmed that, in comparison with many other developing countries, its growth has been slow and that it continues to rely heavily on imports and foreign technology. One of the reasons for this lack of success is argued to be the lack of any meaningful interaction between government and the industry.

Based on the findings of the survey, the major recommendation to emerge is that the government should, in consultation, modify specific policies to promote the establishment of a dynamic, resilient and internationally competitive industry.

Chapter One outlines the important role played by the electronics industry in the process of economic development. The industry is depicted as being central to the process of industrialisation in South Africa and its positive effect on productivity in other sectors is stressed. **Chapter Two** outlines two forms of interventionist policy with which the state can influence the industry's development. Both trade and technology policy, by providing the structures with which to protect and subsidise the industry, play a decisive role in the development of a technology intensive industry. **Chapter Three** deals with the methodology of the nationwide survey of the electronics industry in South Africa. In **Chapter Four** the industry's development is assessed and various data pertaining to production and value added are evaluated. It is found that it relies heavily on imports and that production constitutes less than 30 percent of the sector's market value.

Chapter Five provides an overview of current state policy with regard to the electronics industry. It is noted that the state has used various measures to stimulate its growth, including providing tariff protection from imports, tax deductible allowances, long-term loans, and grants. Furthermore, a number of groups and committees whose task it is to monitor and make recommendations affecting the industry, have been established.

The various reasons for the industry's limited development are examined in **Chapter Six.** This analysis draws largely on empirical data obtained in the survey and focuses on the effectiveness of various state policies. The survey highlighted that skilled labour shortages, high cost structures, technological dependence, and the lack of exports, all account for the slow growth of the industry.

Chapter Seven examines policy alternatives for the further development of the local industry. These include proposals from the state sector, those made by respondents in the survey and those gleaned from international experience. Final recommendations and conclusions, reached in the course of the dissertation, are made in **Chapter Eight.**

TABLE OF CONTENTS

LIST OF TABLES

PAGE

LIST OF FIGURES

GLOSSARY

BTI	:	Board of Trade and Industry
DFI	:	Direct Foreign Investment
EDP	:	Electronic Data Processing
Electronics:		Includes all systems, equipment, products and components manufactured for the purpose of processing, storing or transferring information by means of electro-magnetic phenomena, but excludes the raw materials from which such items are manufactured.
EO	:	Export-Orientation
FOB	:	Free On Board
GEIS	:	General Export Incentive Scheme
IDC	:	Industrial Development Corporation of South Africa
ISI	:	Import Substitution Industrialisation
ISIC	:	International Standard Industrial Classification
JIT	:	Just In Time
KOTRA	:	Korean Trade Promotion Corporation
LDCs	:	Less Developed Countries
NICs	:	Newly Industrialised Countries
R & D	:	Research and Development
SAPT	:	South African Posts and Telecommunications
SBDC	:	Small Business Development Corporation
SEI	:	Innovation for Support Electronics Scheme

CHAPTER ONE

INTRODUCTION

The South African government considers the development of the local electronics industry to be an important objective and has intervened at a number of levels to promote it.

> It is generally accepted internationally that developed and developing countries have no choice as to whether they will participate in one or other form of electronic manufacturing, or not, but indeed simply have to answer for themselves the questions for what purpose and in which markets they will participate. It is regarded as essential that the Republic should enter the electronics manufacturing industry actively (BTI, 1986:123).

The attention shown by the government is justified for many reasons. Firstly, with an average real growth of 12 percent per annum, the electronics industry is the fastest growing industrial sector worldwide and, consequently, presents numerous trade opportunities.

Secondly, the industry offers extensive potential for employment creation. It was estimated by the BTI (1986) that the rate at which new employment in a high technology industry can be created is almost nine times more than in a low technology industry. The BTI (1986:124) calculated that, for each engineer or manager in Silicon Valley in the United States, four clerical and skilled workers were required. In addition, every engineer and manager in a high technology company creates twelve additional jobs in supporting service industries.

A third reason for government's interest in the industry is that it is of strategic importance. The Working Group (1983:11) argued that the entire economy could be asphyxiated as a result of an effective embargo on the supply of electronic equipment to South

Africa. This conclusion emphasised the widespread role that electronics plays in any economy.

> Electronics today permeates vast areas of human activity not only in the developed countries, but also in the Third World. There is virtually no field where this vital branch of science and technology does not play a role. Not only has it become essential for defense, atomic energy, law and order, and communications, but it is also now an integral part of most industrial production processes (Agarwal, 1985:273).

A further reason for the establishment of an indigenous electronics industry is that its development will have a positive impact on the productivity of the economy, through its direct application in the production process and its affect on indigenous technological capability.

While electronic equipment is employed in many of an economy's activities, one of its most important applications is in the production process. Initially electronic equipment was used to replace outmoded mechanical valves and switches but with continuing miniaturisation and improved processing capability, electronics are being increasingly used to control and monitor whole processes. In what has become known internationally as the 'era of automation', sophisticated control and instrumentation equipment is used extensively in the production process.

> Starting at the beginning, the design output of the engineering department will be passed on to the manufacturing engineers in electronic form, rather than as drawings, and will then move through materials control, which will automatically schedule and order materials and keep track of stock and production. All this information will come together in the factory in the host computer, which will contain in its memory details about how, when and what to produce. This , in turn, will send instructions to the computer controlled equipment, such as numerically controlled machines and robots, which will actually do the job. Quality controls, financial data, and customer service records will also be plugged into the same system (Lambert, 1983 cited in Kaplinsky, 1985:429).

It is advantageous for manufacturers to utilise electronic equipment, such as instrumentation and control equipment, as they allow producers to switch from product to product with minimal time lag, thus allowing batch production to take on many of the characteristics of a continuous process and negating the necessity for economies of scale from long runs. This holds significant advantages for South African manufacturers who are currently hampered by small markets and a lack of economies of scale. Their use has also allowed production runs to become more reliable which enables manufacturers to organise production on a Just In Time (JIT) basis. This production technique has been used with great success in Japan and many of the Newly Industrialised Countries (NICs)[1].

As a result of the effectiveness of their process application, Hoffman (1985:363) argued that the future growth and position of an economy in the international market depended heavily on the capability of its local market agents to innovate and produce with micro-electronics, which, with information technologies, comprise:

> A new 'techno-economic' paradigm that will inevitably define the future path for global economic development (Hoffman, 1985:270).

However, the effectiveness of electronic equipment in the production process depends largely on its application and implementation. Because of this, it is necessary for some form of technological capability[2] to be present. While foreign assistance can be employed in certain cases, it is more satisfactory to have local expertise thus ensuring an efficient

---

[1]As a result of the effectiveness of electronic equipment in improving production efficiencies, Perez (1985:448) argued that, internationally, those firms which utilised electronics enjoyed higher than average growth.

[2]Technological capability in this case refers to the knowledge of how to develop, install, adapt and service electronic equipment, in accordance with the users' requirements and the surrounding environment.

back-up service and reducing the burden on foreign reserves. This capability is also necessary in order to undertake the indigenous development of technology.

> Any technology transfer, including an international transfer of technology, requires a degree of technological capability on the part of the receiving firm (Fransman, 1985:580).

Fransman argued that developing countries wishing to utilise the benefits of technical change[1], must have some form of indigenous technological capability. Agarwal (1985:290) argued also that the fullest application of continuously updated technology was essential for competitiveness, productivity and economic development (see also Fransman, 1985). It was argued by Gomulka (1990:7) that it was one of the reasons for the variation in the rates of innovation and economic growth[2] among economies and Ansal (1990:1513) concluded that it accounted for a high proportion of a country's national income.

Because of the productivity enhancing nature of technical change, Amsden (1990), Kaplinsky (1985) and Herbert-Copley (1990:1466) argued that technological capability played an ever-increasing role in the determination of a country's comparative advantage

---

[1]Fransman (1985:573) defined technical change as being central to the process of economic development and "refers to improvements in the transformation of inputs into outputs, including improvements in the quality of output. Such improvements are an integral part of the process of economic growth which in turn is necessary for the broader process of economic development".

[2]In a study by Kwon (1986:85), for example, it was ascertained that total factor productivity in Korean manufacturing, between 1961-1980, had grown by 3.0 percent compounded per annum. While scale economies contributed about 38.1 percent, technical change was found to account for 44.6 percent of this growth. Maxwell (1987), in his study of the Rosario steel plant in Argentina, noted that incremental changes in technology raised output by as much as 130 percent of the initial design capacity, without significant additional investment. Similar improvements are noted by Dahlman and Fonseca (1987).

and that low wages were no longer a match for the high productivity of more industrialised countries.

> As the use of microelectronics based innovations in Northern industry has become more widespread, LDC firms have often found their initial competitive advantages eroded, and now face the difficult prospect of catching up with a rapidly moving 'best practise' (Herbert-Copley, 1990:1466).

As a result of the increasing returns from technical change in the developed countries, Kaplinsky (1984:84) questions whether or not there is some form of trade reversal whereby previously labour-intensive procedures are being returned to developed countries with the introduction of new, technically sophisticated, capital goods. It can, therefore, be argued that developing countries must obtain some form of technological capability in order to remain competitive (see Amsden, 1990; Kaplinsky, 1985; Kaplan 1990:2). The development of an indigenous electronics industry thus plays an important role in determining the international competiveness of a country and the speed with which it develops.

This thesis sets out to evaluate the effectiveness of state intervention in the industry. Various methods could have been used to achieve this. Specific state polices could be assessed and their effect on the industry disentangled from the implications of other factors and policies. Another approach would be to examine the underlying structures of the industry and then to show the role which state policy played.

This dissertation makes use of a combination of both approaches. Emphasis has been placed on the structural requirements of the industry and an attempt is made to identify the major constraints on its expansion. A nation wide survey was used to gather data pertaining to the structural features of the industry and the questionnaire paid particular attention to determining its skill requirements, technological capability and capacity to compete on the local and international markets.

Recommendations concerning future state intervention in the industry are outlined in the final sections. These are based on the hypothesis that the state will continue to intervene, to a lesser or greater extent, in the industry[1]. In this regard, it is argued by way of conclusion that many of the factors explaining the slow growth of the industry could be effectively addressed by a re-orientation of the policy of state intervention in the electronics industry.

[1]This conviction is based on various discussions, held with government and industry representatives.

CHAPTER TWO

TRADE AND TECHNOLOGY POLICY

2.1 Introduction

It was shown in Chapter One that the establishment of a viable electronics industry plays an important role in a country's industrialisation. This chapter addresses two measures, namely trade and technology policy, which the state may use to develop the industry[1]. This analysis provides the substance for those arguments put forward in Chapters Six and Seven, wherein the effectiveness of government intervention in the South African electronics industry is analysed and recommendations offered.

Trade and technology policies afford assistance to the industry in different ways. For example, trade policy, used circumspectly, can stimulate investment in the local industry by influencing prices in favour of the local or export market. Technology policy, on the other hand, can provide the necessary base of skills and knowledge for the establishment of the industry.

---

[1]The effectiveness of this intervention, however, depends on a number of factors, namely: 1) the professionalism and competence of the planning agency and the extent to which it interacts with industry; 2) the state's ability to attain certain objectives through the establishment of long-term development plans. Central to this ability is its proficiency in ascertaining the existence of future, dynamic, comparative advantages; 3) the selective allocation of subsidies or protection in accordance with the principles of reciprocity; 4) the state's ability to exercise real influence over the investment decisions of individual firms; and 5) the state's credibility in its commitment to certain policies.

2.2 Trade Policy

This section highlights those trade policies which a government may implement in order to stimulate growth in the electronics industry. A brief evaluation of the effectiveness of each policy, and recommendations for its implementation, are also given.

2.2.1 Theory of Trade

A number of theories and models may be used to justify a particular trade strategy in a developing country. There are, however, three broad approaches: the classical view of trade as the engine of growth; the neoclassical view of allocative efficiency through free trade; and the radical and structuralist view of structurally biased trade.

- **Classical Trade Theory**

Against the background of mercantilism, Adam Smith and David Ricardo argued that a country could create wealth by trading[1]. It was argued that international trade was a dynamic force which, by broadening the extent of the market and scope for the division of labour, raised the skill and dexterity of workmen, encouraged innovation, overcame technical indivisibilities and generally enabled the trading country to enjoy increasing returns and economic development.

- **The Neoclassical Perspective**

The neoclassical perspective favours a policy of 'free trade' or laissez faire. The Heckscher-Ohlin (H-O) theorem, used by the

---

[1]While Smith considered the absolute advantage of trading, where both countries hold an advantage in the production of either one of the two goods in question, Ricardo developed the theory of comparative advantage. In this latter case, even if one of the two countries in question produces both goods more efficiently than the other there still was a case for specialisation and trade (see Meier and Baldwin, 1957:20; Södersten, 1980:12).

neoclassical school to justify this approach, states that a country should export those factors which are locally found in profusion (see Samuelson, 1976). This is on the premise that a country can produce more cheaply those goods which make more use of locally abundant factors than can its less endowed trading partner (see Bhagwati 1969:24)[1]. The neoclassical perspective, therefore, holds that any trade intervention, such as import tariffs or export subsidies, reduces welfare relative to the free-trade situation.

- **Infant Industry Argument**

While not a trade theory in itself, the infant industry argument maintains that if a number of initially uncompetitive industries are given temporary protection they will hold a comparative advantage in the long term[2]. It is still regarded as one of the best arguments in favour of protection and many neoclassical economists have argued that it is perhaps the only exception when protection, as opposed to laissez faire, is justified. The infant industry argument is maintained on the grounds that unrealised internal and external economies exist.

- The internal economies argument maintains that the local producer would initially have to start on an uneconomic scale and would, as a result, be unable to compete with foreign competitors. Given protection, however, the industry would be able to expand gradually to the point of competing effectively. The internal argument is essentially a question of comparing early stage losses with projected

---

[1]A number of exceptions to this theorem can, however, be identified immediately, namely that production functions, consumption trends and factor intensities are different between countries.

[2]It was considered by Balassa (1979) that protection should be granted to infant industries for between one to ten years. However, it is clear that the time required for infants to reach competiveness is industry specific and that a degree of review is required for each application.

future net benefits.

- The external economies argument contends that, although private returns may not justify initial investment, the social returns, in the form of externalities, may warrant it (see Chenery, 1962). The argument follows that, if the industry's development has positive net social benefits, the state should increase the likely returns to investors.

- **The Structuralist and Radical Perspective**

The structuralist school argues that the rigidities which exist in many economies provide a rationale for state intervention. Structuralists view international trade as asymmetric in respect of developed and developing countries. It is argued that the profits from trade accrue disproportionately to the rich or developed countries and that, with technological advances and the lower income elasticity of demand for primary rather than manufactured goods, there is a secular decline in the terms of trade against LDCs[1] (see Prebisch, 1950). Furthermore, it is argued that any improvements in LDC productivity would be transferred to advanced countries in the form of lower export prices whilst, under inward orientation, these improvements could have been converted to higher wages.

Associated with the structuralist perspective is the radical school of thought which draws attention to the degree of polarisation between core and peripheral economies as a result of trade (see Amin, 1976). This school is of the opinion that

---

[1]This can be questioned on theoretical grounds. Whilst Prebisch (1950) expected technological development and the creation of substitutes for raw materials to depress the terms of trade against LDCs, these substitutes will only appear when the price of raw materials warrants their production. Also, developed countries contribute a large share of world exports in primary products (Smith and Toye, 1979). Throughout the argument raised by Prebisch, the benefits of trade amongst developing countries, namely on a South to South basis, are ignored (see Havrylyshyn, 1981: 22-28; Frank, 1967:35-43).

there is unequal exchange between them and that goods of a certain value in the periphery would be traded with goods of a lower value in the core areas. Inward looking policies and trade on a South to South basis are, therefore, considered more favourable for successful development.

2.2.2 The Neoclassical Critique of Trade Policy Intervention

During the early part of the 20th century, several countries, including South Africa, utilised import substitution industrialisation (ISI) to attain greater self-sufficiency. Whilst the initial results of this policy were promising, with many economies enjoying rapid industrialisation, it was later concluded that ISI often led to the inefficient allocation of resources. One of the most influential early critiques of ISI was made by Little, Scitovsky and Scott (1970) (see also Schmitz, 1984; Milner, 1988):

- Governments tended to interfere excessively in the administration of policy which often led to bureaucratization, corruption and uncertainty, thus discouraging private initiative.

- The high level of effective protection for IS activities induced a currency overvaluation and a bias against exports. Protection was thus often achieved at excessive cost.

- Since import controls were not applied uniformly and subsidised finance was available, capital intensity was encouraged. This often resulted in the under-utilisation and restricted growth of industrial employment.

- Incentives induced income redistribution in favour of industrial sector profits and this aggravated income inequalities.

- High levels of protection were afforded to final goods and lower rates were applied on intermediate and capital goods. Therefore, whilst the importation of final goods was reduced this was usually at the expense of increased imports of equipment and materials. As a result, dependence on foreign supplies and susceptibility to foreign exchange problems became more pronounced.

- Although IS policy initially stimulated rapid industrialisation, import substituting possibilities eventually dwindled. Growth rates could only be maintained by expansion in the domestic or export markets. However, due to inefficiencies induced by the lack of foreign competition, inappropriate technology and administrative procedure, the ability to move into export markets was reduced.

This critique of ISI offers the rationale for dismantling IS policies in favour of a more liberalised trade regime where trade flows are determined by comparative advantage.

2.2.3 Benefits of Outward-Orientation as Opposed to Inward-Looking Policies

It can be argued that there are three factors which account for the performance disparity between inward and outward-orientated economies: technological factors; economic factors; and politico-economic considerations (see Krueger, 1985:21-22).

- **Technological factors:**

  Size of the market: This plays an integral role in determining the success of import-orientated policy. Due to the nature of inward-orientation, the domestic industry is constructed with the aim of satisfying local market requirements which, when saturated, reduces prospects of further growth. Within an outward-orientated policy, however, the domestic industry can expand well beyond the

constraints of the domestic market.

Economies of scale: Many industries require certain economies of scale in order to be warranted. The capital-intensive nature of import-substituting industries and the restriction of local markets, however, lead to short production runs and high variable costs. Industries in an outward-orientated regime, on the other hand, are able to maintain long efficient production runs as a result of their market size (Keesing, 1967:306).

Factor intensities: Due to the limited scope for growth in the local market and the likely capital-intensive nature of production, growth in factor utilisation is limited in import-substituting industries. The expansion of export-orientated industries, on the other hand, is not limited to the domestic market which allows growth in factor productivity and a greater degree of labour utilisation, thus generating more welfare gains than under inward-orientation (Krueger, 1985:23; World Bank, 1987:87-88; Watanabe, 1973).

Quality and Interdependence: Producers within inward-orientated economies are, in many cases, forced to use domestically manufactured inputs (see Keesing, 1967:318; Schmitz, 1984:11). In an export-orientated economy, on the other hand, producers have the freedom to obtain inputs from any chosen supply which enables them to purchase from the cheapest and most reliable supplier. Over a period of export-orientation backward linkages may develop, thus allowing producers to purchase their inputs from local sources which are internationally competitive.

- **Economic factors:**

It may be argued that the small size of the local market in most developing countries will, as firms attempt to achieve economies of scale, encourage the establishment of

monopolistic regimes. Limited expansion prospects and the fact that growth in most industries will be uniform, reduces incentives for entrepreneurs to concern themselves with improving economic and engineering efficiency (Helleiner, 1973:25).

Industries operating in an outward-orientated economy, on the other hand, can expand production to an optimal size and are unconstrained by local demand. More attention is thus paid to the engineering and economic efficiency of the firm. As a result, a policy of export-orientation promotes competition and the effective and efficient utilisation of resources (World Bank, 1987:91; Keesing, 1967:306). There is also increasing evidence that the adoption of new technology is accelerated in outward-orientated economies as a result of closer links between countries[1] (World Bank, 1987:91; Keesing, 1967:313).

- **Politico-economic factors:**

  It can be argued that government policy which seeks to regulate and control, as found in inward-orientation, is less likely to achieve the intended results than those which create incentives for the realisation of certain goals (see Krueger, 1985:23). Since rewards and incentives offered in an outward-orientated regime are based on performance, they are correlated with the social activity of the sector (Krueger, 1985:23). Furthermore, there is more feedback on the negative effects of policy under outward-orientation (Krueger, 1985:23; World Bank, 1987:91).

There are, therefore, significant benefits to be reaped by firms and economies which utilise the benefits of the export market.

---

[1]It was ascertained by Chen (1987) that export-orientated firms were technically more efficient than import substituting firms.

2.2.4 Empirical Evaluation of Trade Strategies

A number of studies, mostly pertaining to the development of the NICs, have attempted to determine whether certain trade policies generate greater growth than others (see for example World Bank, 1982, 1987; Krueger, 1988; Balassa, 1982; Rajapatirana, 1987; Chow, 1987; Feder, 1982). All evaluated neoclassical trade liberalisation as having a positive effect. However, in order to support the hypothesis that liberalisation or export-orientation (EO) results in higher growth, it is necessary to:

- Distinguish the EO strategy from a non-EO strategy.
- Have a causal link between the EO strategy, trade performance and economic growth.

Few of the fore-mentioned studies took cognisance of these two considerations and it was not appreciated that, while overall trade protection appeared low, it remained high in certain sectors of the economy being researched. In the study by the World Bank (1987) it was concluded that outward-orientated economies had experienced higher than average growth[1]. Two periods were considered (1963-73 and 1973-85) and economies were split between strongly outward-orientated, outward-orientated, inward-orientated and strongly inward-orientated. During both periods the World Bank (1987) identified the average annual growth of manufacturing value added, to be highest in the strongly outward-orientated economies but lowest in the strongly inward-orientated economies. The report concluded that "the performance of the outward orientated economies has been broadly superior to that of the inward orientated economies" (p85). However, as Singer (1988a:232) remarked, this analysis of export orientation "'includes efficient import substitution', and we can all agree that that is 'good', along with mother love and apple pie".

---

[1]These results can also be found in Rajapatirana (1987:2-5).

A number of economists, including Krueger (1985:20), Nam (in Fransman, 1984b:53) and Schmitz (1984:14), all questioned the justification of using the economic success of the NICs to proclaim that export promotion out performs import substitution. In a study of the NICs, Black (1990:5) noted that, although trade policies appeared to be slightly outward-orientated, trade protection continued to play an important role in their development:

> The main point here is that import controls have performed an effective function in developing infant industry by reducing risk and encouraging expansion on a scale sufficient to generate competitiveness. While trade orientation has on average been slightly outward orientated, trade policy has been far from uniform and rates of protection and subsidies have varied enormously for different commodities.

There is extensive evidence that the NICs benefited from a process of 'learning by doing' during the period of ISI, experience which was later put to good effect in the export-led development phase. The dominant view, therefore, is that internal factors led to the success of the NICs. Research has shown that they were not liberal, market-orientated economies and that they relied less on the 'invisible hand' than is portrayed by the neoclassical school (see Roberts, 1985:7-12; Fransman, 1984b:53; Shapiro and Taylor, 1990:874; Rhee et al, 1984; Westphal et al, 1981; Watanabe, 1973:515; Cline, 1985:547; Bradford, 1987:310). Instead, the success of the NICs demonstrates the effectiveness of a well-conceived and orchestrated trade policy which not only protects certain infant industries but also provides incentives to promote exports[1].

---

[1]However, according to a Taiwanese civil servant there were also many cases where various export restrictions were enforced: "Unorganized production and export often lead to excessive production and cut-throat competition in foreign markets, which inevitably caused a sharp decline in price, deterioration in quality, and finally loss of the export market. To combat these shortcomings, the [Taiwanese] government has encouraged unified and joint marketing of exports in foreign markets through limitation of production by means of export quotas" (Fong, 1968 cited in Amsden, 1979:365).

> Import substitution contributed greatly to economic development at almost every stage of South Korea and Taiwan's development, for infant industries could only be developed under the import substitution policy (Qi, 1988:7)
>
> Even under export-led growth, however, production and distribution have been carried out under the shadow of the state...[which] has offered both local and foreign exporters an impressive battery of incentives (Amsden, 1979:365).

It could, therefore, be argued that a trade policy which protects infant industry from international competition whilst promoting exports in other industrial sectors, may be recommended. However, whether or not the NICs success is capable of being widely replicated is debateable. Cline (1982), for example, maintained that, if all less developed countries (LDCs) experienced export success equivalent to the NICs, their exports would increase by some 700 percent and this, by exerting pressure on developed country markets, would result in protectionist measures being taken by them. This argument has been challenged on a number of grounds:

- The capacity for industrial nations to absorb new imports is greater than supposed since LDC manufactures capture only 2,3 percent of the industrial markets (World Bank, 1987:81)[1];
- New exports from developing countries will not appear on the market all at once and a time-phased differential will exist (Ranis, 1985:544);
- Intra-industry trade will prove to be important and may disguise imports (World Bank, 1987:81);

---

[1]In his analysis Watanabe (1973:525-6) established that, in 1967, manufactures accounted for more than 50 percent of total exports in only five developing countries. It was also found that about two-thirds of the meagre share of developing country labour intensive exports in developed country markets, was taken up by a handful of countries in the Far East.

- Manufactures will also be exported to markets in the South (other LDCs) as well as to new market opportunities in the NICs (World Bank, 1987:81; Ranis, 1985:544).

2.2.5 Summary

In this section the various theories underlying the principles of trade policy have been considered. A number of arguments can be used in favour of supporting any one of them in certain situations. For example, whilst initial protection assists the development of infant industries, export incentives assist expanding firms to become internationally competitive.

Central to the discussion of trade theory is that import and export-orientation should not be identified as mutually exclusive.

As the process of industrialisation is a dynamic one, with industries constantly developing or declining, it can be argued that the state should fashion trade policy around the individual needs of targeted sectors. Infant industries could, if required, be temporarily protected through the use of, inter alia, tariffs and quotas, while other sectors could be offered incentives such as tax allowances and financial assistance, to promote their exports.

However, the protection of the local market should only be implemented on the premise that international competitiveness is achieved within a stipulated period. Critical to this argument is the state's ability to timeously formulate and administer appropriate sector-specific trade strategy.

2.3 Technology Policy

> Technology policy can be regarded as consisting of those economic policies specifically concerned with ensuring that firms, consumers, and government have access to appropriate and up to date technology at the lowest possible cost; with fostering invention and innovation; with encouraging the diffusion of innovations, new technologies, and technological best practice; and with ensuring that industry takes advantage of the economic opportunities offered by worldwide developments in science and technology. Technology policy may be viewed as a particular subset of the instruments available to economic policy as a whole, together with the particular intermediate objectives to which those instruments are directed. Technology policy shares the common objective of wealth creation with other branches of economic policy and its instruments can be regarded as just some among the many available for achieving that common objective (Barber and White, 1987:2-3).

The main argument for government intervention on the technological front, results from the market's inability to ensure the optimal allocation of resources for the benefit of society (Coombs et al, 1987:206). Several reasons have been cited for this:

- **Uncertainty:** Firms and their providers of capital are averse to risk and especially uncertainty (see Fransman, 1986:8). Not only are the returns from technological research inherently uncertain but, once knowledge has been successfully created, it may be difficult to prevent its spread to other interested parties (Fransman, 1985:575). This led Arrow (1962) to conclude that there could be an under-investment in knowledge-creating activities in a market economy.

- **Information:** Markets can only allocate resources efficiently if participants are well informed of the opportunities open to them and the likely consequences of their decisions. There is evidence, however, that others, in particular small firms, may lack this information

regarding new technology (Barber and White, 1987:41). Arrow (1962:171) argued that this led to a fundamental paradox in the determination of demand for information as the buyer would be forced to make a bid for information without being able to assess its value completely[1].

- **Competition and market structure:** The high up-front R & D costs may constitute a barrier to market entry, thus preventing many smaller firms from competing in R & D intensive fields. Where this results in inadequate, or excessive, competition, intervention may be justified[2] (Barber and White, 1987:41; Nelson, 1987:94).

- **Externalities:** These will occur when the actions of individual firms, during the development of technology, give rise to benefits which accrue to others but which cannot be appropriated by themselves (Barber and White, 1987:41).

- **Dynamic aspects of innovation and economic change:** There are circumstances in which firms, and their suppliers of capital, do not take into account the longer-term dynamic benefits which may result from a particular course of action. Similarly, domestic firms may be unable to devote sufficient resources to R & D, in order to lay the foundations required for those economic and commercial opportunities which may arise (Barber and White, 1987:41).

To compensate for these various shortcomings in the market, the state could play a significant role in shaping and encouraging

---

[1]This led Dahlman et al (1987:773) to argue that because of economies of scale in the central collection of information "governments often justifiably subsidise its collection and dissemination".

[2]Barber and White (1987:32) argued that these firms often suffer from market failure in the provision of capital and, therefore, have a greater need for government assistance than large firms. The importance of small firms lies in the fact they have been found to be very technologically progressive.

the process of technical change by establishing an environment that stimulates firms to engage in ongoing efforts to develop an indigenous technological capability.

2.3.1 Policy regarding the Local Development of Technology

To compensate for the those factors which lead to the under-allocation of resources on technological research in the electronics industry, several measures may be taken by the state. These include:

- **Local procurement:** In order to increase the size of the expected market, the state may provide a valuable market to the industry. This will, of course, reduce the degree of uncertainty that a firm may experience in the process of developing new technologies.

- **Market protection:** It has been noted that firms are more willing to invest in R & D if the state has protected them from imports (see Fransman, 1986:100). This protection can be afforded through the establishment of import quotas, tariffs and duties or the subsidisation of local firms.

- **Patents:** To prevent the non-optimal allocation of resources on R & D, the state can play a role by establishing a patent system. A patent is a certificate of ownership which, for a limited period, confers a monopoly right for a given piece of intellectual property which has an industrial application. The patent system is justified on the grounds that, because it protects the investor and partially guarantees a return on inventive effort, it will stimulate further investment.

- **Research assistance:** The state can assist in the development of technology either by undertaking research programs itself or through financing them in the market place. When undertaking R & D, the state must ensure that the results from this process outweigh the costs and that

the technology acquired will be marketable. As the private sector evinces little enthusiasm to undertake basic research, the state has a role to play in its development (Vessuri, 1990). However, it is vital that this research is market-driven rather than science-led. This is particularly important in developing countries.

> There is always a risk with government programmes to support applied research that they become captured by the technological establishment and become too technology driven, with little attention being paid to the ability of the country concerned to exploit the research results. Successful innovation involves a complex interaction of both technology push and 'demand pull' and governments must try and ensure that their technology policies give appropriate weight to both....evidence suggests that the main weakness in innovation performance has been not so much in the invention of new products and processes as in their commercial exploitation (Barber and White, 1987:32).

One way to ensure that these institutions consider the market-ability of their research, is by forcing them to recover part of their budgets from fees obtained from the private sector.

- **Technological infrastructure:** The government can also support the local establishment of a scientific and technological infrastructure (Herbert-Copley, 1990). This is a complex process and requires the state to play an active role in the establishment of, for example, an effective communication system within the scientific, technology-driven community; an education system sufficient to support technological development; and, lastly, a "map of the inputs, outputs... organisational structures, and linkages of the national system (together with an understanding of trends and demands from outside the system)" (Rath, 1990:1436).

- **Industrial re-organization:** The state can play a role in organizing the scientific and research-based bodies in the economy into a coherent and workable structure[1]. This will prevent the duplication of research, unproductive domestic competition and the non-optimal allocation of resources. The state can also use this method to manipulate the entire technology-driven community to attain goals outlined in long-term development plans. By doing so the state becomes what Teitel (1987:97) referred to as the "real Schumpeterian innovator".

Fundamental to industrial re-organization is the question of which firms to support: namely, large or small. While the question of the size of the firm is relevant to the industry concerned and the surrounding environment (see Stoneman, 1983), indications are that small and medium-sized firms are more effective at developing technology[2] (Kamein and Schartz, 1982; Nelson, 1982:4).

---

[1]This process can be either highly centralised or decentralised. In the centralised process the state would, by implication, 'manage' the technology developments in the economy and would play an active role in organising firms to undertake R & D as a collective group, with each division specialising in certain fields of technology. In the decentralised process the state would, by indirect means of financial or market coercion, manipulate the industry to meet certain objectives, whilst allowing firms a certain degree of autonomy.

[2]A number of reasons can be given for this; namely that small firms have a more 'personal' employee structure; are better suited to adapt to movements on the technology frontier; are more attentive to market demand and are usually, in the neo-Schumpeterian tradition, involved in incremental innovation.

2.3.2 Policies Regarding Imported Technology

> The central issue of technological development in the developing countries is not acquiring the capability to invent products and processes. It is acquiring the capability to use existing technology - to produce more efficiently, to establish better production facilities, and to use the experience gained in production and investment to adapt and improve the technology in use. The way of doing this is to build on what can be obtained from abroad while developing local capabilities in areas where it makes the most sense (Dahlman et al, 1987:774).

Dahlman et al (1987), Stewart (1977:122), Amsden (1991:2) and Soete (1985:416) argued that developing economies could utilise the results of foreign research without having to carry out the costly process of developing it themselves.

Foreign technology can be obtained in several ways, including direct foreign investment (DFI), license agreements and through the purchase of capital goods. However, it should be noted that indigenous technological capability cannot be achieved simply through purchases. A process of technical diffusion, whereby the purchaser of the technology can establish why and how it works, is required (see Fransman, 1985:584-5; Enos and Park, 1988). Following this, Dahlman et al (1987:761) argued that it was necessary, once the basic production capability had been acquired through transfer, to move beyond the "cookbook phase to study what was behind the recipes and how to make the most of the ingredients".

The state can play a very important role in the transfer of technology from developed countries by influencing:

- **The price of technology:** The state can play an integral role in determining the transfer of foreign technology to domestic firms. It can attempt to reduce the seller's monopoly power by negotiating on behalf of several buyers simultaneously and by trying to 'unpackage' the technology. This can be done, for example, by allowing only selected

foreigners to supply the local market in exchange for certain property rights over their technology. The effectiveness of this intervention depends largely, however, on the state's negotiating power (see Fransman, 1985:579).

- **The form of technology:** Not only can the price of imported technology be influenced but its form as well. Foreign technology can come in the form of capital equipment, joint ventures, licence agreements or direct foreign investment (DFI). Since DFI implies the ownership of local assets by foreigners, the government may wish to limit its employment in the local market (Fransman, 1985:630). This can be done by establishing certain restrictions on the foreign ownership of indigenous assets and by negotiating with foreigners for the formation of joint ventures.

- **The structure of technology:** As all technological capabilities cannot be developed simultaneously, and since the accumulation of any one takes time and experience, the sequence in which they are acquired is crucial to a developing country[1] (see Dahlman et al, 1987:774). It may, therefore, be appropriate for the state to selectively adopt those technologies which have the greatest impact on economic development.

---

[1]Dahlman etal (1987:764) argued, furthermore, that it was dangerous for a developing country to adopt technology too close to the frontier as firms may never discover how it works, resulting, in what he termed, a process of continually receding from the frontier as it advances.

2.3.3 Other Policies which Affect Technological Development

Although an appropriate technology policy will play an integral role in the process of indigenous technological advancement, this process also depends on other factors, in particular the micro- and macro-economic environment (see Rath, 1990:1435). Various other state polices which affect this environment, such as trade or fiscal policy, will, therefore, also play a leading role in this process and it is necessary to co-ordinate them all in order to obtain technological capability[1] (see Ansal, 1990:1525).

In this section, a number of methods by which the state may intervene in the market to stimulate technological development, have been highlighted. To ensure that it intervenes effectively and in the best interest of the economy, the state should develop a policy which is tuned to the particular needs of the various sectors found in the industry[2].

---

[1]For example, one reason for the failure of developing countries, in general, to achieve technological capability, is partly a result of their inability to ensure the necessary support for its development. In particular, developing countries often lack the skills to successfully assimilate and adapt foreign technology. This is often a result of their inability to ensure the adequate supply of skilled labour necessary for this process to occur (see Vessuri, 1990:1545). Although a deficiency of this sort may last for some time, it can be minimised by, inter alia: building more schools; providing incentives through bursary schemes; providing assistance for in-house training and by implementing appropriate curricula.

[2]The initial aim of any technology policy should be to determine which technologies to target. No standardised recommendation can be offered in this regard as the technological environment differs between countries. It can be argued, however, that those technologies which: assist a diverse population of industrial sectors; are central to the process of national technology development; and have a growing international market share, should be supported.

2.4 Conclusion

The purpose of this chapter was to provide an overview of two types of policy which the government could implement in order to stimulate and direct the growth of the electronics industry. Several conclusions can be drawn from the analysis:

- With regard to trade policy it was argued that import and export orientation should not be considered as mutually exclusive. It was proposed that a policy which supported infant industry, while promoting exports, on a sector specific basis, is appropriate. Furthermore, it was shown that little factual evidence exists to support the neoclassical argument for free, or liberalised, trade.

- With regard to technology policy, it was shown that the state can intervene in many ways to assist the local development of indigenous, or imported, technology. However, it was also argued that a single policy, no matter how well formatted or implemented, would be insufficient to achieve this successfully. Rather, it was proposed that a consolidated policy program, necessary to establish the environment suitable to the industry's development, would need to be formulated.

The main conclusion to be drawn is that the state can play an integral role in the development of the local electronics industry. The following chapters set out to determine whether or not the South African government has made efficient use of the measures available to it for the regulation and development of the local electronics industry.

CHAPTER THREE

THE SURVEY - METHODOLOGY

3.1 Introduction

For the purpose of this thesis, a nationwide survey was considered to be the most suitable method of collecting information pertaining to the effectiveness of state intervention in the South African electronics industry. The survey was undertaken between July and November 1990.

3.2 The Sample

The survey covered firms drawn from all sectors of the electronics industry in South Africa. Firms in the industry were stratified according to activity, namely R & D, production, assembly and marketing. This was done in order to bias the sample slightly towards those firms undertaking production as it was considered that they played a more central role in the development of the industry. Two-hundred and seventy firms were selected for the survey. These were drawn from many sources including, inter alia, the *Central Statistical Services*, *Mc Gregor's "Who Owns Whom"* and the *Pulse Buyers Guide*.

3.3 The Questionnaire[1]

A pilot survey, consisting of an internal and subsequent pre-testing phase, was undertaken in order to compile the questionnaire. During the internal stage, draft copies of the questionnaire and its covering letter were given to members of the Board of Trade and Industry (BTI) and the Industrial

[1]See Appendix A for a copy of the questionnaire used in the survey.

Development Corporation (IDC) of South Africa for their appraisal. Modified versions of the questionnaire were then prepared for the first pilot study for which respondents were chosen from a number of acquaintances in the industry and three firms on the Reef.

Based on feedback from these respondents, further modifications were made. A second pilot study was then conducted with four randomly chosen firms in the industry. Alterations at this stage were of a minor linguistic nature. The final questionnaire was then drawn up.

The final questionnaire was divided into seven sections. The first, second and third sections were concerned with general company information and, in particular, the firm's relationship with the state. The fourth section dealt with the firm's employee structure and the extent of in-house training undertaken. The fifth section ascertained the degree to which firms relied on foreign technology or undertook R & D. The sixth section endeavoured to determine the extent and composition of exports and any advantages held on the international market. The final section dealt with the attitude of the industry to current government intervention.

In most cases the respondent could select an answer from a series of given alternatives. Options listed included the category 'other', for those cases where a respondent's answer fell into none of the categories listed. Furthermore, the respondent was often requested to give reasons for his response or to rank it according to its importance, thus adding to the descriptive detail and data retrieved.

3.4 Survey procedure

The survey was undertaken not only by mail but also through personal interviews, both methods having distinct advantages and disadvantages. While not affecting how the sample would be drawn from the perceived 'universe', the main difference in these two techniques lies in the procurement of information.

- A **postal survey**[1] is, of course, the most cost-effective method of obtaining information on a number of companies, but response rates tend to be low. There is also the difficulty of ensuring that the person providing the information is suitably qualified and is the intended respondent. However, due to time and financial constraints, a postal survey is often the most appropriate means of obtaining data on a large number of firms.

- While **personal interviews** are an effective means of acquiring desired information, this survey technique also has its difficulties. Not only is it costly and time consuming, but respondents are often unwilling to spend the necessary time required for discussion, or, on the other hand, are more interested in deliberating their own ideologies outside the scope of the questionnaire.

In order to ensure a high response rate, with considered replies, to the postal survey, the following procedure was used: a letter explaining the importance of the survey was attached to each questionnaire and addressed personally to the chairman or managing director of the respective firm. In each case the questionnaire asked respondents to attach a business card which

---

[1]It has been argued that a survey of this nature may get a biased response as firms, content with current intervention, may not reply. This problem would exist in most sampling techniques including personal interviews. In this survey any possible bias was reduced by making no reference to the title of the thesis and by using an un-biased questionnaire. However, where undue bias was existent, that part of the questionnaire was discarded.

ensured that it was completed by the intended party. The questionnaire was followed by a reminder and, in most cases, a telephone call.

Personal interviews were then held with firms which were believed to play a vital role in the industry and with those respondents who preferred to discuss the questionnaire in person. Having already received a copy of the questionnaire, the respondent could quickly and accurately complete it thus allowing more time for discussion. It was found that respondents were enthusiastic to discuss all aspects of the industry, especially those that pertained to state intervention and its effects. These interviews were usually held with managing directors or senior members of management.

3.5 Final Sample[1]

Response to the survey was acceptable with 64 firms returning completed questionnaires[2]. Personal interviews were also held with 41 firms on the Reef and in Cape Town[3]. Members of the Industrial Development Corporation (IDC) of South Africa, the Small Business Development Corporation (SBDC), the South African Posts and Telecommunications (SAPT), the Board of Trade and Industry (BTI), the Department of Trade and Industry (DTI) and the Council for Industrial and Scientific Research (CSIR) were interviewed in order to gain a detailed understanding of state involvement in the industry. Telephonic interviews were also held with at least 31 firms and numerous state officials.

---

[1]The results from the survey, which are used throughout this thesis, are given in systematic order in Appendix B.

[2]The variance between the sample and number of returns lies in the fact that many firms did not reply on the following grounds, namely that: the information required was considered confidential; they considered the survey inapplicable as they only marketed imports; they had already contacted the researcher by telephone, or, they did not care to respond.

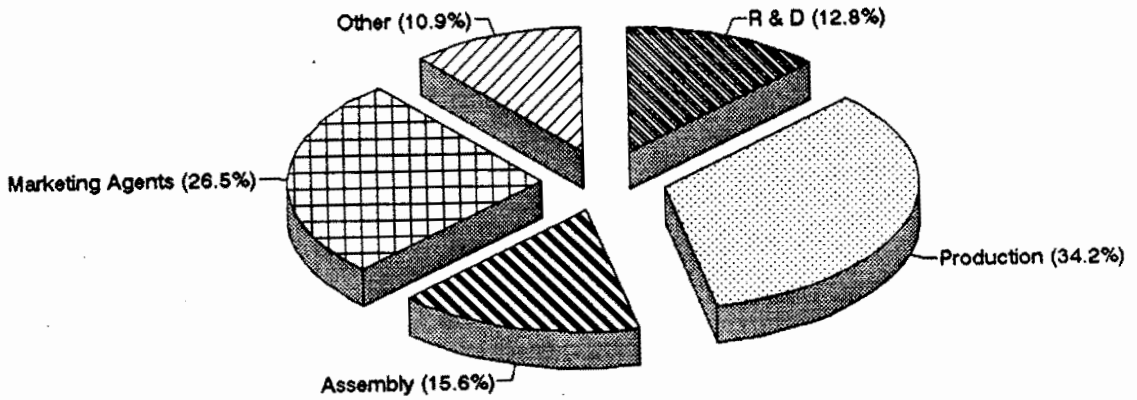
[3]While interviews were mostly held with respondents who had already obtained the questionnaire, approximately 11 were held with other firms.

Although the final sample may appear modest, many of the firms interviewed were large conglomerates. Many subsidiaries were unwilling to respond to the survey and requested that the researcher obtain data from their holding company. These holding companies supplied details of the total extent of their operation in the electronics industry. The final sample can be said, therefore, to represent approximately 250 firms, or 40 percent of turnover in the South African electronics industry in 1990, estimated to be R11.7 billion (BMI, 1990:6). Furthermore, the firms included in the survey employed approximately 32 125 employees which represents 54 percent of the 60 000 employed by the industry.

3.5.1 Profile of Surveyed Firms

In order to ascertain the distribution of firms in the final sample, respondents were required to indicate their activity in the industry (Figure 3.1).

Figure 3.1
The Weighted Distribution of the Final Sample According to Activity

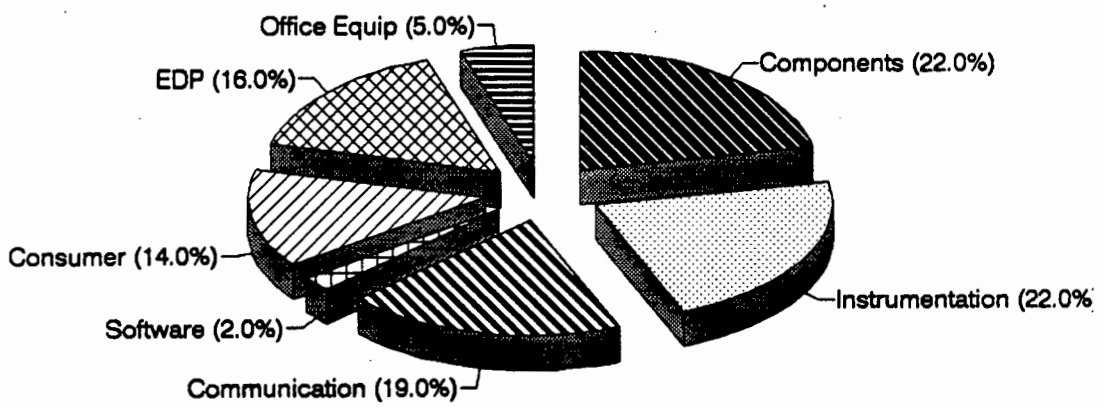


n = 53

Note: 1) Other includes: Testing facilities and installations.
2) Distribution is by firm and not by value.
3) A composite scoring system, in which the major factor was accorded 5 points and the secondary factors 3 and 1 points respectively, has been used in the figure.

Forty-three percent of firms surveyed, claimed production to be their main activity. Although marketing agents formed a large proportion of the final sample, it was found that there was little difference in their views as many were also involved in production or assembly. The average age of firms was 23 years (established in 1968), but many firms were established as recently as 1989. The distribution of firms in the sample according to product, or service, was also ascertained (Figure 3.2).

Figure 3.2
The Distribution of the Final Sample According to Product or Service Offered



n = 63

Note: The distribution is by firm and not by value.

The largest division in the final sample, according to product or service offered, was in the field of components. Many of these firms, however, also manufactured, or marketed, other electronic equipment. Telecomms equipment formed the second largest division in the sample.

In the final sample 34.8 percent of firms had fixed assets of less than R1 million and 18.4 percent had fixed assets of over R60 million (Table 3.1). Correspondingly, 22.8 percent of firms in the final sample have turnovers exceeding R120 million (see Table 3.2).

Table 3.1

The Distribution of Firms According to Fixed Assets

Fixed Assets in Rands	No. of Respondents	Percent of Firms in the Final Sample
0 - 1 000 000	17	34.8
1 000 000 - 2 000 000	5	10.2
2 000 000 - 4 000 000	6	12.2
4 000 000 - 8 000 000	1	2
8 000 000 - 15 000 000	5	10.3
15 000 000 - 20 000 000	2	4
20 000 000 - 40 000 000	3	6.1
40 000 000 - 60 000 000	1	2
60 000 000 - Above	9	18.4

n = 49

Table 3.2

The Distribution of Firms According to Turnover

Turnover in Rands	No. of Respondents	Percent of Firms in the Final Sample
0 - 2 000 000	10	20.8
2 000 000 - 4 000 000	3	6.3
4 000 000 - 8 000 000	5	10.4
8 000 000 - 16 000 000	6	12.5
16 000 000 - 30 000 000	2	4.2
30 000 000 - 40 000 000	2	4.2
40 000 000 - 80 000 000	8	16.7
80 000 000 - 120 000 000	1	2.1
120 000 000 - above	11	22.8

n = 48

In this analysis a similar method to the Central Statistical Services (CSS) has been used to determine what constituted large firms in the sample. When the combined turnover of the largest firms contributed between 80 and 90 percent of the sample's total turnover, they were classified as large. In this analysis, firms with a turnover in excess of R40 million are considered large, while those of less than this amount are deemed small.

On the whole, it was felt that the sample adequately represented the sectoral and spatial distribution of the electronics industry. The slight bias towards large firms added to, rather than detracted from, the viability of the sample for the purpose of this study as it increased the proportionate representation of productive capacity.

3.6 Reliability of Data[1]

There are two main problems with any survey undertaken, namely: the respondent may misinterpret the question or may provide a 'guesstimate'. It is believed that these errors have largely been avoided. In the first instance, care was taken to compile a questionnaire which was self-explanatory and succinct. Through two pilot surveys it was possible to determine and remove any ambiguities. In the second instance, all respondents were senior members of management, thus the possibility of 'guesstimates' was reduced. Furthermore, the postal survey was, in most cases, followed by personal interviews which allowed respondents to discuss their earlier responses.

---

[1]Much of the data collected in the survey correlates well with that of other sources, notably the BMI (1988; 1989; 1990), BTI (1986) and Kaplan (1990). Even so this data is not extensively used for numerical analysis. The data was manipulated using a spreadsheet package on an IBM PS/2 personal computer. While a wide range of statistical procedures could have been undertaken, this was not done because, in most cases, the sample, if divided into sub-categories, was not sufficiently large to achieve statistically significant outcomes.

3.7 Other Data Sources

The Business and Marketing Intelligence (Pty) Ltd (BMI) also provided a valuable source of data on the size and structure of the electronics industry in South Africa. It obtains its information through detailed surveys of the industry and the CSS. Since no single term for 'electronics' exists in the International Standard Industrial Classification (ISIC), the BMI catalogues all appropriate sectors within the Standard Industrial Classification (SIC), down to a eight digit code[1]. These classifications are recognised by industry and their use has been standardised since the inception of the BMI data base. This has ensured the reliability and compatibility of the data used. The data used for international comparisons was obtained from an international source, cited in the BMI, which also used standardised categorisations. The BMI is considered to be an accepted industry reference.

Data on imports and exports of electronics was obtained from Customs and Excise (various) which use a 'harmonised' system, modified in 1988, to categorise products within the SIC. This data was again categorised according to BMI classifications which were standardised throughout this study (see Appendix C for these classifications).

[1]By analysing the data the BMI was able to extract any items which were not appropriate such as white goods or hi-fi cabinets.

CHAPTER FOUR

AN OVERVIEW OF THE SOUTH AFRICAN ELECTRONICS INDUSTRY

4.1 Introduction

In recent years there has been growing concern regarding the slow development of the South African electronics industry. Causes for anxiety include: the continuing trade deficit in the industry, the low level of local production undertaken and the extent of licensed technology in use. This chapter gives a brief analysis of the electronics market in South Africa, followed by an examination of the extent and composition of production within the local industry.

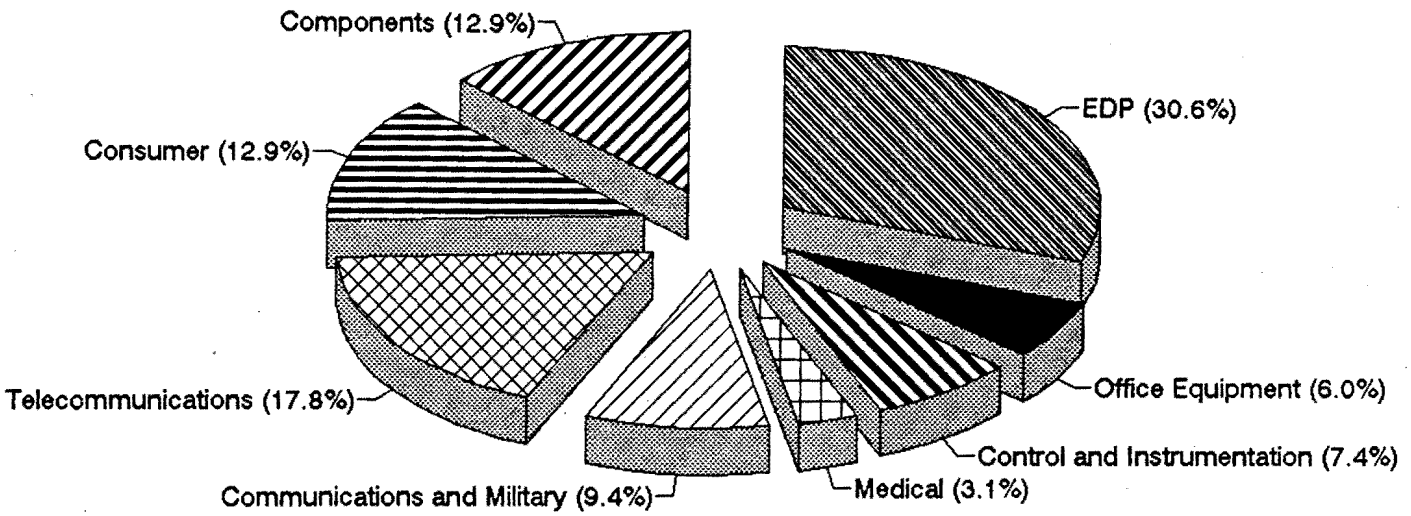
4.2 The South African Electronics Market

The South African electronics market is comprised of several sectors, namely: electronic data processing (EDP), telecommunications equipment (telecomms), audio and video, software and services, military equipment, test and control equipment, instrumentation and, of course, components. The distribution of the local market, by value, as shown in Figure 4.1 gives some indication of the constituents of the local electronics market.

Figure 4.1

The Sectoral Distribution

of the South African Electronics Market in 1988



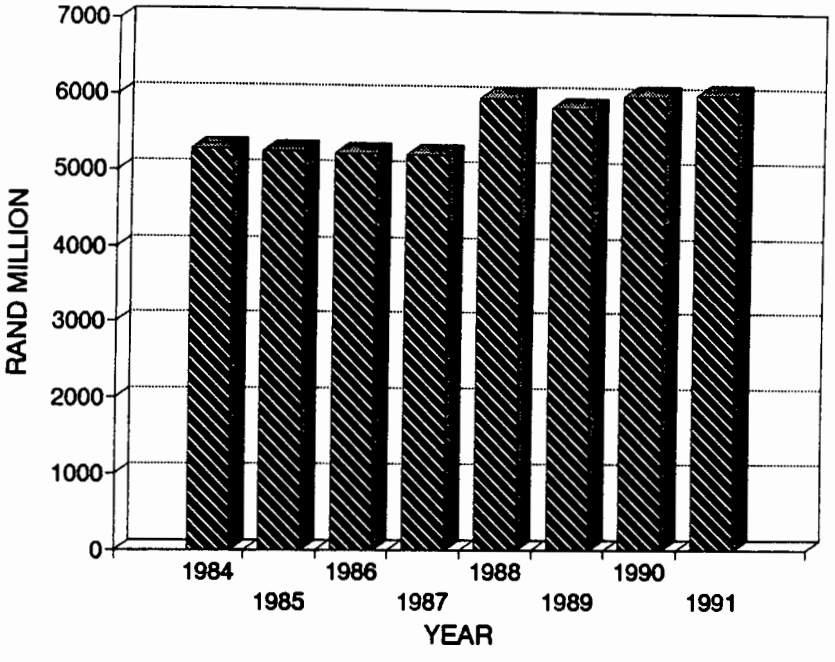
Source: Business and Marketing Intelligence (1989:13).

It can be seen in Figure 4.1 that the largest division in 1988 was the EDP sector which constituted approximately 30.6 percent of the local market. Telecomms formed 18 percent of the market, a decline from 23 percent in 1984. This decline was partially the result of cut-backs in public sector procurement from the industry. In 1987, for example, the SAPT's procurement was reduced in nominal terms by 16 percent which led to a nominal decline of 10 percent in the telecomms market that year. It should be noted that components formed only 12.9 percent of the local market for electronics which is indicative of the limited

level of production or assembly undertaken locally[1].

Figure 4.2

The Real Value of the South African Electronics Market between 1984-1991



Source: Board of Trade and Industry (1986).

Business and Marketing Intelligence (1989).

Business Day, July 30, 1990.

Note: 1) Figures are adjusted to the PPI with the base year of 100 in 1985.

2) Market size for 1990 is forecasted according to BMI estimation.

3) Due to BTI data being used up to 1983, data between 1983 and 1984 is not fully comparable.

Although the market for electronics enjoyed real per annum growth of 10.7 percent between 1980 and 1984 (BTI, 1986:13), this declined to approximately 2 percent per-annum (adjusted to the PPI) between 1984 and 1990 (Figure 4.2). In 1990 the South

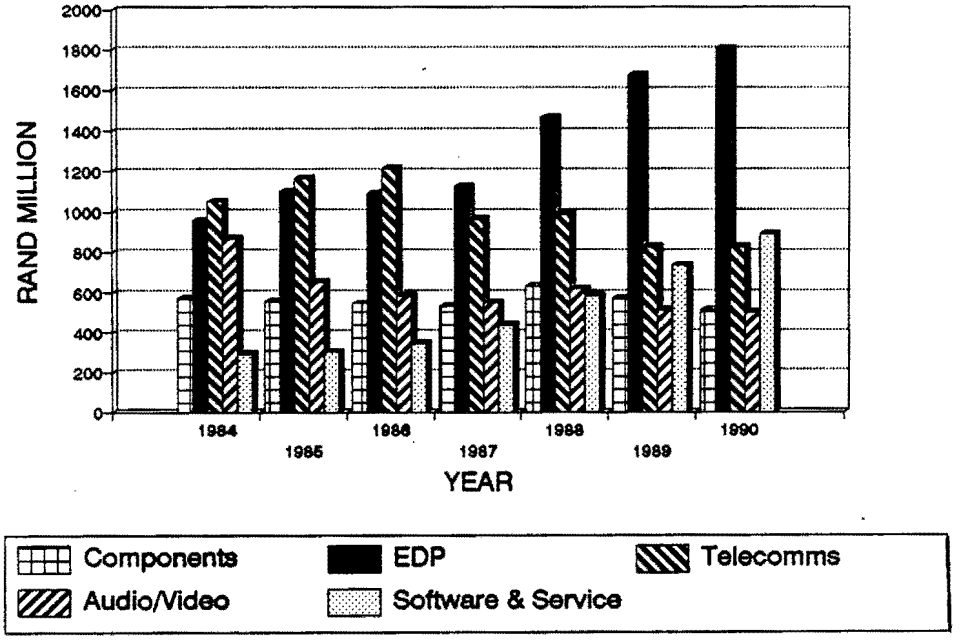
[1]In contrast, components formed 24 percent of the world market for electronics and 41 percent of Korean production in electronics in 1988.

African market for electronics recorded a real decline in revenue growth of 3 percent. This decline was partially the result of a deepening recession in South Africa and, as a result of the declining exchange rate, the higher rand cost of imports. The world market for electronics, on the other hand, enjoyed real growth of 15 percent per-annum over the same period.

The South African electronics market was valued at an estimated R11.7 billion in 1990 (BMI, 1991:6). This represented roughly 3.5 percent of South Africa's GDP or 0.6 percent of the world market for electronics in that year. It is the third largest industrial sector in South Africa.

The growth in the five largest sectors of the industry (EDP, telecomms, software and services, components and audio and video equipment), between 1984 and 1988 is shown in Figure 4.3.

Figure 4.3
The Real Growth in the Five Largest Sectors of the South African Electronics Industry



Source: Business and Marketing Intelligence (1989;1991).

Note: 1) Figures are adjusted to the PPI with a base year of 100 in 1985 (CSS correspondence).

2) Figures for 1989 and 1990 are forecasts.

From Figure 4.3 it can be seen that the local market for EDP and software experienced positive growth, recording real per-annum growth rates of 10 and 19 percent respectively. The other major sectors of the electronics market - telecomms, components and audio and video - declined in real terms. The audio and video sector experienced a negative growth-rate in real terms of 8 percent per-annum between 1984 and 1988. It is apparent from Figure 4.3 that the local consumption of electronics is shifting towards the EDP and software sectors.

4.3 The Extent and Composition of Production undertaken in the South African Electronics Industry

For the purpose of this dissertation, use was made of three different methods[1] to calculate the level of domestic production in the electronics industry. The first calculation was done by using BMI (1989) data which effectively showed the low level of production but did not clarify whether or not the data included the import content of locally manufactured inputs. In order to underscore the low level of production undertaken, a second calculation was done. By eliminating the foreign content of local production it was possible to calculate the local content of the industry. This was done by estimating the local content of final products and subtracting any foreign inputs. A third calculation was made whereby the local value added of the industry was ascertained. This figure contains the value of sales margins and installation and customer service.

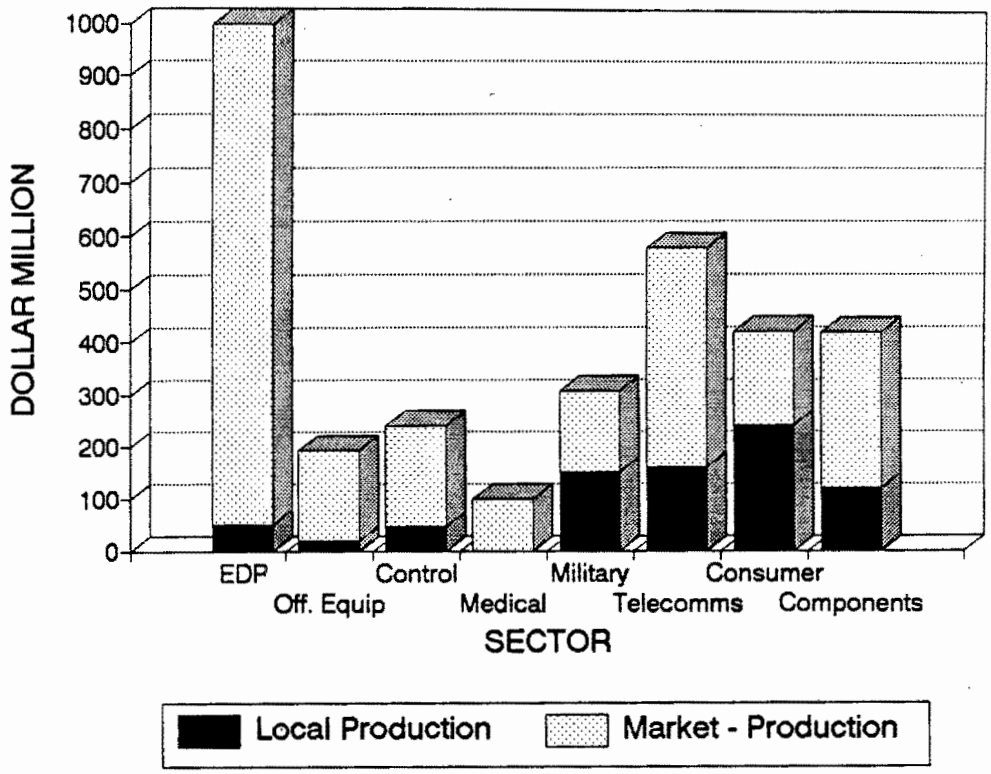
---

[1]All three measures are problematic and should be used with discretion. Firstly, they are calculated on the assumption that local prices are equivalent to those in the international market. However, in most cases this is not so as the price of locally manufactured products usually exceed international prices. If value added was to be based on prices prevailing on the international market, therefore, it would be accordingly lower. Secondly, the exchange rate can also have a significant effect on value added. For example, a drop in the exchange rate would increase the landed cost of imports which, by increasing the import content of the market, would, ceteris paribus, reduce the level of value added in the industry. However, this depends largely on the time scale and the nature of the import.

- **Local production**

It was established by the BMI (1989) that in 1988 the value of local production constituted only 24 percent of the domestic market for electronics (see Figure 4.4).

Figure 4.4
The Extent of Local Production in the South African Electronics Industry in 1988



Source: Business and Marketing Intelligence (1989).

From Figure 4.4 it can be seen that the consumption of electronics in South Africa far exceeds the extent of production undertaken in each sector of the local industry. For example, only 5 percent of the market value of EDP equipment was locally produced in 1988. Sectors that showed higher levels of local production were the telecomms, components, military and consumer sectors but these levels, as a percentage of consumption, also remained low.

♦ Local content[1]

The low level of local production in electronics was very apparent on re-examination of the level of local content in the industry. It was ascertained in personal interviews that many firms which sourced their component and material requirements from local manufacturers, recorded such purchases as being 100 percent local notwithstanding the fact that they frequently contained high levels of imported content. Therefore, in order to calculate the true extent of local content, it was necessary to subtract any imported inputs.

To calculate the extent of local content in the industry, data obtained from the survey was used. It was ascertained that the components sector sourced approximately 52.5 percent of its input requirements locally, compared with 34.8 percent for the rest of the industry.

On the premise that producers calculated their locally-sourced components as being 100 percent local, and that all their inputs were in the form of components, the following calculation was made:

$$\text{Local Content} = (LC(1) / 100) \times LC(2).$$

Note: LC(1) = Local content of components and materials.

LC(2) = Local content of final manufactures.

---

[1]Local content can be defined as the value of local production, minus imported inputs and any margins on sales, as a percentage of the local market (BMI, 1989). Kaplan (1990:85) defines local content as a measure of the foreign exchange saved as a consequence of local production.

Table 4.1

Local Content of the Surveyed Electronics Industry

Sector	Level (%) of Local Content	Level (%) of Import Content
Component Manufacture	52.5	47.5
Producer and Import Agent	32.8	67.2
Overall	17.2	82.8

n = 53

It can be argued that the local content in the surveyed industry was, therefore, approximately 17 percent. A similar calculation may also be made for the telecomms sector.

Table 4.2

Local Content of the Surveyed Telecomms Sector

Sector	Level (%) of Local Content	Level (%) of Import Content
Component Manufacture	54.7	45.3
Telecomms Manufacturers	52.2[1]	47.8
Final Telecom Manufactures	28.5	71.5

n = 35

In the telecomms sector the level of local content was slightly higher at approximately 28.5 percent. This figure compared well with other estimates[2]. This data suggests that imports constituted approximately 80 percent (market value less local production) of the local market for electronics. But account must

---

[1]Correspondingly, the BTI (1986:16) calculated the average level of local content of those companies with long term agreements with the SAPT to be 53 percent.

[2]For example, a managing director of a large telecomms company argued that most "telecomms companies in South Africa would be lucky to hit 20 percent true local content" (cited in Kaplan, 1990:86). Kaplan (1990:90), on the other hand, after considering BTI and BMI data and making extensive inquiries, argued that: "A guesstimate for the true local content for the telecomms equipment industry en toto (although this would be much higher for some products, eg telephone instruments) would probably be of the order of 30-40 percent".

also be taken of other factors namely, sales margins, installation and customer service. Depending on the sector and the product, these additional 'value adding' expenses can form between 10 to 30 percent of local market value.

- **Value added**[1]

From Table 4.3 it can be ascertained that the local value added accounts for 42.6 percent of the total electronics market in South Africa in 1988.

Table 4.3
Extent of 'Value Added'
in the South African Electronics Industry

Sector	Market Value in 1988 (rand million)	Local Value Added as a % of Market Value	Local Value Added in the Market
Components	867	47	408
EDP	2259	27	609
Test and Measurement	178	33	59
Transport instr.	79	41	32
Office and Business	438	30	131
Process control	296	43	127
Telecomms	1525	44	671
Security	317	47	149
Power	198	49	97
Audio and Video	953	52	496
Medical	213	22	47
Software	897	64	574
Military	470	65	305
TOTAL	8690	(av) 42.6	3705

Source: Business and Marketing Intelligence (1989).

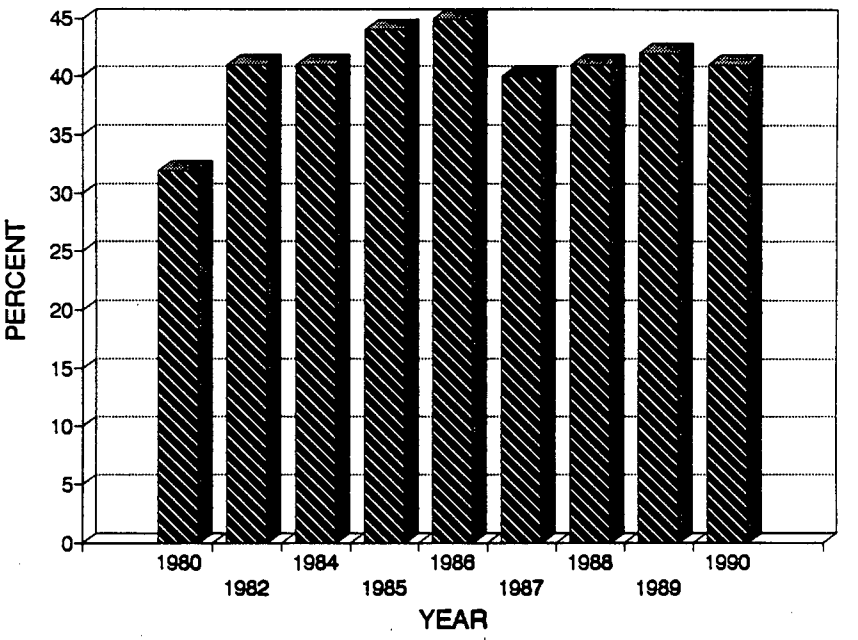
[1] 'Value added' is defined as the margin between the selling price of the product and its imported cost, inclusive of duties and surcharges. This includes any margins on sales of locally produced and imported electronic goods.

From Table 4.3 it can be seen that the telecomms sector was the largest contributor to value added, followed by EDP and software. However, while the local value added, as a percentage of local market value, of the EDP and software sectors has increased from 2 and 50 percent respectively in 1984, it appears that value added, in the telecomms sector, has declined. For example, in 1984 the BMI depicted the level of value added in the telecomms sector to be 60 percent of the sector's market value.

4.4 The Industry's Reliance on Imports

It is clear that, with the low level of local production undertaken, the South African electronics industry relies heavily on imports to satisfy market demand. It was established that the ratio of imports free on board (FOB) of electronics to the South African electronics market remained above 40 percent between 1982 and 1990 (Figure 4.5).

Figure 4.5
The Percentage of Imports in the South African Electronics Market between 1980 and 1990

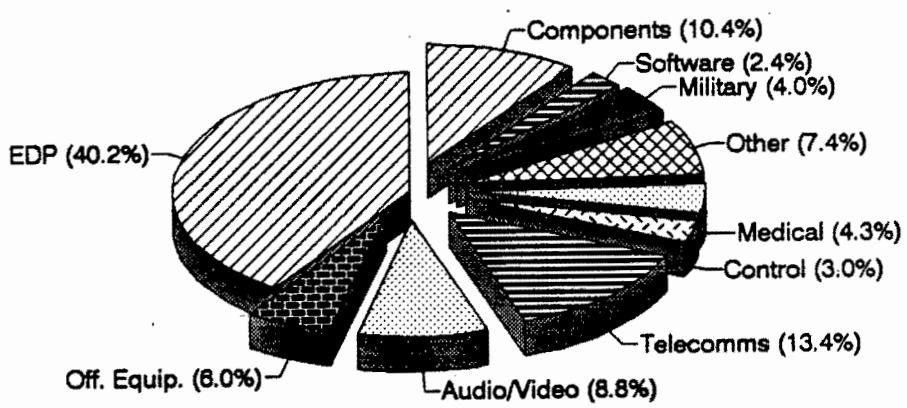


Source: Customs and Excise, RSA (various).

Note: 1989 and 1990 are forecasts.

It should be noted that the data utilised was FOB and thus excluded any importation costs or importer's mark-up. The extent of the industry's reliance on imports of electronics is further undervalued as certain imports, such as aircraft and automobiles, which contain extensive amounts of electronics, are considered as a total package. Thus the value of the electronic equipment imported in this way is not accounted for and the market value of imports is substantially higher than suggested in Figure 4.5. Imports of electronic equipment constituted approximately 9 percent of imports to South Africa between 1984 and 1990 (CSS correspondence). The composition of these imports is set out below:

Figure 4.6
The Composition of
Electronic Equipment Imported into South Africa in 1988



Source: Business and Marketing Intelligence (1989).

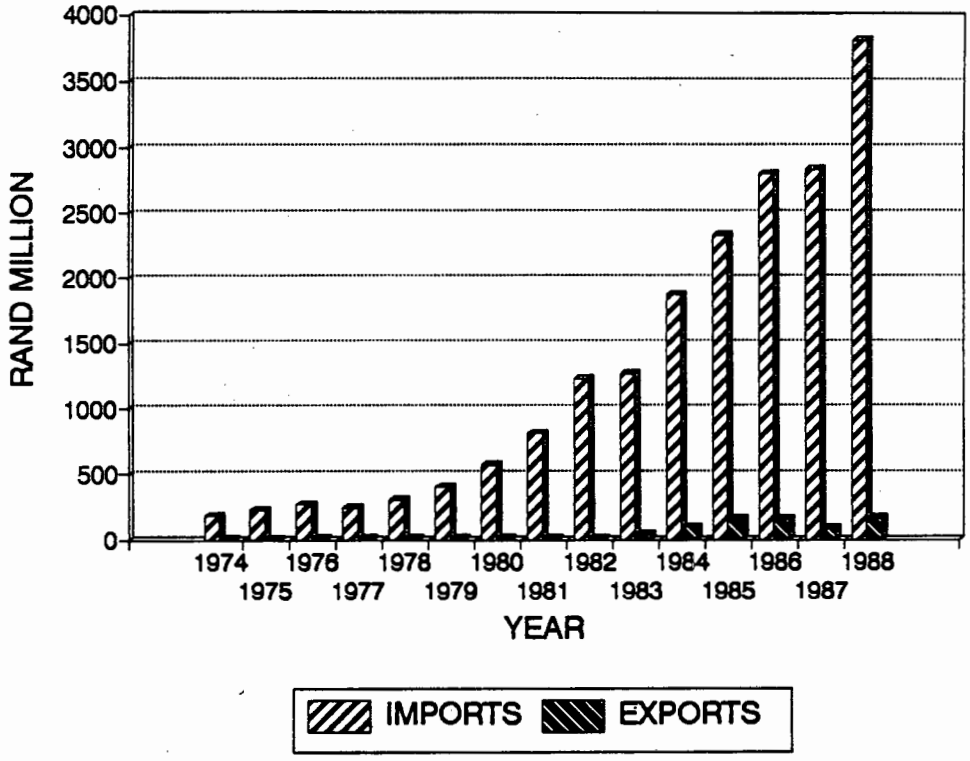
Note: Other includes test and measurement, transport, security and power related equipment.

Figure 4.6 indicates that the largest single importer in the local electronics industry was the EDP sector which constituted

approximately 40 percent of total imports to the local industry. By following consumption trends in the local electronics market and analysing the composition of production in the industry, it can be deduced that it will continue to rely heavily on imports.

While imports of electronic products have been substantial, exports have remained low (Figure 4.7).

Figure 4.7
Nominal Imports (FOB) and Exports of Electronics between 1974 and 1990



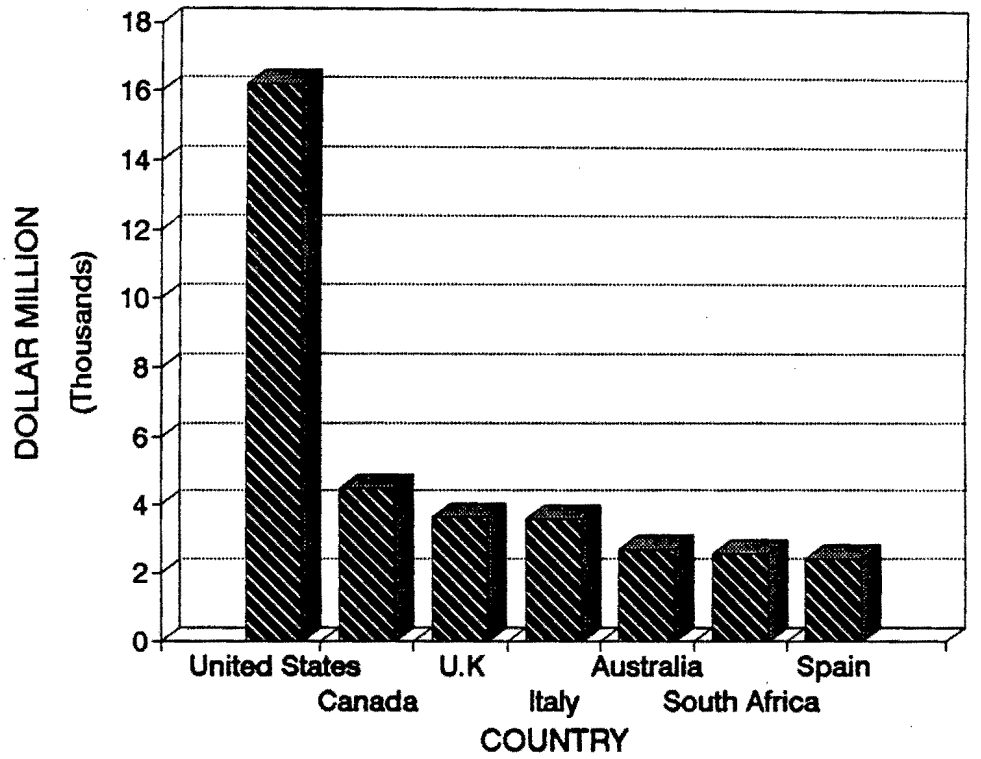
Source: Customs and Excise, RSA (various).

Note: 1989 and 1990 are forecasts.

It can be seen in Figure 4.7 that exports[1] from the industry represent approximately 3.8 percent of the value of imports[2]. As a result of the industry's reliance on imports to meet local consumption, South Africa has become one of the world's largest net importers of electronic products (Figure 4.8).

Figure 4.8

The World's Largest Net Importers of Electronics outside the Eastern Bloc



Source: Business and Marketing Intelligence (1989).

---

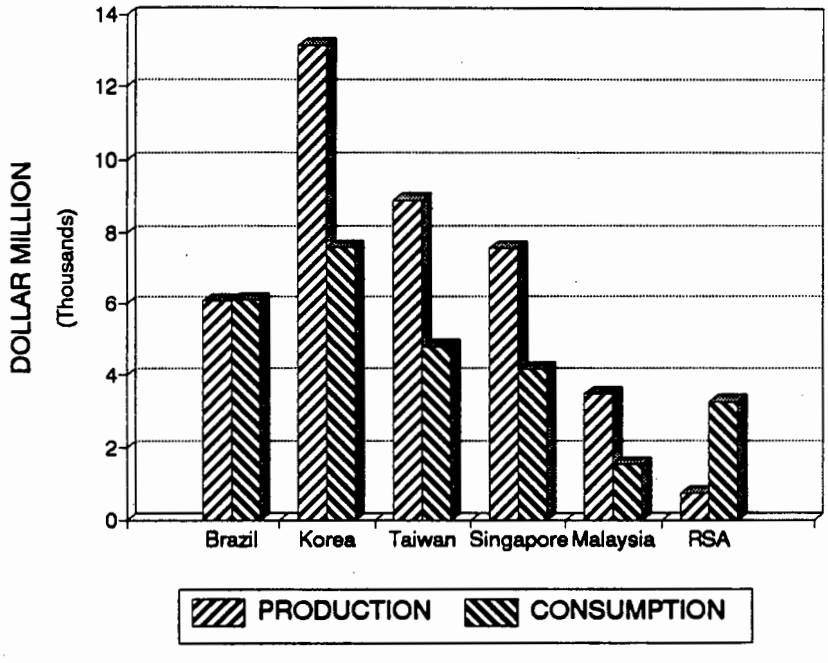
[1]As in the case of imports, exports from other sectors which incorporate electronics are not recorded in this calculation but the extent of this undervaluation is not very significant.

[2]Of those firms surveyed, 38 percent of small firms and 65 percent of large firms were exporters. It was established that approximately 60 and 40 percent of large and small firms' exports, respectively, were directed to third world markets. Approximately R190 million worth of electronic equipment was exported by these firms, indicating that roughly 4 percent of surveyed industry turnover was obtained through exports in 1990. Likewise, exports from these firms represented approximately 10 percent of the value of their FOB imports.

4.5 Conclusion

Imports (FOB) continue to form over 40 percent of the total final value of the South African electronics market. **Exports** from the industry, however, remain low which has resulted in a substantial trade deficit in this industry. Furthermore, consumption trends in the local market indicate that the industry is relying increasingly on imports. The lack of development in the local industry can be effectively demonstrated by a brief comparison of achievements elsewhere (Figure 4.9).

Figure 4.9
The Extent of Electronics Production in Other Countries



Source: Business and Marketing Intelligence (1989).

Figure 4.9 shows that a number of developing countries produce more electronic goods than South Africa. Malaysia, for example, produced five times the value of production in electronics undertaken in South Africa in 1988. As its local market for electronics is half the size of South Africa's, this indicates that the size of the indigenous market does not necessarily determine the growth of the industry.

Although the state has intervened extensively in the industry (see Chapter Five), it may be argued that this intervention has not proved effective in establishing a dynamic, resilient, competitive or domestically integrated industry. This has resulted in a heavy burden being placed on South Africa's foreign exchange reserves and has also limited the industry's ability to provide the necessary indigenous technological capability to the surrounding environment with which to aid the quest for international industrial competitiveness.

CHAPTER FIVE

STATE INTERVENTION IN THE ELECTRONICS INDUSTRY

5.1 Introduction

It was shown in Chapter Two that the state can intervene in many ways to develop a technology-intensive industry. The purpose of this chapter is to determine what measures have been taken by the South African government to stimulate growth in the local electronics industry. These measures include:

- Protection of the local market
- Export incentives
- Tax allowances
- Local procurement policies
- Establishing organisations which assist the industry.

5.2 Protection of the Local Market

In terms of Act No. 19 of 1944, the Board of Trade and Industry (BTI) is "empowered to advise the government on measures to promote industrial development" (BTI, 1986:22). Over the years, the BTI has attempted to promote the local electronics industry through the establishment of a protected market[1].

According to Dr Reinhardt of the BTI, the measures used to protect the electronics market act as a 'tax' on imported electronics, thereby offering the local manufacturer an initial cost advantage over international competitors. The measures used to protect the local market are:

---

[1]See - BTI: "Guide to the Policy and Procedure Relative to Customs Tariff Protection and Tariff Relief", RSA, 1980 - for an outline of policy procedure.

- Customs duties
- Fiscal duties
- Ad valorem duties
- Surcharges.

♦ **Customs duties**

These duties are levied on imports on a formula basis and can amount to between 0 and 25 percent of the landed cost of the import. The duty levied on imports may be calculated as an ad valorem duty as well; for example, instruments and apparatus which measure time intervals. Here the duty is 20 percent of the import value, or R20 each less 80 percent of import value (BTI, 1984). Customs duties are levied on the rand value of the imported item and are the most common form of protection offered to manufacturers.

♦ **Fiscal duties**

Fiscal or excise duty, as distinguished from import duty, is an ad valorem duty applied to certain locally retailed products that are considered luxury items by the BTI (Customs and Excise interview). Excise duties applicable to local electronics manufacturers range from between 0 and 35 percent. For example, an excise duty of 35 percent is levied on all television sets sold in South Africa, whether of local or foreign origin. A rebate is, however, allowed on the added value of locally made electronic components used in the TV receiver (BTI, 1986). EDP, office equipment, tape media and reception apparatus are also liable for fiscal duties.

♦ **Ad valorem duties**

Like customs duties, ad valorem duties are determined in relation to the extent of foreign competition and the amount of local production and design being undertaken on equivalent products. They can have a value of between 0 and 100 percent. According to Customs and Excise, ad valorem duties are levied on the rand

value (customs value) of the imported goods and any customs duties which are payable.

- **Surcharges**

Surcharges have recently been introduced to protect the balance of payments and are a welcome source of revenue to the state (government interview). They are normally applicable to all imported commodities, barring specific exceptions such as basic raw materials. On electronics (including components), for example, surcharges vary between 7.5 and 20 percent. These surcharges are levied on the rand value (customs value) of the imported goods and any customs and ad valorem duties which are payable.

5.2.1 An Example of how Protection is Implemented

The above mentioned duties and charges raise the domestic price of imported electronic equipment. The BMI (1989:36) utilised its large subscriber base to calculate the average rate of duty and charges paid by firms in each sector (Table 5.1):

Table 5.1
Average, Sectoral, Rate of Duties on Imported Electronics

Components	30%
EDP Equipment	11%
Test & Measurement	38%
Transportation Equip	19%
Office & Bus. Equip	19%
Control & Automation	16%
Telecommunications	6%
Security Equip	19%
Power related Equip	19%
Audio and Video	60%
Medical	11%
Software and Services	10%
Military	10%

Source: Business and Marketing Intelligence (1989:36).

Note: The values used is calculated from the sum of duty, surcharges and ad valorem paid on FOB imports. The effective percentage paid is a derived field, based on the actual duties paid.

The various duties and tariffs placed on imports of electronic equipment, protect the local manufacturer from foreign competition. However, the protection of components can often offset this advantage. For example, a firm importing test and measurement equipment, with a landed cost of R1, would pay, after tariffs and other duties according to Table 5.1, a total value of R1.38.

5.3 Export Incentives

The state offered export incentives up to April 1 1990 in the form of an A and B scheme. Under scheme A, rebates, of 50 percent of the duty paid on those inputs used in the manufacture of exports, were offered. Under scheme B, the government offered compensation amounting to 10 percent of value added in the manufacture of exports (BTI interview). Value added was ascertained by taking the difference between imports and the value of export sales (FOB) and an exporter could in many cases receive assistance through both schemes.

From 1 April 1990, the rebate scheme was abolished in favour of a general export incentive scheme (GEIS). This scheme is offered to all exporters and preference is based on the extent of local processing undertaken in accordance with various established 'harmonised' codes. Manufactured products such as electronic equipment receive the highest level of assistance.

The Level of assistance granted in this scheme is calculated in the following manner:

Rand Assistance = $EV \times (LA \pm EF) \times VA$.

Note:
EV = Value of exports (FOB)
LA = Maximum assistance offered by the scheme
EF = Exchange rate factor[1]
VA = Percentage value added during manufacture (Value of exports (FOB) less Imports (CIF))[2]

In June 1991, for example, the rand was calculated by the Reserve bank to be under-valued by 13 percent. As a result, the incentive offered to exports was reduced from 25 to 18.5 percent (BTI interview). The degree of value added is then taken into consideration. This scheme is intended to reduce the offsetting effect of tariffs and duties on inputs used in the manufacture of exports. Due to a shortage of government funds, however, these incentives are paid by means of a combination of cash and promissory notes which are paid out over a number of months. While the interest on them has been raised to 15 percent, this is fully taxable (BTI interview).

In order to further encourage exports, exporters receive a tax deductible allowance of 75 percent of their export marketing expenses. This is in addition to the standard allowance of 100 percent. Those who export 10 percent more than the lowest average of three of the previous five years, receive an additional deduction of 25 percent of their marketing costs. These deductions are afforded to a maximum of 20 percent of export turnover. However, these additional allowances will be terminated by 31 March 1992 (Receiver of Revenue interview).

---

[1]When the rand is under-valued or below parity, the value of the exchange rate factor in the formula will be reduced by 0.5 percent for every 1 percent below. When it is overvalued, the value of the factor will be increased by 0.5 percent for every 1 percent above parity.

[2]If the exports have a value added of 75 percent or more the factor is equal to 1. When the value added is between 75 and 35 percent this factor declines proportionally. Exports with a value added of less than 35 percent receive no assistance.

5.4 Tax Deductible Allowances

The South African electronics industry does not receive any special tax deductible allowances besides those applicable to other manufacturers and exporters (Working Group, 1988:24). These tax deductible allowances apply to plant and machinery and buildings.

Deductible allowances on plant and machinery and buildings have changed substantially over the last three years. For example, in the case of plant and machinery:

> Up to December 1988 a 50 percent initial deduction was allowed after which a 20 percent depreciation allowance was granted, per annum, on the yearly balance. Before 1989 a firm could receive a depreciation allowance of 60 percent in the first year.
>
> Between January 1989 and 15 December 1989 the initial allowance was done away with and plant and machinery could be depreciated, for tax purposes, at 50 percent in the first year, 30 percent in the second year and 20 percent in the third year, on the original balance.
>
> After 15 December 1989 plant and machinery expenses were deducted over 5 years at a rate of 20 percent per annum on the initial balance. A firm can thus receive a depreciation allowance of 20 percent in the first year.

Source: All figures obtained from the Receiver of Revenue.

Over the last three years, therefore, (1988 to 1990) the tax allowances on plant and machinery have become less favourable. A similar scenario occurs in the case of tax allowances on buildings[1].

With tax allowances becoming less favourable, the cost of adding value locally has increased. This can best be demonstrated by an example:

---

[1]Before December 1989 an initial allowance of 17.5 percent was given after which a normal depreciation of 2 percent per annum was allowed. After December 1989 there was no initial allowance and a depreciation of 5 percent per annum was allowed.

If a firm, operating before 1988, bought plant and machinery and buildings to a value of R200 000 and R100 000 respectively, the tax allowance in the first year would equal R139 500.

Before 1988:

Plant and Machinery	R200 000	
Tax deductible allowance		R120 000
Buildings	R100 000	
Tax deductible allowance		R 19 500
Total Tax deductible allowance in the first year:		R139 500

If the same firm were to purchase plant and machinery and buildings for the same amount in 1990, however, the tax deductible allowance in the first year would be substantially reduced.

Purchases in 1990:

Plant and Machinery	R 200 000	
Tax deductible allowance		R 40 000
Buildings	R 100 000	
Tax deductible allowance		R 5 000
Total Tax deductible allowance in the first year		R 45 000

The decline in tax deductible allowances have thus had the effect of increasing the tax liability of firms within the industry. The development of the South African electronics industry has, therefore, not been assisted by means of tax policy.

5.5 Local Procurement Policies

The government has played an important role in generating a substantial market for locally sourced electronics. The state, through, inter alia, the Working Group (1983) and the De Waal Committee (1983), has undertaken various investigations to establish the most feasible means of consolidating and rationalising public sector purchases. As a result, two methods are used by the public sector to procure its electronic equipment requirements from the industry, namely, preference schemes and

long-term contracts with suppliers.

5.5.1 Preference schemes[1]

The public sector currently pays a price premium for its procurement of locally manufactured electronic equipment. Under the existing formulae used by state purchasers (which include Armscor, SAPT, SABC, ESCOM and municipalities), no preference is awarded if the product's local value added falls below 25 percent of its total value. However, a price preference on tenders of up to 25 percent will be offered if the product is 100 percent manufactured in South Africa, with pro rata increases between these limits.

An additional preference of up to 10 percent is given if the product is locally designed. Should a product be 100 percent locally manufactured and designed, it will receive a price preference of up to 35 percent[2].

It is interesting to note that the state is concerned that preferred contractors may tender prices insufficient to meet overheads. In this regard the BTI (1986:29) stated: "care will be taken to ensure that a positive contribution to his overhead costs and profits is nonetheless earned by the contractor". This creates a possible anomaly whereby preferred contractors reduce their tenders in order to obtain contracts whilst later campaigning to receive funds to cover their overheads.

The state negotiates with preferred contractors on a single source basis to ensure that their purchases are compatible with one another and that contractors attain economies of scale.

---

[1]See Appendix D for a copy of a State Tender Contract.

[2]Preferences can vary slightly and are higher in the case of locally manufactured strategic equipment. Preferences offered to locally manufactured electronics are, in general, substantially higher than those given to non-electronic goods which usually receive a price preference of approximately 10 percent.

Moreover, companies, already able to meet public sector demand, obtain preference over newly established firms.

5.5.2 Long-term Agreements

Besides giving preference to locally manufactured electronic equipment, the government also makes purchases from the industry through long-term supply agreements. The most notable of these is for the supply of telecommunications equipment in terms of 15-year contracts, and arms-length agreements by which state suppliers are required to use locally sourced components.

- **Long-Term Agreements of 15 Years**

  During the period following the Second World War, several committees were established by the state to investigate and report on the local supply and manufacture of materials that were considered to have military/strategic significance. In 1958, the SAPT entered into four, ten-year agreements with firms for the supply of telecomms equipment.

  The four firms, namely ATE (later Plessey), AEI Henley (later GEC), STC and Siemens, soon achieved local production capacity with preference being granted in respect of the level of local value added. The move to digital technology in the late 1970s required substantial capital investment from manufacturers who then asked the SAPT to prolong their agreements. In 1979 these were extended for a further period of 15 years. All agreements, with the exception of Teltech (part of the Altech group), terminate in 1994. The current agreements with contractors are for the manufacture of the following equipment:

Altech/STC	:	Automatic telephone exchange equipment (1/3 of all rented lines using CIT Alcatel's E-10 locally known as the SA 128E) Frequency multiplex equipment Carrier and micro wave systems Pulse code modulation equipment Optic fibre equipment
TMSA	:	Automatic telephone exchange equipment (1/3) of all rented lines using Siemens EWSD system) Telephones supplied as standard rented equipment
Plessey	:	Small business telephone systems Manual public telephone exchanges and manual branch telephone exchanges Switchboards for test and maintenance centres
Siemens	:	Automatic telephone exchange equipment (1/3 of all rented lines using its EWSD system) Automatic telegraph exchanges Telex and teletex terminals Seventy five percent of telephone exchange power supply equipment

Source: Board of Trade and Industry (1986:15).

- **Arm's-length agreements**

The second form of long-term contract entered into by government are 'arm's-length agreements' which are usually negotiated for a period of four years. In terms of these agreements, all suppliers of locally manufactured telecomms equipment to the SAPT are required to use components sourced from approved contractors.

These contractors provide an account of their costs for scrutiny by the SAPT. A price, based on cost plus an allowance for profit, is then agreed between the SAPT and the component manufacturer. The agreed price is then subject to a 'price variance factor' which takes into account variations in the inflation rate and yields the final component or product price. Firms supplying telecomms

equipment to the SAPT are then able to claim, from them, any increased costs which result from their usage of these local components (SAPT interview).

An anomaly occurs, however, as suppliers of electronic components under these agreements do not have to produce them locally but may import them fully manufactured (BTI, 1986:15). This was, however, denied by a senior SAPT spokesman who explained that, "this may be allowed for under the agreement, but it is not applied this way. We examine every case and if there is not local manufacture, we will not support it" (SAPT interview cited in Kaplan, 1990:80).

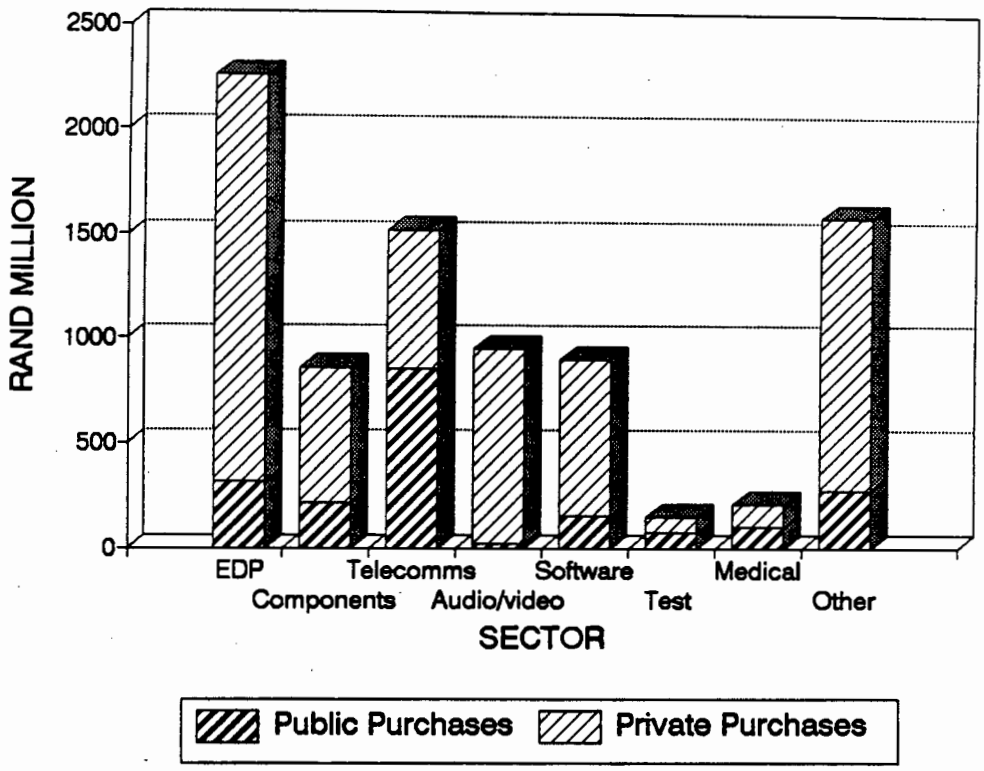
5.5.3 The Extent of State Procurement from the Industry

The state is the largest purchaser of electronics in South Africa. In 1988, public sector purchases of electronic equipment constituted approximately 25 percent of the local market (Figure 5.1), which is down from 34 percent in 1984[1]. With present cutbacks by the SAPT and Armscor, it is expected that its share of purchases will drop even further over the next few years.

[1]In 1984, these purchases constituted approximately 80 percent of the local telecomms market, 50 percent of the market for test and measurement equipment and 70 percent of the components market (see BMI, 1984).

Figure 5.1

Government Procurement from the Electronics Industry in 1988



Source: Business and Marketing Intelligence (1989).

Note: 1) Other includes test, security, power and medical equipment, transport instruments and office equipment.

2) The state is the only local purchaser of electronic equipment used for military purposes.

From Figure 5.1 it can be seen that the state has made purchases predominantly in those areas which are typically within the ambit of the public sector, namely telecommunications and military.

5.6 State Organisations

Several governmental working groups, committees and organisations have been established to monitor and assist the development of the South African electronics industry. They include:

- The Working Group for the Promotion of the Electronics Industry
- The Standing Committee for Electronics
- The Council for Scientific and Industrial Research
- The Industrial Development Corporation
- The Small Business Development Corporation.

♦ **The Working Group for the Promotion of the Electronics Industry**

The Working Group is comprised mainly of government officials from, inter alia, the IDC, Armscor, SAPT, CSIR, SABC, SATS, ESCOM and the BTI. The government's current local procurement policy represents the initiatives of the Working Group. This Group was also instrumental in establishing a Standing Committee.

♦ **The Standing Committee for Electronics**

The Standing Committee was established in 1984 primarily to implement and monitor the state's local procurement policy (BTI, 1986:31). To date the Standing Committee has accomplished the following:

- The privatisation of SAMES;
- The establishment of the Integrated Circuit Design Centre (ICDC);
- The implementation of a standard system of price preferences throughout the public sector for locally designed and manufactured electronics;
- The initiation of joint projects in terms of which the participating state agencies agree on standardised product specifications, and short-term preferential supply contracts;
- The initial organisation, in association with Business and Marketing Intelligence (Pty) Limited, of a comprehensive data base on the electronics industry.

Source: Personal interviews with the Standing Committee, 1990.

The Standing Committee has recently become involved in the Innovation Support for Electronics scheme (ISE). In 1989, Mr Kent Durr, Minister of Trade, Industry and Tourism, designated the Standing Committee the task of allocating R200 million in grants, to the industry over five years, on a rand for rand basis[1].

Applications for these grants require firms to provide details concerning R & D projects being undertaken which are evaluated in terms of their originality and forecasted export potential. The ISE scheme allocated R34 million to the industry in 1990 and a similar amount will be allocated in 1991 (Standing Committee interview).

From personal interviews, it appeared that some firms believed that large conglomerates received the majority of these funds, with one firm stating as much: "The big boys (sic) will get most of the money". This was denied by a prominent member of the Standing Committee who stated that 27 of the 45 companies (over 70 applied) which received grants through the scheme were private and independent[2]. He said that the importance of small independent firms was "recognised by the Committee and small firms were not discriminated against" (Standing Committee interview). The distribution of funds on a sector-by-sector basis is given in Table 5.2.

---

[1]The motivation for financial assistance in this manner first came from the BTI (1986) and especially the Working Group (1988). Through this scheme for each rand that preferred firms invest in selected fields of R & D, the state will grant a similar amount.

[2]The BTI argued that 30 percent of the funds were allocated to small firms (Electronics News, July 1990).

Table 5.2

Financial Assistance afforded to the Industry through the Innovation Support for Electronics Scheme

Sectors of the industry	Grant (rand mil)	Size of Market addressed (rand mil)
Control and Automation	7.2	1707
Computer Hardware	5.3	1130
Telecomms Equipment	5.2	782
Office and Business	2.5	202
Transportation	0.9	84
Security	0.7	54
Medical Equipment	0.6	149
Power	0.5	249
Test and Measurement	0.1	1
TOTAL	23	4358

Source: Electronics News July (1990:1).

Note: 1) No grants have been awarded to projects in the components, military, audio and video sectors. Pure software development has also been excluded from the scheme. SAMES received R11 million to meet government financial commitments to the organisation.

2) The size of the market addressed refers to the expected market for the products being developed.

3) The amount of R34 million allocated is notably less than the BTI's initial recommendation of R50 million in 1986.

These funds are not distributed immediately to firms but rather as certain progress targets are reached by the various projects. This allows the IDC "to measure the level of success which the Innovation Support for Electronics scheme experiences. We want to be sure that there are more successes than failures" (Mr G. Morse, Chairman of Standing Committee, cited in Electronic News, July, 1990:2).

- **The Council for Scientific and Industrial Research (CSIR)**

The CSIR was established by the government with the intention that it should act as a 'research centre' for industry. In an advertisement in Electronics News (Nov. 1989), it posed the question:

> CSIR:
> What's in it for me?
>
> A research and development capability, quite literally, for hire.

The CSIR allows firms in the private and public sectors to utilise its resources for research purposes. Research undertaken in the field of electronics is predominantly in military and telecomms where the CSIR has recorded significant success. For example, the Magnolia System (a telephone system specially developed for sparsely populated areas), introduced by the SAPT, involved extensive research by the CSIR.

Research centres at the CSIR include: the National Committee for Micro Electronics, the Technology Finance Corporation, and the Foundation for Research and Development. This Foundation offers bursaries for undergraduate and post-graduate studies in natural science and engineering and directs its resources primarily towards the sponsorship of degrees with a scientific or research orientated nature. For example, in 1990, whilst only 100 bursaries were awarded to undergraduate students, a total of 1337 postgraduate bursaries were awarded to 389 Honours students, 694 Masters students and to 254 Doctoral or post doctoral students, 46 of whom studied abroad (Engineering Week, March, 1990).

- **The Industrial Development Corporation of South Africa (IDC)**

The IDC was established by the South African government in 1940 to provide financial support for industry during its initial

stages of development. The IDC continues to assist firms, in, inter alia, the electronics industry, in the following ways:

- Medium-term loans or grants for the purchase of fixed assets and operating capital;
- Deferred purchasing and/or leasing finance for equipment;
- The IDC's purchase of ordinary or redeemable share capital;
- Venture capital for small[1] or new firms.

The IDC has afforded financial assistance to several firms in the electronics industry, especially to those who export or whose products substitute imports. The necessary requirements for receiving state assistance are, however, often stringent. For example, applicants for loan capital are expected to have a "well motivated business plan, based on a good knowledge of their potential market and the production and other costs of their proposed venture. It is normally also necessary to have ready a prototype of the product they intend manufacturing" (Mr W.C Van der Merwe, Managing Director of the IDC). As a result, much of the assistance is directed at the further development of firms already established.

As the IDC actively participates in the electronics industry as a share-holder in many private firms, it is incumbent upon it not to formulate or execute any policy which may affect the industry unless all parties involved are treated equitably.

♦ **The Small Business Development Corporation (SBDC)**

The SBDC was established to assist firms with fixed assets of less than R2 million and offers two schemes, namely:

- The General Finance Programme; and
- The Small Business Establishment Fund.

---

[1]Fixed assets must, however, exceed R2 million to be applicable for IDC finance.

The SBDC provides low-interest rate loans to developing firms or to those struggling due to prevailing economic conditions. Firms applying for financial assistance must be able to prove that they are worthy of it and, in many cases, documented market research must accompany the application. The SBDC favours those firms which have already established some form of productive capability (SBDC interview).

5.7 The Extent and Direction of State Intervention in the Industry

From the above analysis, it is clear that the government has been active in the promotion of the indigenous electronics industry. It was ascertained that 41 percent of surveyed firms interacted with the state in some way or other (Table 5.3).

Table 5.3
The Extent to which Firms in the Industry Interacted with the State

Relationship with State	Percentage of Large Firms Interacting	Percentage of Small Firms Interacting
Share Holding	10	6
Loan Capital	15	13
Short-Term Finance	15	3
Grants	35	16
Long-Term Contracts	40	9
Advisory Services	20	3
Other	25	3

n = 54 (22 large, 32 small)

Note: 1) Firms often interacted with the state in more than one field with the result that percentages do not add up to 100.
2) Other included short term contracts with the SAPT and Armscor.
3) Surveyed firms with a turnover in excess of R40 million are classified as large.
4) While the table indicates the extent of state interaction in the industry it is not possible to determine its rand value due to confidentiality of data.

From Table 5.3 it can be seen that grants are the state's preferred means of offering financial assistance to the industry. With the allocation of grants by the Innovation Support for Electronics scheme (ISE), it is expected that they will play an even more prominent role. Long-term contracts are also a favoured means of providing assistance. Seventy-three percent of these were allocated to large firms.

The Table reveals that the state affords, in total, more assistance to large than to small firms[1]. Seventy-five percent of large firms interacted with the state compared with only 22 percent of small firms[2]. Public sector institutions which have been prominent in assisting the industry through finance and local procurement are the IDC, Armscor and the SAPT. These organisations were responsible for approximately 90 percent of all state links among surveyed firms. As the IDC was involved in the allocation of grants and loan capital, it was responsible for up to 55 percent of all mediation that took place.

The survey was used to ascertain the approximate direction of this assistance which came in the form of grants, long-term contracts (LTCs) and loan capital (Table 5.4).

---

[1]This is statistically evident. $\chi^2 = 103.78$ at 6df which is significant at the 1% level.

[2]In contractual terms the survey indicates that 66 percent of all state mediation was directed at large firms.

Table 5.4

Direction of

State Assistance in the Surveyed Industry

Sector	Percent of Grants Allocated	Percent of LTCs Allocated	Percent of Loan Capital Allocated
Components	19	24	28
Instrumentation	14	8	27
Commun. + Telecomms	16	44	15
EDP	28	11	19
Consumer	12	0	0
Software	0	0	0
Office Equipment	11	13	11

n = 22 (15 large[1], 7 small)

Note: 1) It is not possible to determine the exact distribution of financial assistance in the industry. The Table thus indicates the distribution of contractual assistance and does not refer to actual rand values.

2) The Table is based on an assessment of the major operation or product of those firms receiving assistance.

3) The data used in the above Table is adjusted to take into consideration the sample distribution of the survey.

From Table 5.4 it can be seen that certain sectors receive greater 'contractual assistance' than others. The EDP sector, for example, received a large proportion of grants allocated. Telecomms received 44 percent of all long-term supply contracts. According to the data collected in the survey, the state has used distinct measures to develop certain sectors of the industry. Assistance has also been directed towards certain activities within the industry and producers received approximately 40 percent of all grants and 60 percent of all long-term contracts allocated.

[1]Surveyed firms with a turnover in excess of R40 million are classified as large.

5.8 Conclusion

The South African government has endeavoured to promote the development of the electronics industry. Firstly, it has used a policy of import protection. Secondly, it has remained the industry's largest customer, and, thirdly, it has assisted firms financially. However, in Chapter Four it was established that the industry has not grown substantially. It was ascertained that the industry relies predominantly on imports and produces approximately only 25 percent of the local market value for electronic equipment.

Thus it can be concluded that the forms of assistance given have not proved appropriate to the needs of the industry to enable it to compete in world markets. There are many reasons for this, some of which are discussed in Chapter Six.

CHAPTER SIX

ACCOUNTING FOR THE LIMITED DEVELOPMENT OF THE SOUTH AFRICAN ELECTRONICS INDUSTRY WITH PARTICULAR REFERENCE TO STATE INTERVENTION

6.1 Introduction

It was shown in Chapter Four that the industry continues to rely heavily on imports in order to satisfy local market demand. In Chapter Five it was shown that the government has intervened extensively in the local industry in an attempt to encourage its development. The question remains - how can the slow growth of the South African electronics industry be explained?

The limited growth of the industry can be ascribed to a number of factors, which form part of the four intrinsic interlinking problems[1] existing in the industry, namely:

- A shortage of adequately qualified labour;
- The high cost of adding value locally;
- The dependence on foreign technology; and
- The small size of the electronics market supplied by local manufacturers.

[1]In a study undertaken by the BMI (1988:8) it was ascertained, through means of a survey, that these were the prime areas of concern to industrialists in the industry.

6.2 The Shortage of Adequately Qualified Labour

> In South Africa a stage has been reached where our competitiveness and future economic growth is being constrained by the scarcity of adequately trained high level manpower (Dr D. van Rensburg[1] cited in Engineering Week, March, 1989).
>
> There is a shortage of engineers, technologists and technicians in South Africa....this represents a bottle neck (BTI, 1986:120).

In Chapter Two it was shown that education plays an important role in the electronics industry which increasingly requires suitably skilled manpower. Furthermore, the skill content of the labour force has been identified as being integral to the development of an indigenous technology base.

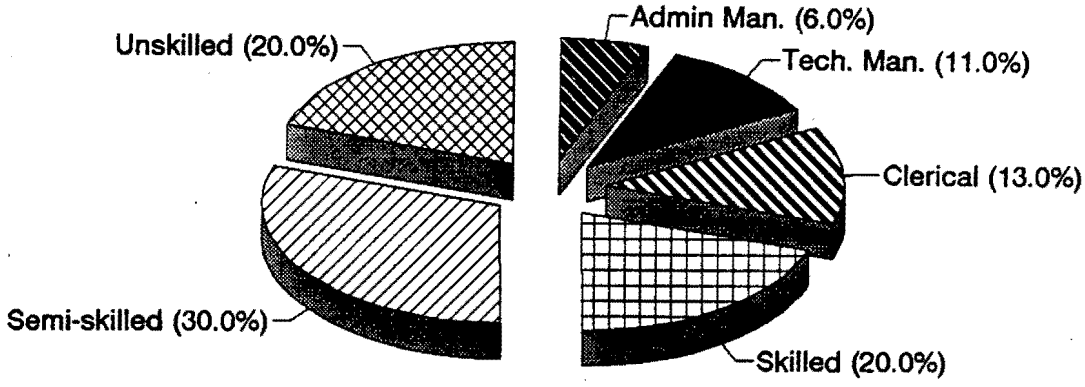
The survey ascertained that 78 percent of firms in the industry have difficulty in satisfying their manpower requirements. Eighty-five percent of respondents believed that there is a general shortage of skilled labour in South Africa.

The survey was used to assess the labour requirements of the electronics industry, respondents being required to give a breakdown of their current employee structure (Figure 6.1). It was ascertained that the industry relies extensively on skilled and semi-skilled labour and places greater emphasis on technical than on administrative management.

---

[1]Dr Van Rensburg is the chairman of the Committee of Heads of Technikons in South Africa.

Figure 6.1
The Employee Structure
in the Electronics Industry



n = 40

Many respondents contended that the skill requirements in the industry are becoming increasingly diversified and that the engineers and technicians of today should essentially be computer-literate with a basic understanding of the electrical and mechanical aspects of the operation. With this demand for a highly-skilled workforce, many in the industry are finding it increasingly difficult to obtain suitably qualified labour[1].

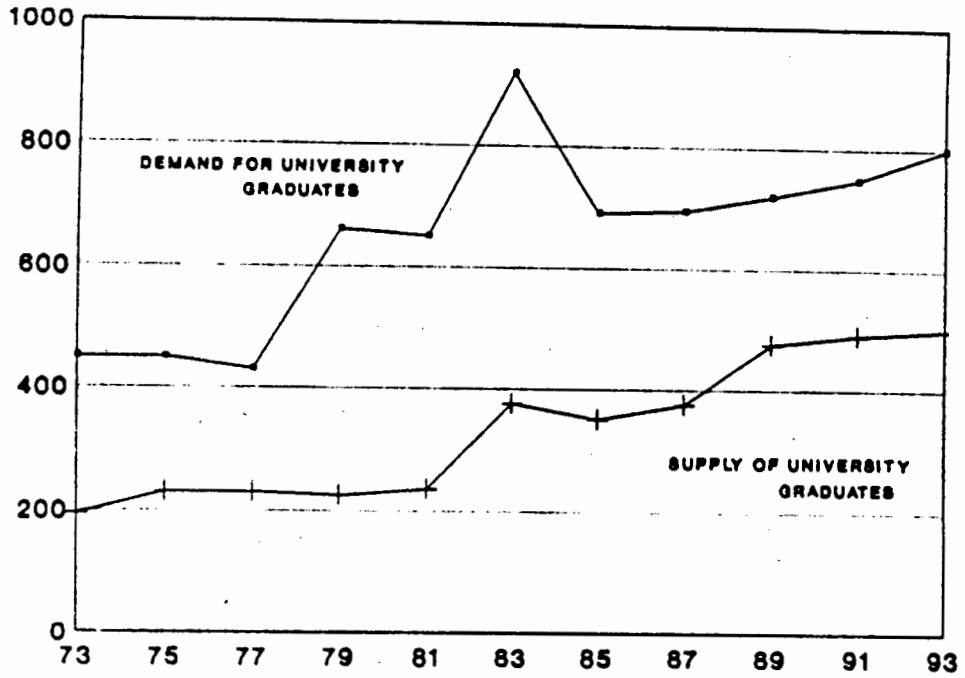
It has been argued that the industry suffers most from a **shortage of qualified engineers.** This shortage can be depicted by comparing the industry's demand for electrical engineers and their supply (Figure 6.2). The shortage of electrical engineers is considered critical by those who argue that the industry's future lies with the development of new and innovative technology.

---

[1]This is not, however, peculiar to South Africa and many of the NICs, among others, experience similar problems.

Figure 6.2

The Demand and Supply of Electrical Engineers in South Africa[1]



Source: Business and Marketing Intelligence (1988).

It can be argued that a developing country needs to utilise the results of foreign research in order to remain competitive and that there is, therefore, a need for highly skilled engineers capable of adapting and assimilating these technologies.

Many respondents, however, summarily dismissed their importance to the industry and argued instead that the industry had to develop its productive capacity through the establishment of competitive products, aided by an adequate supply of technically trained labour. Furthermore, university graduates were criticised for having no hands-on experience. One firm concluded: "Young graduates have no practical knowledge and need guidance".

---

[1]The illustration does not take into account the extent of emigration of electronic engineers from South Africa. It was established by the BMI (1988) that approximately 40 percent of all graduates leave South Africa as a result of political, economic or military commitments.

Respondents suggested that there is a greater **shortage of technically trained manpower**[1]. This correlates with the findings of the CSIR which ascertained that, as a result of this shortage, qualified engineers were doing jobs normally reserved for technicians. The apparent shortage of qualified engineers was, therefore, argued to be largely the result of a greater shortage of technicians. This point was emphasised by Dr Z Joubert of the HSRC: "If there were more of the latter [technologists and technicians] the supposed shortage of engineers would cease to exist" (cited in Engineering Week, March, 1990:1).

Interviews established that an adequate supply of technicians to the industry would play a fundamental role in establishing a more robust local industry which would then be able to compete internationally. The Committee of Technikon Principals demonstrated the lack of skilled personnel by drawing a comparison between South Africa's skilled labour supply with that of other countries. In the United States, for example, 370 engineers graduate each year per million of the inhabitants whilst in Australia it is 220 per million. In South Africa the corresponding figure is a dismal 35. Korea has 20 technicians per engineer, South Africa only 0.8. In Australia, with a population half the size of South Africa's, there are more than 800 000 students at colleges for technical education. In South Africa there are slightly more than 60 000[2] (Van Rensburg, Engineering Week, March 1989).

There is also, however, a **shortage of adequately qualified school leavers**. This has been found to hamper the ability of firms to undertake training effectively and has reduced the number of applications for technikon and university training.

---

[1]The difference between the two lies in the fact that electrical engineers have a theoretical education as opposed to the hands-on (or applied) experience of the technician.

[2]It was established by the BTI (1991) that technikon students represented only 14 percent of all students at tertiary institutions in South Africa.

The shortage of adequately trained school leavers was judged by respondents to be the result of an "inadequate education system for the majority of the population" which has "not been developed in the interest of the economy but rather on political grounds".

To date, the South African Government has used several institutions to educate its diverse population, maintaining that autonomous bodies would best 'facilitate' the needs of each cultural group. The result of such a policy has been disastrous and has, as Enos Mabuza, Chief Minister of KaNgwane, pointed out, "bankrupted our human resources bank" (cited in Engineering Week, Nov. 1990:5).

> White schools are emptying and many face imminent closure, but thousands of black pupils and in particular those already living in central areas, are precluded from access to these schools by laws which are sometimes justified on educational principles, but which are perceived by most to be manifestly discriminatory, unjust and dated (Dr J. Van Zijl cited in Engineering Week, March 1989).

Blacks continue to receive approximately 15 percent per capita of the amount spent on white education, so that a very low percentage receive adequate schooling or tertiary education. The effect of this policy can be seen in low literacy levels (Table 6.1) and the low level of general education (Table 6.2).

Table 6.1

Literacy Levels in South Africa in 1986

Population Group	No. Literate	Percent of Population over 15
Blacks	8683480	51
Whites	3981675	87.5
Coloureds	1823020	69.5
Asians	636612	77.7
TOTAL	15124787	64.7

Source: Central Statistical Services, RSA (1986).

The degree of literacy in South Africa compares very unfavourably with countries such as Korea where literacy rates were over 90 percent during the 1980's (see Westphal et al, 1981).

Table 6.2

Education Levels in South Africa in 1986

Population Group	None	None to Std 8	Std 9 to Matric	Higher Edu.
Blacks	37.4%	58.1%	3.9%	0.6%
Whites	12.4%	43%	25.5%	19.1%
Coloureds	25.8%	67.2%	4.9%	2.1%
Asians	19.9%	60.3%	15.3%	4.5%

Source: Central Statistical Services, RSA (1986).

Note: In 1990 between 33 and 36 percent of the 247 000 black candidates who took part in the matric examinations passed (Argus, January 4, 1990).

A further cited deficiency of the education system concerns **curriculum** (company interviews). It was argued that school leavers at matric level are, in most cases, insufficiently, or inappropriately, skilled to become immediately active economically.

Many respondents contended that the current education system does not provide sufficient scope for individuals to learn some form of basic trade at school, whether technical, commercial or agricultural. Respondents argued that current curricula at schools were based almost exclusively on "economically unusable knowledge". It was also argued that the curricula at university level were largely inappropriate being too theoretical and having little regard for the needs of industry.

The survey asked respondents whether or not they considered the education system to have had a positive effect, no effect, or a negative effect on the development of the industry (Table 6.3).

Table 6.3

The Industry's Opinion of the Education System in South Africa

Firm Size	No. of Firms Sampled	% Positive Influence	% No Influence	% Negative Influence
Large	15	13	27	60
Small	20	10	25	65

Note: Surveyed firms with a turnover exceeding R40 million are classified as large.

It was established in the survey that, although there is a shortage of adequately trained personnel in the labour pool, approximately only 1.6 percent of total turnover in the surveyed industry was spent on training (see Table 6.4). Technical training was considered to be the most important but training was also provided to improve assembly, operator and sales skills.

Table 6.4

Number of Firms undertaking Training in the Electronics Industry

Firm Size	No. of firms Sampled	Percent Undertaking Training	Percent of Turnover Spent
Large	20	80	2
Small	32	63	2.6

Note: Surveyed firms with a turnover exceeding R40 million are classified as large.

The low level of training undertaken by firms in the industry was argued to be principally the result of high cost[1], scarcity of trainers and the lack of suitable applicants. Many respondents also claimed that there were no guarantees that labour, having received training, might not seek employment elsewhere (Table 6.5). As a result, 27 percent of firms offering training insisted

[1]Training expenses are generally not state subsidised and have to be met en toto by the firm or its employees.

that these expenses be partially repaid by those employees who had benefited.

Table 6.5
Turnover of Trained Labour
in the Electronics Industry

Firm Size	No. Offering Training	Percent Experiencing High Labour Turnover
Large	16	31
Small	20	20[1]

Note: Surveyed firms with a turnover exceeding R40 million are classified as large.

The low level of training undertaken, and the need for some firms to partially recover expenses, signifies an area were the state could have intervened more effectively. At present the government makes little attempt to promote in-house training[2]. The lack of stimulation of training programs by the state is best depicted by firms supplying the SAPT with telecomms equipment in accordance with 15-year contracts. The survey established that the training expenses of these firms was, on average, less than 2 percent of turnover.

The government's education policy has, therefore, been largely unsuccessful in ensuring an adequate supply of skilled labour to the industry. This has constrained its growth and increased its cost structures. As the establishment of an adequate supply of trained labour is a slow process, this constraint may become even more pronounced as the industry develops further.

---

[1]The fact that small firms experienced a lower rate of turnover in trained labour than large firms, partially indicates the extent to which small company ethos and employee interaction can stimulate a dedicated workforce.

[2]Similarly, the state has recently taken steps to reduce the tax deductible allowance which was offered to that portion of a salary invested in a bursary scheme (Argus, June 1991:1).

6.3 The High Cost of Adding Value Locally

> The industry is hampered by a number of problems one of which is the high cost of producing locally - a feature which is partially the result of ineffective and inconsiderate government intervention (company interview).

For the electronics industry to be competitive, it is vital that cost structures are kept as low as possible. However, local costs have been found to handicap the development of the industry by reducing its competitiveness on the local and international markets. These structures comprise input costs (materials and components) and capital costs[1].

6.3.1 Input costs

The government should attempt to ensure that inputs to the industry, in the form of materials and components, are free of additional cost and are available to the local manufacturer at world prices. This, to a large extent, has not occurred in South Africa, many respondents stating that they had to pay a premium for their inputs on account of the following:

- **Import duties**

  It was shown in Chapter Four that the industry still relies heavily on imports. It was ascertained that more than 40 percent (FOB) of the industry's material and component requirements were imported in 1988. As these inputs are liable for import duties and surcharges (see Chapter Five), it is not surprising that input costs to the South African electronics industry are above world levels. On account of

---

[1]Although it was expected that labour costs would increase due to perceived shortages of skilled workers, this did not occur. While salaries and wages for technikon trained labour increased marginally in real terms, those in respect of university graduate labour (BSc, MSc) declined in real terms. A possible explanation is the deepening recession in South Africa and the slow growth of the local industry.

this, the local manufacture of finished electronic products is disadvantaged.

> Import duties hamper the development of the industry as they are often higher on inputs than on complete products (company correspondence).

Furthermore, many respondents claimed that their capital costs had also been increased as a result of import duties. One firm in particular, argued that, "these duties have increased the cost of capital equipment, especially sophisticated test and measurement equipment required for R & D purposes". The Federated Chamber of Industries (FCI) demonstrated how an element of plant and machinery, costing the equivalent of R1 million in Japan, costs R2,1 million by the time it is ready for commissioning in South Africa. The difference was found to be the result of, inter alia, import duties and surcharges (cited in Business Day, 8 January, 1990:2).

Not only is the local manufacturer disadvantaged in the local market as a result of these higher costs, he is also disadvantaged in the export market. Forty-four percent of respondents claimed that present import tariff duties negatively affected their export competitiveness.

> Our input costs are far higher than they should be. This is reflected in our selling price and our competitiveness has been affected (company correspondence).

Although 'incentives', in the form of GEIS, are offered to exporters it is necessary for firms to complete documentation which is so detailed and time-consuming that many do not consider them worth the inconvenience (company

interviews[1]). 'Incentives' are also offered on a retrospective basis and firms may, having completed the necessary documentation, receive payment only after a protracted period. Mr Brooke, marketing manager of ASM, argued that while these 'incentives' are acknowledged and paid by the DTI this was often

> months later, thus clogging the manufacturer's cash flow and raising the cost of doing business (cited in Computer Mail in Financial Mail, August, 1989:26).

- **Inflation**

> Inflation has had an overwhelmingly bad influence on the performance of the RSA economy (BTI, 1990:39).

South Africa has had an average inflation rate of 15 percent for the past ten years (CPI obtained from CSS) which is higher than most of its trading partners. This has increased the cost of locally sourced inputs into the industry and has served to reduce competitiveness. As a result of high inflation, the debt crisis, political instability and a worsening recession, the rand has fallen relative to the currencies of South Africa's trading partners. The rand dropped from R0,77 to the $1 (R1.5 to the Pound) in 1980 to approximately R2.88 to the $1 (R4.9 to the Pound) in 1991. This decline has had direct bearing on the rand price of imported materials and components used by the industry. It is a false hope that this may improve the competitiveness of locally manufactured electronics on the international and local markets as the majority of capital, material and component requirements for local manufacture are imported.

---

[1]One respondent bemoaned the fact that he had to document each and every component used in his exports by, inter alia, type, value and make, in order to receive any rebate. Apparently such documentation could be many pages in length.

6.3.2 Taxation Policy

Another factor which increases the cost of adding value locally is, of course, the taxation of profits. Firms in the electronics industry receive no special tax deductible allowances other than those offered to industry in general which have become increasingly less favourable to investors (see Chapter Five).

> The impact of these higher taxes on fixed costs will make it all but impossible for SA manufacturers to become internationally competitive (Mr B. Cole, cited in Business Day, 8 January, 1990:2)

Furthermore, firms have been subjected to a flat 50 percent tax rate on profits, even from their inception. As a result, the amortisation of capital is lengthened. The South African industry is disadvantaged on the international market as many of its trading partners offer their industries substantial deductible allowances.

Respondents to the survey were asked to comment on the current corporate tax structure. Apart altogether from the natural aversion to taxation, it was apparent through interviews that industry considers the current tax structure to have had an adverse impact.

6.3.3 Cost of Capital

With ongoing technological advancement, the supply of finance plays an important role in the further development of the electronics industry. In many cases the cost of capital equipment and stocks cannot be met by the industry itself which has to seek finance elsewhere in the private and public sectors. However, the private sector evaluates loans on grounds of security and is generally averse to risk. As a result, many firms may be either circumscribed by lack of finance or endure high interest

payments[1]. Two public corporations have been set up specifically to provide financial assistance to firms, namely the IDC and SBDC. However, these also have certain requirements (see Chapter Five) which must be met before aid is granted.

As the public sector and financial institutions have a bias towards evaluating loans on grounds of financial security rather than the advancement of technological entrepreneurship, there is a resulting shortage of finance which makes it difficult for industrial entrepreneurs to establish themselves, or for current concerns to upgrade existing capital equipment.

The survey showed that the majority of respondents considered the financial assistance afforded by the state to be inappropriate to their needs. It was held that more firms should be eligible for assistance and that the government should utilise low-interest rate loans more widely. One respondent commented: "A lack of long-term funds exerts pressure on returns - to quote a Harvard Business Review Article 'No Patience Capital'". Other grievances were that assistance was primarily directed to large firms (see Chapter Five) and required lengthy applications, which may not be successful[2]. The survey established that many firms believed that the financial assistance allocated by the government had had little effect on the development in the industry (Table 6.6).

---

[1]Interest payments will be high as a result of the degree of risk, the high inflation rate and state monetary policy.

[2]One respondent in particular told how his application to the IDC for a special low-interest rate loan was rejected. After completing the necessary paperwork and visiting members of the IDC, he was assured of getting the loan. Further meetings took place over a period of some months and expectations were high. On final approval of the loan, however, a statement was made by the IDC disallowing any further assistance under the loan scheme. Months of preparation and work had been to no avail.

Table 6.6

The Industry's Opinion Regarding the State's Financial Assistance

Firm Size	No. of Firms Sampled	% Positive Influence	% No Influence	% Negative Influence
Large	14	29	50	21
Small	20	25	40	35

Note: Surveyed firms with a turnover exceeding R40 million are classified as large.

6.4 Dependence upon Foreign Technology.

> Underdeveloped countries with little or no organized domestic capital goods sector simply have not had the opportunity to make capital-saving innovations because they have not had the capital goods industry necessary for them. Under these circumstances, such countries have typically imported their capital goods from abroad, but this has meant that they have not developed the technological base of skills, knowledge, facilities and organization upon which further technical progress so largely depends (Rosenburg, 1982:146-7).

Rosenburg, therefore, argued that countries which extensively borrowed foreign technology were less likely to build up the base of skills and knowledge so necessary for the development of an indigenous technology base. It was shown in Chapter Two, however, that significant benefit can be attained by utilizing foreign technology and that, through its assimilation and refinement, this dependency may be reduced.

Amsden (1990:13-5) argued that technology imitators may, through the process of assimilation and 'learning by doing', develop a technology base sufficient to enable them to become technology leaders in certain fields. It was also shown in Chapter Two that the state can play a central role in this process by negotiating imports of foreign technology and promoting local R & D. In this section the local industry's dependence on foreign technology is evaluated.

By determining the number of firms using technology under licence, and the extent of involvement by multinational corporations in the industry, the survey established the degree of reliance on foreign technology. It was found that 58 percent of firms had 'purchased' technology through licence agreements with foreign firms (Table 6.7).

Table 6.7
The Number of Firms which acquired Foreign Technology through Licence Agreement

Firm Type	No. of firms Sampled	Percent with agreements	Percent of Turnover subject
Large firms	20	85	52.5
Small firms	32	41	50
Producers	23	52	62.3
Other	29	62	44

Note: 1) Surveyed firms with a turnover exceeding R40 million are classified as large.

2) Other consists of firms specialising in assembly, marketing or R & D.

The industry relies on foreign technology, obtained through licence agreements, for approximately 50 percent of turnover. This is significant in that royalties are paid and restrictions are often enforced on the use of this technology.

It was established that royalties paid to foreign licence holders often exerted pressure on the profitability of respondents. For example, 40 percent of licencees who exported, stated that their export competitiveness had been affected. Furthermore, 'suppliers' of technology often place restrictions on the 'purchaser's' use of that technology.

The survey indicated the extent to which the local industry was constrained by these agreements (Table 6.8).

Table 6.8

Number of Firms constrained

by Technology/Royalty Agreements

Type of firm	No. with Agreements	Percent Constrained	No. Constrained
Large firms	17	76	13
Small	13	38	5
Producers	12	67	8
Other	18	56	10

Note:1) Surveyed firms with a turnover exceeding R40 million are classified as large.

2) Other consists of firms specialising in assembly, marketing or R & D.

Approximately 35 percent of surveyed firms were constrained in some way as a result of technology agreements. Since foreign firms are concerned lest users of their technology compete with them on the international market, 60 percent of these constraints precluded local licencees from exporting to certain markets[1]. As a result of these agreements, two firms were entirely prevented from exporting.

The survey ascertained that approximately 72 percent of exports from firms which were constrained in this manner, were directed to third-world markets. It was established from interviews that this was the result of an explicit requirement in most licence agreements which constrained exports to third world markets which usually offered limited opportunities.

In certain cases it appeared that local manufacturers camouflaged or modified their products in order to avoid imposed constraints (company interview). Whilst this policy can be employed successfully for certain products, it raises cost structures, thus partially offsetting any perceived benefits.

---

[1]Other constraints prevented local firms from supplying the government or its agents.

There is also foreign involvement in the local electronics industry in the form of direct foreign investment (DFI). Approximately 40 percent of large firms were partially or wholly owned by multinationals. (Most of these firms had utilised foreign technology under licence.)

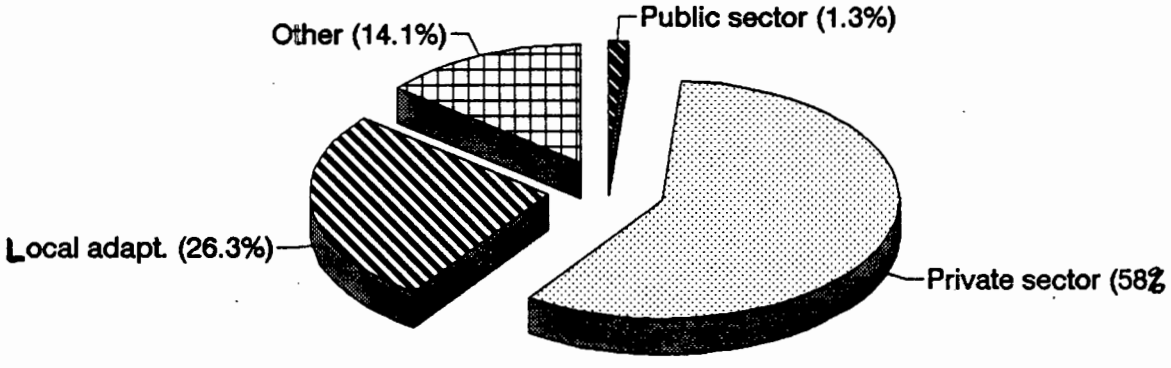
It may be asserted that the South African electronics industry relies heavily on foreign technology. It was shown in Chapter Two, however, that developing countries may utilise the benefits of foreign technology effectively, contingent upon a policy being implemented to reduce both its cost and the restrictions placed on its use. The South African government has, while not attempting to negotiate on behalf of local firms for foreign technology, promoted public and private sector R & D.

- **Public sector R & D**

  The BTI (1986) calculated that the state undertook and financed up to 94 percent of all R & D activity in the electronics industry in 1983. More recent data is unavailable but it is obvious that the state continues to play an important role. It was established in interviews that a large percentage of public sector R & D in the field of electronics is undertaken by the CSIR, the ICDC, the SAPT and SAMES.

  The survey was used to ascertain the extent to which the industry employed the results of state-funded R & D. Firms utilising technology developed in South Africa were requesced to indicate the source of this technology (Figure 6.3).

Figure 6.3
The Source of Local Technology used in the Electronics Industry



n = 23

Note: Excludes firms in service sector or those utilising foreign technology only.

Although a significant amount of R & D is undertaken by the public sector, it can be seen in Figure 6.3 that surveyed firms estimated that it accounted for only 1.3 percent of their locally sourced technology. This indicates that the public sector, in particular the CSIR, has been unable to develop usable or marketable technology effectively. It was argued by one respondent in the public sector that the "CSIR doesn't help at all in the quest for locally developed technology".

R & D undertaken by the public sector has been predominantly biased toward basic and applied research. The BTI (1986:42) estimated that South Africa invested 16 percent of its R & D funds in basic research, 42 percent in applied research and 43 percent in development. The BTI compared this with the United States which invested 12 percent of funds in basic research, 22 percent in applied research and 66 percent in development. It can be concluded that South Africa places more emphasis on basic and applied research than does a highly developed country such as the United States. The BTI (1986:42) considered this to be inappropriate:

> A developing country cannot in the nature of things, maintain the same level of R&D expenditure (as a percentage of GDP) as can a developed country...only developed countries can afford to strongly emphasise basic research at all...the ability of the South African industry to convert research results into industrial products is 7.4 times weaker than that of the USA.

It can be concluded that the results of public sector R & D have largely not assisted firms to assimilate or improve foreign technology or to develop marketable products. Therefore, although research budgets may be adequate, little benefit is passed on to the industry in terms of indigenous technological capability.

- **Private sector R & D**

The private sector also invests in R & D and the survey was used to ascertain the extent of this (Table 6.9).

Table 6.9

Extent of R & D undertaken by the Industry

Firm Size	No. of Firms Sampled	Percent Undertaking R & D	Average % Turnover Invested
Large	20	85	4
Small	32	53	10
Producers	23	90	5
Other	29	45	4

Note: 1) Surveyed firms with a turnover exceeding R40 million are classified as large.

2) It was established from the survey that approximately 4.3 percent of employees, in companies undertaking R & D, were exclusively engaged in R & D. It may, however, be assumed that many of these employees are likely to be called upon to undertake other assignments when required.

3) South Africa's only integrated circuit manufacturer could not quantify R & D activity undertaken and is thus excluded from the above calculation. Estimates from interviews are between 5 and 10 percent of turnover, whilst Kaplan (1990) ascertained an estimate of between 4 and 5 percent.

4) Turnover invested by Producers and Other is calculated by ascertaining total expenditure divided the number of firms.

Approximately 3 percent of the industry's total turnover was employed in R & D. This finding compares with the internationally accepted minimum of 5 to 10 percent of turnover which should be spent on R & D for a viable electronics industry and 10 percent to 15 percent in the field of micro-electronics (BTI, 1986). Why, therefore, is the amount of R & D undertaken by the private sector, so low?

A number of reasons for this, such as cost, uncertainty and the 'public good' nature of research results, were outlined in Chapter Two. It was argued that, as a result of these factors, less R & D is undertaken than is socially desirable and that this could, therefore, be used to argue in favour of more governmental support.

Besides the ISE scheme and the preferential allocation of grants and long-term loans, the state has provided no significant incentive to firms to stimulate R & D[1]. While the R23 million in the ISE scheme will assist firms, many respondents argued that its effectiveness will be negligible. One member of the industry argued:

> The Taiwanese didn't say here's R40m, now develop an industry. Instead they built universities and trained people. They had limited resources, but they bit the bullet. We must make the hard choices" (Mr G. Heinebach[2] cited in Computer Mail, supplement to Financial Mail August 1989).

If one considers that Siemens AG alone spent DM1.5 billion on its megabyte IC project, it may be perceived that R23 million distributed amongst 45 firms will cover few expenses. Furthermore, the scheme supports the development of new and unique technologies. Dr H. Smith of the DTI, who was extensively involved in the ISE fund, argued that:

> Growth in the industry is vertical, through new products and new product technologies.....smart companies are investing in R & D and new, original technology. But this should be augmented. We want the smart companies to develop more technology and faster, and the others to realise the importance of investing in new developments (cited in Electronics News, October, 1990).

While Dr Smith's argument is admirable, it is questionable whether or not the development of new and original technologies indicate the right direction for the local industry to take. For example, Mr A. Paul, of the BMI,

---

[1]Many of its policies have increased the cost of R & D undertaken by firms. One firm argued that "too much import surcharges and/or duties are levied on high technology equipment required for R & D, manufacturing and education".

[2]Mr Heinebach is joint managing director of Siemens Ltd.

argued that:

> There is no point in South Africa trying to innovate, design or modify anything in electronics at all. We are 10 years away from that, our option is to go into production. In 10 years time when we have had the experience in production, then we can move down the curve and look at modifying, adapting and designing equipment (cited in a special discussion forum of auto-electronics in Electronics News, July 1990:9).

It may be concluded that the government has not used the measures at its disposal to develop marketable technology in the industry but has been overly-concerned with the development of new and innovative products. It is apparent, therefore, that the South African government has, as Dahlman et al (1987) and Barber and White (1987) warned, become too technology-driven while paying little attention to the assimilation of existing technology and the commercial exploitation of results.

6.5 The Small Size of the South African Electronics Market

> What drives manufacturing in the hi-tech industry is volume. Without it, you don't begin to compete in world markets (Computer mail, in Financial Mail, August 25, 1989:19).

It was shown in Chapter Two that the state can influence the size of the market, accessible to the industry, by protecting it from imports, procuring local manufactures and promoting exports. The effectiveness of the steps taken by the South African government to implement these measures is examined in this section.

6.5.1 Trade Barriers

The government has used import tariffs and duties to protect and nurture the development of the South African electronics industry. However, this protectionist policy has been unable to effectively develop the industry as a result of the following:

- **Low level of effective protection**

  It was shown in Chapter Five that, in order to stimulate their local production, duties are applied to imported electronic equipment and components. However, these duties are not implemented selectively and are applied even to those inputs not domestically available. The industry's effective rate of protection has, therefore, been reduced. Taussig (1914) was one of the first to note how the implementation of tariffs on intermediate goods lowered the level of protection offered to final manufactures. In order to demonstrate the effect of tariffs on intermediate goods Barber (1955) used the following formula:

$$E = \frac{V(1) - V(0)}{V(0)}$$

E = Effective rate of protection.
V(1) = Value added on the final stage under protection.
V(0) = Value added on the final stage under free trade.

By applying duties and surcharges to the industry's inputs, the government effectively reduces the level of protection offered to final manufactures in the industry. This can be best demonstrated by an example[1]:

If there exists an ad valorem rate of duty of 11 percent on complete computers and raw materials are purchased at world prices and account for 66 percent of the value of the process, the 11 percent duty provides the activity with a 32 percent level of protection on the value added by manufacturing. However, if an ad valorem duty of 30 percent was also imposed on the imported input to this process, the effective rate of protection would decline to a negative 26 percent.

It follows, therefore, that the higher the ad valorem duty on imported inputs and the higher their proportion of total costs, the lower the effective rate of protection. As a result of the local industry's reliance upon imports, which are liable to duties and surcharges, effective protection for the industry has been lowered.

- **Competition**

In spite of protection, many local manufacturers cannot compete with imports in the domestic market (company interviews). Many of the NICs export electronic products at costs which, in spite of tariffs and duties, are often lower than goods produced in South Africa. As a result of this intense competition in the local market, margins are low and this suppresses investment in the industry.

[1]For more a more in depth analysis of effective protection see Corden (1966) and Du Plessis (1974).

- **Dumping**

  Dumping is the term used when goods are sold below cost in the international market. It is used by foreign producers to obtain market share or to off-load stocks. The tariff rates for imported electronics are again too low to offer any real protection against these imports.

- **The Wide Range of electronic products imported**

  As it is difficult to distinguish between the many electronic products which exist, it may be possible for firms to misrepresent their imports to customs officials. By doing so, electronic goods which are liable for duty, may be passed through customs as duty-free.

- **Imports of finished electronic products**

  Imported electronic components and sub-systems are normally subject to customs duties but when the same components are imported as part of complete duty-free goods, the components escape duty. This serves to undermine the local component industry.

- **Circuitous routes for imports**

  It was established in interviews that neighbouring states, within the South African Customs Union, have been used by importers as a channel for the importation of foreign products. Imports of electronic equipment to these areas have value added to them, through assembly or packaging, and are then exported to South Africa. With these imports into South Africa being duty free, importers can use this circuitous route to avoid paying duties. This has caused adverse repercussions especially in the television industry whose members have already made representation to the government in this regard.

- **Lagged business cycle**

  As a result of the South African business cycle lagging behind its major trading partners, the protection induced by ad valorem tariffs has been severely undermined (see Kaplan, 1989). It can be argued that, during periods of economic upswing in South Africa, imports are encouraged by the high value of the rand and, with the downswing, in international activity, by the discounted price of imports. On the other hand, during an economic downswing in South Africa, imports are discouraged due to declining market demand and escalating import prices. As a result of these oscillations and their effect on the competitiveness of locally-manufactured electronics, the enthusiasm of investors to finance risk capital in the industry has been further reduced.

The effectiveness of market protection, as applied by the government, in the form of tariffs and duties is, therefore, questionable. Firstly, rather than affording high levels of protection to judiciously selected sectors of the industry so that these sectors may develop their resources efficiently and become internationally competitive, protection has been at a low level and too widely spread. Secondly, protection has been granted in a rather ad hoc fashion, especially in the case of surcharges. Thirdly, protection has not been allocated in accordance with any rule of reciprocity whereby the rate of protection could be determined by the extent to which exports or in-house training were undertaken. Fourthly, there has been no established time period by which firms were expected to have reached a level of competitiveness, thereby allowing for the eventual curtailment of protection.

6.5.2 Public Sector Purchases

The South African government is the single largest consumer of electronics in South Africa (see Chapter Five) and its procurement from the domestic industry can provide a substantial

market for local firms to support their early development. However, the state's policy of local procurement is flawed. For example, recent cutbacks in government procurement have confirmed that many well established firms continue to rely on the state for a large share of their turnover. These firms strongly maintain that support should be continued.

> Cuts in Armscor and SAPT budgets are killing the industry and technology overnight - becoming a 3rd world country at a fast rate (company correspondence).

In an article entitled "Venter warns Government to protect local industry" (cited in Electronics News, July 1990:1), the opening remarks are "In its desperate bid to reduce state expenditure, Government has been accused of turning its back on the local electronics industry". Another member of the Altron Group, Dr D.H. Jacobson, contended that:

> Members of the electronics industry are not looking at the Government solely as a source of funds. We are asking for a continuing commitment to our locally designed and manufactured products...Only with this support structure in place can South Africa hope to look at a sizeable export market for electronics (cited in Electronics News, August 1990:1).

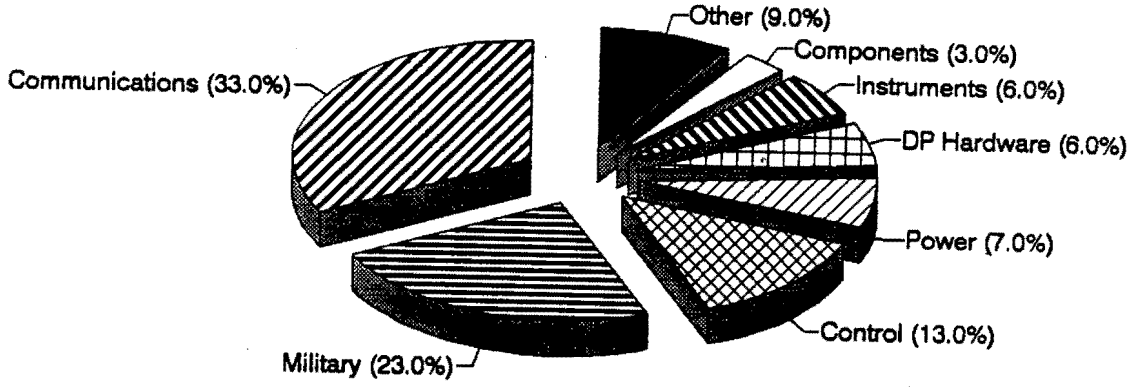
While the government expected market growth, either locally or through exports, to compensate for the decline in state procurement, this has not occurred, for a number of reasons:

- **Specific nature of purchases**

  In order to meet public sector demand and attain high levels of local content and design, many firms invested substantially to develop suitable production capacity. While investing resources to meet the specific demands of the government, however, many firms ignored the development of exportable products. The distribution of R & D activity in the industry helps to show the extent to which resources are devoted to certain sectors (Figure 6.4).

Figure 6.4

R & D Activity in the South African Electronics Industry



Source: Business and marketing Intelligence (1990:93).

Note: The distribution was obtained through a study of 109 firms which undertook R & D.

It can be argued that the sectoral distribution of R & D and production activity (see Chapter Four) is inappropriate for various reasons: namely, it is inconsistent with the sectoral distribution of the world market for electronics and is directed at those sectors which, internationally, customarily receive assistance from government and are, therefore, heavily protected. Furthermore, it is apparent that resources are not necessarily being allocated in accordance with any current or future comparative advantage. Resulting from this concentration of resources to particular sectors, recent reductions in public sector purchases have had a damaging effect.

- **No export requirements**

It was established in interviews that, when accepting tenders from the industry, the government made little attempt to urge local manufacturers to export their products. This lack of requirement for suppliers to export is illustrated by the fact that firms with 15-year agreements with the SAPT, export to the value of approximately only 5 percent of turnover. Furthermore, the largest telephone manufacturer does not currently export.

- **Encouraged concentration**

The SAPT's long-term contracts have tended to encourage a high degree of concentration in the local electronics industry. For example, in the case of telecomms the government has purchased from a limited number of suppliers who have developed extensively and can now source most of their component requirements in-house. The BTI (1986) and Kaplan (1990:77) have argued that this has led to a monopolised market[1]. The state's policy of supporting only selected manufacturers has met with animosity from small firms, one of whom contended in an interview that:

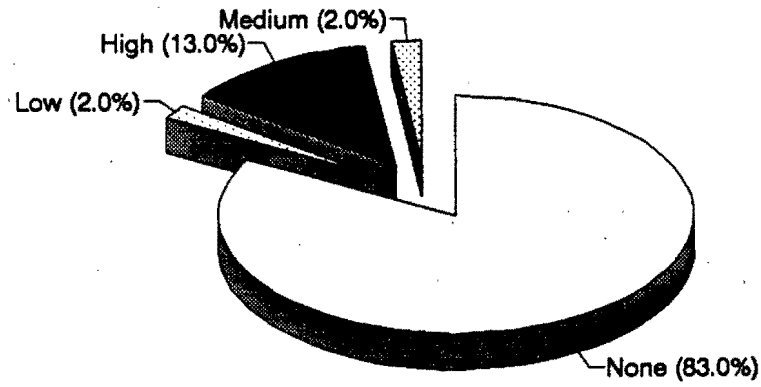
> No state agency is interested in our sized company and its policy is there to protect and advance a few well-connected companies only and not the broad spectrum. Monopolies are created locally by large, privately owned, conglomerates receiving the bulk of government subsidies.

[1]For example, according to Kaplan (1990), nine of the 18 firms which make up the Electronics Component Manufacturers Association are accounted for by companies currently supplying telecomms equipment to the SAPT under long-term agreement. Five of these are in the Altech Group.

- **Insufficient stimulation of local design**

By and large, public sector purchases of electronics have failed to stimulate local design in the industry. The lack of local design was analysed by the Working Group (1983) and the BMI (1984). The results of these investigations showed, for example, that, while the SAPT was the largest state consumer of electronics, accounting for 62 percent of public sector consumption, its purchases had a low level of local design content (Figure 6.5)

Figure 6.5
Extent of Local Design in SAPT Purchases



Source: The Working Group for the Promotion of the Electronics Industry (1988).

It was ascertained in interviews that suppliers of telecomms equipment to the SAPT under 15-year contracts, invested only 4 percent of their turnover in R & D. As a result of the low level of local design content in government procurement, members of the industry and public sector have argued that the preference scheme offers too little incentive for firms to invest in R & D.

- **Continued import reliance**

  One ambition of the state's local procurement program was to reduce the industry's reliance on imports. This has not occurred, for various reasons. Firstly, the public sector's technological requirements have often adversely affected the extent of local manufacture undertaken in the industry. For example, the SAPT's decision to go digital, while an important technological advance, had the effect of reducing the existing local manufacturing capability in electro-mechanical exchanges. Secondly, the state has only purchased from certain sectors in the industry. Partly as a result of this, certain sectors, such as EDP, which do not receive any substantial governmental incentive to manufacture locally, often have very low levels of local content in their output.

While providing a substantial market to certain local manufacturers, the state's procurement policy has not made firms become more internationally competitive as R & D, in-house training and the ability to export were not considered to be of consequence in the awarding of long term contracts and tenders.

6.5.3 Export Market

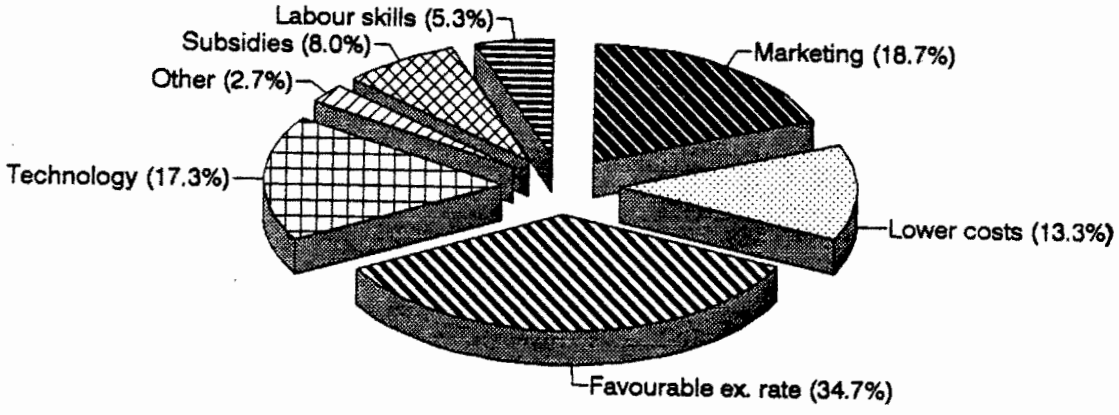
As the state has been primarily concerned with developing the industry around the requirements of the local market, it has overlooked the importance of exports. In addition, measures used by the government to develop the industry have often adversely affected its ability to compete in the export market as firms have to contend with, inter alia, high input costs and shortages of skilled personnel[1].

---

[1]"With low level of skills and high cost of labour we are unable to compete effectively in the international market" (company correspondence).

Of the firms surveyed 25 exported. Thirty-six percent of these argued that they held no particular advantage on the international market and exported, usually at a loss, in order to: ascertain the marketability of their products, establish their market, or, generate foreign exchange[1]. The remaining firms relied predominantly on a favourable exchange rate for the success of their exports (see Figure 6.6).

Figure 6.6
Perceived Advantages held by Exporters of Electronic Equipment in the International Market



n = 16

Note: 1) Nine exporters held no advantage on the international market.

2) Technology includes patented and specialist technology.

Due to the lack of indigenous capability, technology appeared to constitute only 17.3 percent of the advantage held by exporters. In contrast, the industry relies on a favourable exchange rate for 25 percent of its advantage in the international market which

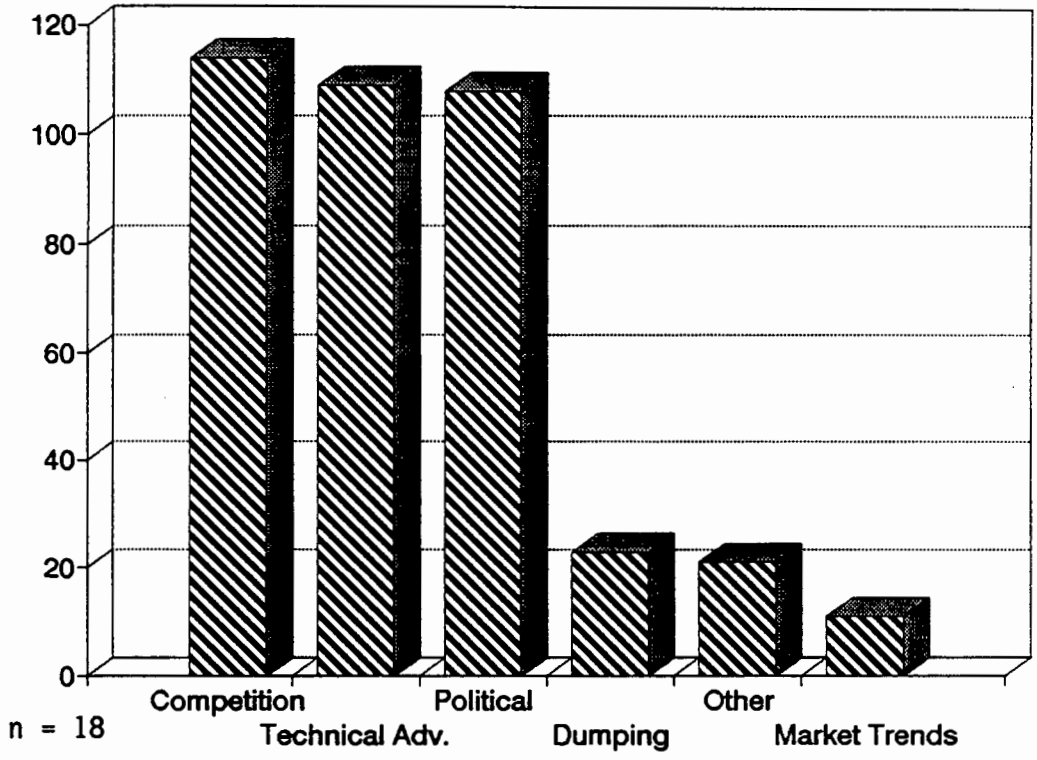
[1]It was established in interviews that this was done in order to obtain sufficient foreign exchange to purchase imports, to establish foreign subsidiaries or to undertake market surveys.

gives an indication of the lack of any export infrastructure[1]. It was ascertained that few exporters thought government subsidies provided any form of advantage. This is partially because GEIS is paid retrospectively and only compensates exporters for some of their increased input costs caused by tariffs and duties.

Seventy-two percent of exporters considered that the export market was more hazardous than the local one. It was established in the survey that certain specific factors hamper exports from the industry (Figure 6.7).

Figure 6.7

Hazards in the Electronics Export Market



Note: A composite scoring system was used whereby 9 points were allocated for the major factor, 6 for the secondary reason, 4 for the third factor and 1 for the fourth.

---

[1]Although the exchange rate currently favours exports, it has an inflationary impact which will eventually erode any benefits currently accruing to exporters. Furthermore, as this fluctuates, the exporter's ability to plan ahead is reduced. Exporters, therefore, have to rely on an unstable market which effectively reduces their propensity to export.

From Figure 6.7 it can be seen that many respondents thought that the international market was highly competitive. It was established that firms, because of the distance between themselves and the export market, experienced difficulty in co-ordinating their export campaigns and establishing a foreign subsidiary. In this regard the procurement of foreign exchange must, in most cases, be done with the necessary Reserve Bank approval (company interviews).

South Africa's international isolation has also had a resounding effect on the industry. Many respondents contended that exports were being impeded as a result of the sanctions imposed by many of South Africa's erstwhile trading partners[1]. Although these impediments can be overcome by trading through third parties such as Turkey and Chile, the costs of doing so further reduce export competitiveness (company interviews). One respondent argued:

> It is extremely difficult to market hi-tech electronic products from RSA into world markets: the reason being sanctions against SA products...it has a cumulative effect, eg. we could have been doing an additional $100 thousand per year for the last two years but because of the political scenario many lucrative export markets are not available to us.

The South African electronics industry is also distanced and ostracised from the developed world and this limits the flow of valuable technical or market information which is necessary for developing a competitive export market as shown by Westphal (1984:296) in the case of Korea:

---

[1]With the gradual easing of sanctions since interviews were conducted this factor has become much less important.

> Merely by their export activity, Korean firms have enjoyed virtually costless access to a tremendous range of information, diffused to them in various ways from the buyers of their exports. The minor innovations that have resulted have been significant in increasing production efficiency, changing product designs, upgrading quality and improving management practices. Exporting thus appears to offer a direct means of improving productivity.

Besides the South African Foreign Trade Organisation (SAFTO) the South African government has not effectively established any organisation to assist local firms in exporting their products. This lack of an established communication channel has limited information flows between buyers and sellers thus reducing the export potential of firms[1]. Also licence agreements with foreign companies have restricted exports. There is a North to North trading bias in electronics as developed countries trade mostly amongst themselves. Therefore, most licencing agreements granted by foreign electronics firms restrict local export activities to the third world (see section 6.4).

The lack of success in the international market has limited economies of scale and has reduced information and technological gains by the South African industry. The inability to establish an export base has severely curbed the industry's growth and will hinder future attempts by firms aspiring to sell their products on the international market.

---

[1]The survey established that many of those firms which exported benefitted from the technical information provided by buyers.

6.6 Apartheid Policies

Although discussed at the end of this chapter, the effect of South Africa's apartheid policies on the industry cannot be over-stressed. Labour laws, job reservation, pass control, segregated education systems, duplication of administration and resulting political struggle plus international sanctions have all contributed to the slow growth of the industry[1].

With the adverse effect of apartheid policies in South Africa, it is not surprising that the majority of respondents to the survey considered them to have had a negative effect on the industry (Table 6.10).

Table 6.10
The Industry's Opinion of South Africa's Racial Policies

Firm Size	No. of Firms Sampled	% Positive Influence	% No Influence	% Negative Influence
Large	15	0	7	93
Small	19	11	11	78

Note: Surveyed firms with a turnover exceeding R40 million are classified as large.

[1]One of the questions asked in the survey was whether the relationship between a subsidiary and its holding company had been affected by political considerations. Sixty percent of the 21 respondents confirmed this to be the case. Sixty percent of these firms stated that they had benefited as a result, through the purchase of local subsidiaries and greater market share.

6.7 Conclusion

There are several reasons for the slow growth of the South African electronics industry. One is the inability of the industry to mobilise resources and to innovate. The inadequate size of the local market is another, as is the isolation of the South African market and manufacturing base from the developed world. Also the rapid rate of technological advancement makes it difficult for a developing country like South Africa to remain competitive.

The government has intervened, both directly and indirectly, but it is apparent that many of its efforts either hamper the local industry or have little effect. One fundamental reason for this is the **lack of meaningful interaction** between the government and the industry. Although 80 percent of firms surveyed considered that government policy had influenced the industry, few believed that they had been consulted before policy was initiated, or that the policy was in the best interests of the industry (Table 6.11).

Table 6.11

Interaction between the State and the Surveyed Industry

Firm Size	No. of firms Sampled	Consulted By Government?	Policy Represented Interests?
Large	20	25% - yes	15% - yes
Small	32	6% - yes	13% - yes

Note: Surveyed firms with a turnover exceeding R40 million are classified as large.

On the whole, the survey presented a bleak picture. In no area did members of the electronics industry consider that state intervention had had a net beneficial effect. For example, although education is critical to the development of technology, the government has persisted with a discriminatory system. While foreign technology can be valuable to the development of a

technology base through assimilation and development, the state has continued to undertake basic and applied R & D. Also, although the international market could present numerous opportunities, the government has continued to support import substitution and has been ineffectual at improving the export competitiveness of the industry.

It is apparent from the survey that the government has not fully utilised those measures available to it (see Chapter Two), to develop the industry and has been unable to effectively co-ordinate the relevant data acquired by research groups and committees into a coherent long-term development policy.

CHAPTER SEVEN

STATE PROPOSALS AND ALTERNATIVES FOR THE DEVELOPMENT OF THE SOUTH AFRICAN ELECTRONICS INDUSTRY

7.1 Introduction

It may be argued that the development of a successful electronics industry in South Africa rests on the domestic availability of four interlinked requirements:

- Skilled labour
- Investment
- Technology
- Markets.

This chapter considers various proposals which could lead to the stimulation of the South African electronics industry. Those made by government organizations, such as the BTI (1986)[1], the Working Group for the Promotion of the Electronics Industry (1983; 1988) and the Standing Committee for Electronics, are briefly analysed. Proposals from the industry[2] and the experiences of other countries, especially Korea, Taiwan and

---

[1]Whilst the BTI Report 2455 was not officially recognised, many of its recommendations are slowly being integrated into government policy.

[2]Assessing the requirement for specific state policy by means of a survey has its obvious limitations for it is by no means necessarily the case that policies which this group wish to see implemented would produce the long term economic growth desired. Attitudes are, therefore, only briefly assessed.

Japan[1] are also considered. These economies have successful electronics industries which have benefitted from extensive state support.

7.2 Education

Education is the first link in the chain of success in the electronics industry.

> The availability of sufficient numbers of high level manpower is a prerequisite for a successful electronics manufacturing industry (BTI, 1986:129).
>
> In an increasingly competitive world market place people have become and will remain, the new raw material of international trade...People have become the 'cutting edge of competitiveness' (Van Rensburg, Committee for Technikon Principals, cited in Engineering Week, March 1989).
>
> The computer industry is essentially a knowledge-intensive industry wherein skilled, highly trained scientific, engineering and technical labour power is probably the single most important asset. Without such labour, even access to adequate financial resources and material inputs would not be a decisive advantage in a country's effort to develop an indigenous industry (O'Connor, cited in Hewitt, 1990:2).

7.2.1 Proposals from the Public Sector

It was shown in Chapter Six that a shortage of skilled labour exists in the industry, especially in technical fields, and that this poses a serious threat to the industry's future development. The Working Group (1983) made proposals concerning education which included, inter alia, a campaign to stimulate public awareness regarding the manifold applications of electronics and

---

[1]In a presentation given by Robert Wade at the University of Cape Town in 1991 it was argued that any government wishing to intervene effectively should study the example of countries such as these. While policies must be suited to indigenous features, the experience of these countries can assist policy makers to determine what constitutes effective intervention. See his book: "Governing the Market: Economic Theory and the Role of Government in East Asian Industrialisation", Princeton University Press,1990

its benefits. The thorough and purposeful training of adequate manpower was considered necessary and it was recommended that this goal be achieved through an increased allocation of bursaries, particularly for higher tertiary education and overseas study. However, proposals made by the Working Group contained little guidance as to their implementation.

The BTI (1986:132) was concerned over the low level of skilled labour in the industry and mooted that a Task Group on Manpower (electronics) be established to investigate "all aspects of manpower supply in respect of engineers, technologists, technicians and unskilled workers for the electronics industry". In addition the BTI recommended that a Technology Branch be formed to:

- Bring foreign electronics experts to South Africa to participate in symposia and consultations. This was recommended on the premise that the interflow of knowledge would stimulate interest in electronics and provide local manufacturers and users with valuable information.

- Send delegates to international conferences in the field of electronics.

- Encourage studies in electronic engineering at universities and technikons. Studies at the university level were stressed on grounds of their importance in R & D.

- Make it possible, through subsidies, for electrical engineering students to be employed by the ICDC, SAMES and the CSIR to design integrated circuits as part of their university curriculum.

- Encourage black students to study electronics at university level through adequate bursaries and career guidance.

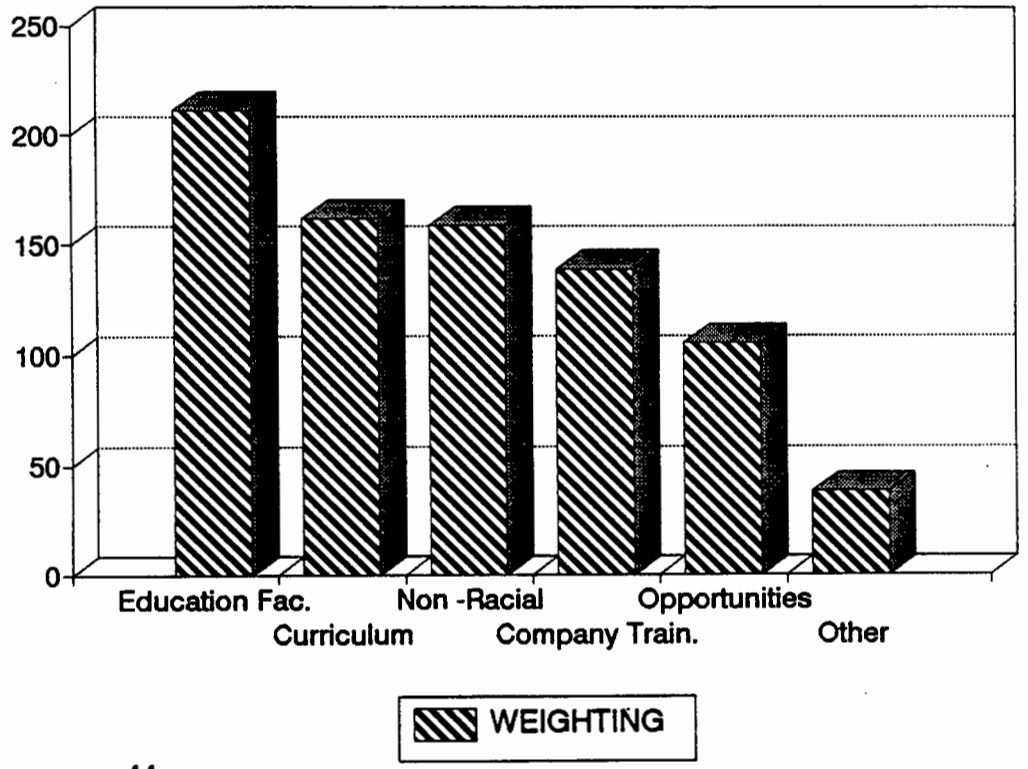
Many of the recommendations made by the BTI (1986) centred around its perceived necessity for more university graduates rather than the encouragement of technikon studies. While this policy was intended to promote the establishment of a base of skills and knowledge necessary for the development of, inter alia, new technologies, it did not take cognisance of the industry's requirements in terms of technically trained labour.

7.2.2 Proposals from the Electronics Industry

The survey was used to determine what measures the industry considered appropriate in order to alleviate the current shortage of suitably qualified manpower (Figure 7.1).

Figure 7.1

The Most Effective Measures to Improve the Availability of Adequately Trained Labour in the Electronics Industry



n = 44

Note: 1) Data pertaining to the Figure was obtained only from those respondents who considered a shortage of skilled labour to exist in South Africa.

2) A composite scoring system was used whereby 9 points were allocated for the major factor, 6 for the secondary reason, 4 for the third factor and 1 for the fourth.

3) Other included co-operative training schemes and the need for greater public awareness.

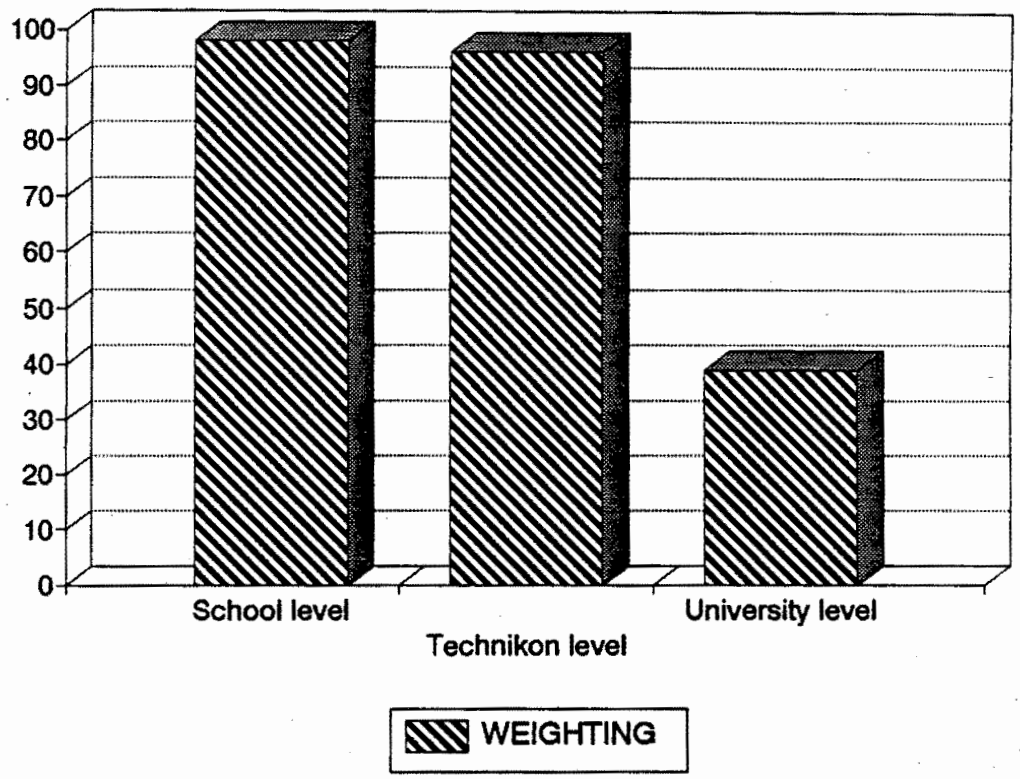
Measures considered applicable for improving the availability of skilled labour were the establishment of better education facilities, the formulation of appropriate curricula, a non-racial education system and company sponsored training.

♦ **Education facilities**

It is clear from Figure 7.1 that the industry considers the promotion of education facilities to be of great importance. But which facilities should be promoted?

Figure 7.2

Education Facilities which should be Promoted



n = 26

Note: A composite scoring system was used whereby 5 points were allocated for the major factor, 3 for the secondary reason and 1 for the third.

Schools and technikons were seen by respondents as the two facilities which should be given priority. These findings emphasise the industry's concern about the low level of general and technical education in South Africa. University education was ranked least important as, while acknowledging its relevance to professional applications, such as R & D, it was the experience of many firms that graduates require significant in-house training before becoming proficient. Technikon students, on the other hand, already have extensive 'hands-on' experience.

- **Diversity of curricula**

Changes to curricula, especially at school level, were perceived to be the second most effective method of producing suitably qualified graduates[1].

> For too many years we have doggedly supported a pure academic education and we have sadly neglected vocational equilibrium (Van Rensburg cited in Engineering Week, March, 1989:2).

Some respondents felt that a three-pronged curriculum strategy incorporating courses in agriculture, commerce and engineering was required at school level. It was argued that children should be allowed to follow certain career paths within the education system and, in this way, would become proficient in chosen fields or would reassess their choice of vocation timeously. This would allow for a more appropriate form of tertiary education and would substantially reduce industry's training costs.

---

[1]Here we mean graduates from all three institutions namely: schools, technikons and universities.

> Appropriate education will help children acquire the insights and skills they need as future leaders and citizens; it will help them acquire life skills and work skills to lead the region to peace, prosperity and racial harmony (Dr Van Zijl of the CSIR, Engineering Week, March, 1989:2).

Respondents argued that universities and technikons needed to reassess and understand the specialist needs of the electronics industry and maintained that the gap between the 'hands-on' approach of the technikons and the academic nature of the universities was unacceptably wide. It was argued that they should associate more closely and that credits should be transferrable between them.

- **Non-racial education system**

A non-racial education system was seen as the third most important step towards achieving an adequate supply of labour. All respondents argued that the upgrading of the black education was a critical factor for the future well being of the industry and, indeed, the economy.

- **Company Sponsored Training**

Company-sponsored in-house training was seen by the industry as the fourth most effective means of overcoming the current skills shortage (Figure 7.2). On the whole, firms were willing to undertake additional training but maintained that the responsibility for the general education of the population lay with government. Respondents were, however, apprehensive to proclaim the benefits of in-house training as it was costly to undertake and there was no assurance that trained employees would not seek employment elsewhere. As a result, most argued that

state assistance was necessary[1]. Respondents also expressed some reservation about the pertinence of company training as trainees were required to have some form of minimum education which was not always present in the labour pool. A shortage of competent trainers and the company specific nature of most in-house training were also argued to be factors restricting the effectiveness of company sponsored training.

7.2.3 Alternatives from the International Front

> The abundant supply of labour with a relatively high educational background and with a strong motivation to work diligently not only provided very favourable initial conditions for the Korean economy to take off in the early 1960s, but has also continued to be the primary source of growth in the Korean economy thereafter (Park, 1988:99).

The literature on education in developing economies stresses the need for high levels of literacy early in the development process. In South Korea, for example, a system of compulsory primary and secondary school education was enforced after 1945 in both the cities and rural districts. The Korean government invested heavily in the development of an education infrastructure adequate to the economy's needs with the result that literacy rates reached 90 percent in the early 1960s, up from a level of only 22 percent in 1945 (Park, 1988:99). The relevance of this astonishing increase should not be underestimated. Whilst Korea is slowly implementing a phonetic script into the education system, two thousand Chinese characters are still taught (Little, 1979:462).

Coinciding with increasing literacy levels, secondary and higher education was also promoted with remarkable success as, in 1965, approximately 8 percent of the population had attained college

---

[1]The government did subsidise in-house training until the early 1980's when, due to firms abusing the system, it was abolished except in certain centres.

level education (Kim, 1988:8). This figure is expected to reach 20 percent by the late 1990s (Park, 1988:103). The Korean government also offers vocational high schools designed to train job-seekers in specific industrial skills (Park, 1988:106).

While investment in education accounts for more than 20 percent of the Korean government budget (Corbo, 1988:43), approximately two thirds of the total cost is borne by parents[1]. Henderson noted that many families borrowed beyond their means and sold "not only cattle but sometimes houses and land to send one's son through college" (cited in Park, 1988:115). This demand for education is the result of the Confucian ethos which holds that education is the "avenue to social mobility" (Steinberg, 1988:26). To ensure that the burden of training was widely distributed, the Korean government enacted a special training law in 1974 requiring firms of 500 or more employees to offer in-house training to 15 percent of their workforce (Park, 1988:108).

The form of vocational training offered in Korea is not dissimilar to that of other countries, such as Germany, where school leavers are encouraged to join a firm for the purpose of an apprenticeship. The government gives subsidies to firms which offer in-house training, usually two years in length, in certain fields. Having completed apprenticeships, students may, if they wish, attend university at a heavily subsidised rate whilst still receiving a minimum wage.

Brazil also offers a form of vocational training which is undertaken by its National Industrial Training Service (SENAI). Because SENAI is funded principally by employers' contributions, it focuses on the specific skill requirements of the industry and is presently opening training schools specialising in computer hardware and software (Hewitt, 1990:17).

---

[1]For example, the cost of education, as a percentage of disposable income, to parents in 1966 was 10 percent for primary education, 15 percent for secondary and 33 percent for college education (Steinberg, 1988:25).

7.2.4 Policy Recommendations

The problem of how to overcome the skills shortage faced by the South African electronics industry is not easily solved. As Van Zijl, of the CSIR, points out:

> It is an incontrovertible reality that we face an immensely difficult period ahead. There are no shortcuts in educational reform and we are moving into terrain that is largely uncharted and unknown. It would also be futile to imagine that our educational problems can be resolved without major, even radical, changes in the political, social and economic relationships in the country - education does not operate in a vacuum (cited in Engineering Week, March 1989:2).

While the task of overcoming the shortage may be immensely difficult and will not be achieved overnight, it is obvious that urgent steps must be taken to solve the dilemma. These steps could include:

- The upgrading and expansion of current education facilities on a non-racial basis. Schools and technikons, and their teacher requirements should, with high levels of literacy being a priority, be upgraded first.

- Establishing curricula to meet the requirements of the industry by promoting interaction between the industry and education authorities. As the skill requirements of the industry will change with ongoing development it is vital that communication between these two is maintained.

- The promotion of 'hands-on' technical training at technikons and universities. Final-year students should actively participate in the industry and academic credits could be transferrable between these institutions. Also, research undertaken at universities should, as far as possible, be related to industry requirements to reduce any unwarranted or duplicated effort.

- The provision of selective support for technikon students by way of bursaries and other means[1].

- The promotion of in-house company training. As previous schemes to promote in-house training were unsuccessful and were abused by many in industry, they should be made conditional on results. The assistance could be given as tax allowances or preferential access to financial assistance; and, in order to monitor the success of the training policy, a national certificate of competence could be issued. This qualification could be established within a nationally recognised framework and may require trainees to undertake a brief examination. Also, training centres, subsidised by the public and private sector, could be established to offer training covering a wide range of skills applicable to the industry.

For the future economic prosperity of the country, steps must be taken to conceive a new education system suitable to both the needs of the industry and the populace.

[1]At present 80 percent of technikon students are self-supporting (Kaplan, 1991).

7.3 Investment

Through automation and technological advance, the electronics industry is becoming increasingly capital-intensive. This makes it very difficult for new firms to enter the industry and for established concerns to expand.

7.3.1 Proposals from the Public Sector

The BTI was the first to investigate the capital requirements of the industry and conceded that "the availability of adequate risk capital is exceedingly important" (BTI, 1986:122) and that funds be reserved "specifically in order to help new electronic manufacturing industries to get started" (BTI, 1986:136). It also proposed that the state should stand surety for small and medium sized firms where circumstances warranted it (BTI, 1986:136).

The Working Group (1988:25), although making no attempt to determine the capital requirements of the industry, recommended the use of grants as a means of financial assistance. Though tax concessions, "provide a strong measure of stimulation", they were not recommended in acceptance of government's standpoint that they were undesirable.

7.3.2 Proposals from the Electronics Industry

In the survey, the following question was posed: "In your view what policies should government implement in order to generate development and growth within the electronics industry?". It was not surprising that most firms considered the availability of finance to be of the greatest importance. Foremost, however, were tax concessions.

These were seen by respondents to be the most effective method of generating investment in the industry, as documentation was uncomplicated and, since they were deducted from tax payments, cash flows were not hindered. It was established in the survey that the current tax allowance on foreign marketing expenses was

considered to be one of the most effective export incentives offered by the state.

Low-interest-rate loans and grants were also considered important for generating growth and development in the industry. For example, 87.5 percent of respondents favoured the granting of more long-term loans. It was, however, advocated that the state should become more attuned to the financial needs of the industry and provide more assistance to smaller firms which had difficulty in obtaining finance from the private sector.

While the industry advocated greater financial assistance it was not, however, in favour of government having greater control over investment in the industry. Respondents argued that this would lead to excessive bureaucratic inefficiency and that funds would be directed principally to preferred firms and not in accordance with industry's requirements or potential advantages. One response was notable:

> Government bureaucracies should not try to plan and run industries - leave it to free markets..Hand-outs are to the favoured and non-competitive businesses, and increase inflation.

It is clear from the survey that although respondents favour greater financial assistance, they are apprehensive of extended government involvement in the electronics industry. This seemingly contradictory view was widely held.

7.3.3 Alternatives from the International Front

The Japanese, Koreans and Taiwanese ('the Three') have used similar methods to promote investment in their respective industries (see, inter alia, Luedde-Neurath, 1984). These countries provide an interesting example of the ability of government to motivate the direction of investment.

All three governments utilised a system of preferential loan rates, differential rediscount rates and credit floors and

ceilings in order to promote **priority sectors** (Feinstein, 1990). Interest rates charged by banks were consistently kept below competitive free-market equilibrium levels, especially where funds were targeted to strategically important or potentially profitable industries (Qi, 1988:10). Moore (1987) labelled this interventionist policy in Korea as 'state capitalism'.

In Korea almost the entire banking system was state-owned between 1961 and 1980 (Roberts, 1985:23) which allowed the government to promote those sectors of industry which it determined held a comparative advantage (Qi, 1988:9). Commercial banks were also required to reserve a portion of their loanable funds for selected projects in industry.

As a result of low real-interest rates in Korea (which were mostly negative during the period 1960 to 1973), domestic savings were never sufficient to meet investment demand (Qi, 1988:12). In order to encourage foreign investment, a number of incentives, besides market opportunities and cheap labour, were offered to transnational firms[1].

All foreign investment was, however, carefully regulated and controlled to ensure that it complemented national economic priorities (Wade, 1988:144; Nayyar, 1977:65; Black, 1990:6). Foreign subsidiaries were, for example, often prevented from competing with local concerns in both the domestic and international markets. As a result, Korea became one of the few countries with very restrictive investment regulations. As a result, foreign investment in Korea accounted for less than 8 percent of investment in manufacturing in 1970 (Wade, 1988:144; Luedde-Neurath, 1984:19).

---

[1]On the grounds that political stability and labour docility were important influences on investment decisions, many of the NICs (Singapore, Malaysia and Indonesia) advertised their repressive labour legislation and offered special labour laws which ruled out industrial disputes with foreign firms (Nayyar, 1977:77).

To stimulate private sector investment in the electronics industry, the Korean government selectively offered a number of tax concessions which included low corporate tax rates, tax holidays for newly established firms, for a period of usually five years, and various deductible allowances for stimulating exports. The Korean government showed remarkable willingness to achieve its predetermined goals under 'state capitalism', as shown by Moore (1987:7):

> Incentives tend to be negotiated more on a case-by-case basis than by the application of universal rules, and individual firms are more likely to be approached by state agencies to undertake specific projects rather than vise versa.

The financial assistance offered by the Korean government to its electronics industry is not dissimilar to the Japanese blueprint approximately 15 years before. Many have argued that Korea's policy, and for that matter Taiwan's, cloned Japan's (see Petri, 1988; Iqbal, 1988). In Japan, a number of monetary and fiscal incentives, which included subsidies, low-interest-rate loans, tax benefits and loan guarantees, were offered to investors in selectively targeted sectors of industry (Anchordoguy, 1988).

This was particularly important in the early stages of development. For example, subsidies and tax benefits to the computer industry alone amounted to 46 percent ($132.6 million) of private sector investment and 188 percent ($542.8 million), if government loans are included, between the period 1961 and 1969 (Anchordoguy, 1988:8).

The Ministry of Trade and Industry (MITI) was given the primary task of directing funds to the industry. Although not having extensive funds itself, it possessed the power to approve or disapprove loans, including those from the Japan Development Bank (JDB). By controlling the banking sector it could make indicative investments which guided the entire financial community's resources to selected industries (see Scalapino, 1977:257). Firms which had received loans from the JDB could expect further

financial assistance from commercial banks.

The MITI also had extensive negotiating power as many of its senior retiring members were given posts in the top echelons of every major enterprise in Japan. Members of MITI, when negotiating with representatives of firms, would often then be talking with men who themselves had spent some 20 years in MITI. This made it easier for both sides to come to an agreement and helped ensure administrative guidance (Scalapino, 1977:258).

7.3.4 Policy Recommendations

In the following analysis it is argued that the South African government could play a more significant role in providing financial assistance to the local industry. Fundamental to this argument is that assistance should be selectively allocated to those sectors in the industry which hold some form of future comparative advantage and, if supported, will attain a level of international competitiveness.

Tax concessions, proven to be effective at stimulating investment, could be offered to selected sectors of the industry. It is recommended that tax holidays be given to newly established firms specialising in production and value adding activities and that tax concessions, on the purchase of locally fabricated capital goods and on export turnover, be offered to these sectors.

Long-term loans and grants could also be used to provide assistance but should be allocated with greater regard to the performance of the recipient, especially in the export market. Loans are preferred as they are profit driven, are less open misuse and offer more widespread assistance.

The interest payments on these loans could be determined on a gradual scale whereby the firm's importance (in accordance with long-term goals), size, age and turnover are all taken into consideration. The amount of exports undertaken by the firm could

also be considered and those firms which achieve success in the international market could receive preferential assistance. Funds could also be set aside for the use of selected small firms in order to facilitate short-term, high-risk investments.

All these methods of assistance, however, have opportunity costs and it is, therefore, important for the government to ensure selectivity in their allocation. Therefore, having selected certain sectors, the state should set performance targets, ascertain obstacles in their development and then monitor their performance. It is important for the government to have the flexibility to modify or redirect assistance if firms prove uncompetitive.

In order to encourage foreign investment to the local industry the state should take measures to ensure its security and rate of return. This is on the grounds that foreigners consider "low labour costs, limited distance, special concessions (which may offset the labour cost and distance factors) and political 'reliability' or 'stability'" as important considerations before making investments (Helleiner, 1973:44).

Unfortunately South Africa offers few of these factors but progress is being made in laying the foundations for political stability. Once this is attained and international sanctions have been lifted, foreign investment may return. When this occurs it is important for government to use circumspection in allowing certain investment, especially Direct Foreign Investment, into the economy. While this is, of course, dependent on the state's ability to negotiate with foreign investors and their propensity to enter the South African economy, it should nevertheless be considered in any approval of foreign investment in the industry.

7.4 Technology

The limited technological capability of the South African electronics industry is widely recognised as a major obstacle in its development (see Chapter Six).

7.4.1 Proposals from the Public Sector

The importance of indigenous technological capability was initially identified by the Working Group (1983) which laid down guidelines for technological development. These measures were, however, restricted to those preference schemes, for locally-manufactured and designed goods, currently being offered by the public sector.

The BTI (1986:119), however, re-addressed the importance of technology arguing that "sustained growth in the electronics manufacturing sector will be achieved only if sufficient electronic engineers, technologists and technicians are available and a comprehensive and ongoing R & D effort is applied". The BTI (1986) recommended that:

- A Branch for Technology be established in the Department of Trade and Industry to co-ordinate and implement a technology policy.

- Small firms be encouraged, by means of venture capital and public sector purchases. It was argued that they were more innovative and were in a better position to quickly adapt to technological developments (BTI, 1986:125).

- The ICDC and SAMES be optimally utilised for the research and development of ICs. It was argued that facilities should be constantly upgraded to avoid technological stagnation.

- R & D should, as far as possible, be undertaken by the firm manufacturing and marketing the product.

- The protection afforded to the industry should ensure moderate competition from foreign products in order to avoid technological stagnation.

- A wide range of products be supported rather than a few products requiring heavy investment in R & D.

The importance of grants was emphasised by the BTI and they were argued to provide the best means of stimulating R & D in the industry. However, some respondents criticized this method, arguing that they were not allocated in accordance with performance. This lack of any performance requirement was highlighted by the BTI (1986:135) which stated that "applications for retroactive assistance...should be considered only in cases where the firm experiences problems in recovering the development costs because of competition from overseas".

The BTI (1986:117) was concerned that few firms in the industry based their strategy on the development of competitive products destined for the international market. It argued that it was essential for local firms to undertake applied and specifically product-oriented R & D and that the state should play a role in its stimulation and become more result-orientated.

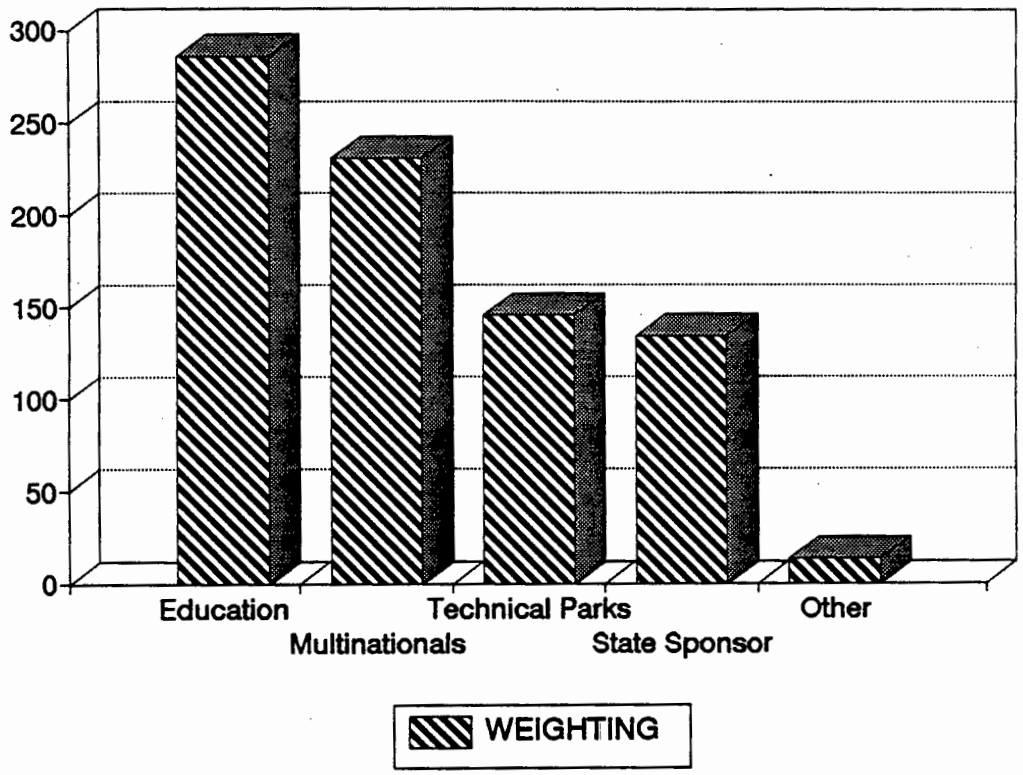
> The procurement of suitable foreign technology, its adaptation to local conditions, and subsequent on-going improvement and up-grading thereof, should be energetically pursued, in contrast with efforts to develop our own technology from the start.....the technological risks involved in R & d should therefore be distributed, inter alia, by support from the state (BTI, 1986:119).

Although the government is willing to provide financial assistance to firms in the industry for R & D, both the BTI (1986) and the Working Group (1988:22) advocated that the "state should not prescribe to the industry..[and]..support should be of an enabling and stimulatory nature". The government's reluctance to expand its role in technological development has been well received by many in the industry.

7.4.2 Proposals from the Electronics Industry

The survey was used to determine the industry's views on how indigenous technological capability could be improved (Figure 7.3).

Figure 7.3
Methods to Improve Local Technology
in Terms of Appropriateness or Advancement



n = 45

Note: 1) A composite scoring system was used whereby 9 points were allocated for the major factor, 6 for the secondary reason, 4 for the third factor and 1 for the fourth.

2) Data for the Figure was collected from only those firms which utilised technology developed in South Africa.

Figure 7.3 shows that education and multinational involvement are considered fundamental to the development of indigenous technology in the industry. Technical parks and government involvement[1] were, however, considered to be less important.

- **Education**

  The importance of education cannot be over-emphasised. Respondents recommended that sufficient suitably qualified personnel should be trained to fill positions in the industry (see Section 7.2). Respondents also argued that links should be established between the universities and the industry and that students and postgraduates could be usefully employed in researching viable projects for the further development of indigenous technological capability[2].

- **Multinational Involvement**

  Respondents generally favoured greater multinational involvement. This is surprising as it could have been assumed that local firms would be averse to increased competition on the local market. However, respondents argued that the presence of multinationals in the industry would stimulate a greater awareness of the need to attain an acceptable level of international competitiveness and would allow foreign technology and skills to enter the economy. Subsidiaries to multinationals were asked to indicate the benefits derived through this relationship.

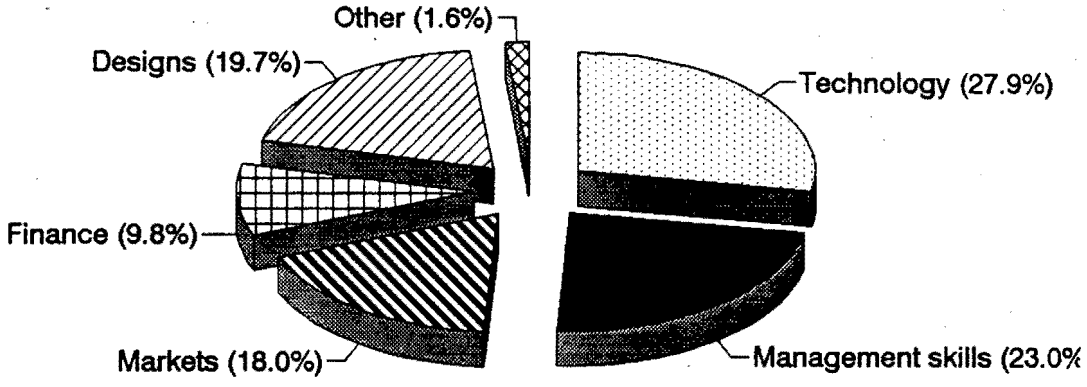
---

[1]Fifty six percent of respondents were in favour of less government involvement in technology research.

[2]At present scarce resources at university are often spent on research with no industrial application. For example, the development of an X25 Traffic Generator by Mr S. Aspin at UCT (MSc, 1986) for monitoring the throughput capability of equipment in a telecomms network was never exploited fruitfully as it was only of 'academic value'.

Figure 7.4

Advantages of Multinational Affiliation



n = 21

Multinationals were considered to be a significant source of technology and management skill by local subsidiaries. It was established that, while these firms benefitted directly from their close affiliation, employee transfers and dialogue ensured that this 'foreign knowledge' was distributed. It was established in interviews that multinationals were also considered to provide:

- The means by which the industry can maintain an 'ear to the ground' on international developments
- A competitive environment
- Production capacity
- Additional employment and training opportunities

Several firms, however, contended that multinationals "gave nothing for nothing" and "that they were only out to make a profit" (company interviews). While this is often the case, recent international experience indicates that, when properly managed, multi-national investment can be of great benefit to the industry (see Chandhuri, 1988).

7.4.3 Alternatives from the International Front

In order to overcome the under-allocation of resources for the development of indigenous technological capability (see Chapter Two), technological development has, in most countries, taken place in association with government. Some of the instruments used to develop this capability have been the screening and control of foreign investment and technology, industrial reorganisation, financial assistance and the establishment of R & D facilities.

- **Foreign investment**

Japan's computer industry provides one of the best examples of how foreign investment can be controlled and manipulated to meet broad developmental goals. In addition to restricting computer imports by means of quotas and tariffs, MITI exercised tight control over foreign investment in the Japanese market. In most cases, foreign subsidiaries were not allowed to remit proceeds and dividends abroad. Furthermore, they could be prevented altogether from producing. This provided leverage by which foreign technology could be cheaply obtained due to foreign firms being 'pressurised' into joint ventures or being obliged to sell their patents in order to have access to the local market.

With IBM controlling approximately 70 percent of the world's computer market in the 1960s, MITI took precautions to safeguard the Japanese industry. After lengthy negotiations, MITI finally allowed IBM to produce in Japan but asked it to be considerate towards the local industry:

> Japanese makers are mosquitoes, IBM is an elephant. I would appreciate it if IBM does not do anything to crush the mosquito under its feet (Shigeru, Head of MITI's Heavy Industries Bureau, cited in Anchordoguy, 1988:3).

During the negotiations, MITI kept a tight control on the local IBM operation which was required to export a certain percentage of its turnover. In return for the market granted, 15 companies received IBM's technology, through licence contracts, which allowed them to produce compatible machines. Royalties were negotiated at a fee of 5 percent on sales and 1 percent on parts and restrictions were minimal. Although IBM never entered into a joint-venture with any local firm, several other computer manufacturers including RCA, General Electric, TRW, Honeywell and Sperry Rand did, thus 'sharing' their technology with their Japanese counterparts (Weiss, 1986:393).

The Japanese success in acquiring foreign technology under the best conditions was largely the result of its increased bargaining power resulting from negotiations being centralised via MITI. This allowed certain industries to obtain foreign technology through joint ventures or at reasonable royalties with a minimum of restriction.

- **Imports of Technology**

In many cases, foreign firms were willing to licence their technology to Korea, Taiwan and Japan in order to maximise returns and avoid becoming immersed in joint ventures or government mediation (Weiss, 1986:392). Between 1950 and 1968, for example, Japanese firms signed over 9 800 licencing contracts with foreign firms. In a similar fashion to Japan, the Korean and Brazilian governments intervened extensively in negotiations over imports of technology to ensure low royalty rates and the minimum of restrictions (Enos, 1984:31; UNCTAD, 1985:119).

Fundamental to obtaining foreign technology through licence, was the process of 'unbundling' it, in order to understand its application. Japan was the first to demonstrate the effectiveness of this reverse engineering by assimilating and improving imported foreign technology

(Weiss, 1986:392), a process later followed by Korea (World Bank, 1987:208) and Brazil (Bastos, 1990:16). These countries concentrated R & D resources on the effective assimilation of foreign technology and the development of marketable products of good design and quality, rather than on technological breakthroughs (World Bank, 1984:88). The assimilation of foreign technology allowed firms to 'localise' the technology which reduced any royalties and restrictions on its use.

As a result of such policies, Japan has developed from an importer of technology to a world leader investing heavily in basic and applied R & D. Korea also developed a high degree of technological capability (Leipziger, 1988:209), whilst Brazil is making significant inroads into the local design and production of computers (Bastos, 1990:24).

- **Industrial Reorganisation**

In order to strengthen the competitive position, computer companies in Korea and Japan were given incentives by the state to reorganise into groups (Weiss, 1986:396). These co-operative projects were encouraged as they reduced redundant research, accelerated technological advancement and encouraged firms to specialise in order to achieve the economies of scale necessary to compete with multinationals. As a result of this policy, the first major public/private sector research project saw Japan's computer industry concentrated on the development of one system, namely the prototype of a machine to compete with IBM's 360 series.

- **Financial assistance**

Widespread financial assistance was given by Korea, Taiwan and Japan to firms undertaking R & D in their respective local industries. This assistance included preferential access to loan capital, grants and tax concessions. The

survival of the Japanese computer industry, for example, at one time was ascribed to "government subsidies and co-operative R & D" (Anchordoguy, 1988:9).

- **R & D facilities**

Internationally, state R & D centres have been established to assist and undertake research for private firms which do not have adequate facilities. For example, in Korea and Taiwan these institutions[1] concentrate on developing products to the specifications of firms in the industry, rather than on technological breakthroughs. A great deal of research at these centres was, therefore, developmental and was largely concerned with the improvement and assimilation of existing technology.

- **Education**

> That Taiwan has assimilated foreign technology as effectively as it has in no small part harks back to its highly educated population (Amsden, 1985:96).

Approximately four out of every ten graduates at Seoul University are trained engineers (Enos, 1984:31) and close ties with universities and interaction in research have proved very fruitful in the process of technological development (see Section 7.2).

[1]The Advanced Institute of Science and Technology in Korea and the Industrial Research Institute in Taiwan.

7.4.4 Policy Recommendations

While it is deceptively easy to recommend a policy used successfully elsewhere, it cannot be assumed that the "simple transposing of policy would allow us to emulate their economic performance" (Black, 1991:10). However, the experiences of other economies, such as the NICs, provides policy makers in South Africa with a useful example of the consequences of certain types of intervention.

In the quest to formulate an appropriate technology policy, a number of factors need to be considered. Firstly, state intervention in the process of indigenous technological development has been present in almost every economy, including the United States. Secondly, some form of intervention is required as market failure may result in the non-optimal allocation of resources in the development of technology. It can, therefore, be argued that the South African government should intervene to support the process of technological development.

Financial assistance, in the form of tax allowances, long-term loans or grants, could be offered to firms undertaking R & D, conditional to certain requirements being met, namely that results coincide with future comparative advantages and have market value. The state could also attempt to organise the industry to undertake joint R & D projects and thus minimize duplicated research. Existing R & D institutions, such as the CSIR, ICDC and universities, could become more closely integrated with the technological needs of 'selected' sectors in the industry. Their activities should assist firms to develop marketable products through intensive developmental and applied research.

While it is important for the government to promote the assimilation and adaptation of foreign technology, there should also be some form of governmental monitoring to ensure its appropriateness to long term economic plans. The state could negotiate on behalf of a group of buyers in order to reduce

restrictions or insist that training be a condition of any licence agreement. Fundamental to a successful policy is the state's ability to selectively support and promote those technologies which will establish some form of future comparative advantage.

Edison Dytz, a former chairman of the Brazilian Special Secretariat for Informatics (SEI), made suggestions, in a speech referring to the electronics industry in Brazil, which are very pertinent to state intervention in the South African electronics industry.

> We need to launch a second phase, encouraging the association among firms, universities and research centres with well defined technological goals. After some time of supporting producers and researchers, we would have to assess what we have obtained and then select the most successful areas for continued support. Those areas in which our support has not led to adequate local capability will have to be supplied from abroad, even if this means the elimination of some national firms (Globo, 1987 cited in Bastos, 1990:20).

7.5 Markets

> Nothing happens until somebody sells something (Arthur H Motley).
>
> The basic purpose of any business is to create markets - that is, to create customers (William Stanton).
>
> Because it is its purpose to create a customer, any business enterprise has two - and only these two - basic functions: marketing and innovation (Peter Drucker).

- cited in The Working Group (1983) - opening address.

7.5.1 Proposals from the Public Sector

While the IDC (1981), the De Waal Committee (1983) and the Working Group (1983) dealt almost exclusively with the rationalisation of government procurement from the industry, the BTI (1986) made some important recommendations concerning the development of the local and export markets by proposing that:

- A 'Task Group for the Co-ordination of State Purchases' (Electronics) should be established. Measures should be taken to include small firms in government procurement from the industry.

- The existing exclusive supplier agreements, including the 'arm's-length agreements' should be closely tied to the export achievement of suppliers (BTI, 1986:126)[1].

- Tariff protection, when it is applied, should be selectively limited to infant industry and should operate for a limited period only.

---

[1]In personal interviews undertaken by Kaplan (1990:123) in the late 1980s, it was established that many members of the BTI were in favour of scrapping long-term contracts altogether - a proposal which, not surprisingly, met with much resistance from contractors.

The BTI was concerned that the state was the single largest consumer of electronics. It observed that manufacturers often adapted their production exclusively for this monopsonistic market and argued that this led to "a situation where the small extent of local design that still exists, is requirement-driven and not market-driven" (BTI, 1986:122).

The BTI (1986) was of the opinion that tariffs, over a wide area, should be abolished. This was on the grounds that "tariff protection only assists in protecting profits or reducing losses in the short term, without improving the underlying capabilities of the industry". The need for protection to allow the South African manufacturer time to test his product on the 'home front' was, however, fully appreciated (BTI, 1986:119).

Furthermore, the BTI (1986) argued that, to stimulate the industry's development, components should, with certain exceptions, be freely imported. This recommendation proved controversial. Certain respondents were adamant that higher component costs reduced their ability to compete on local and international markets. These firms favoured reduced component costs even if it "set the scene for the demise of local [component] manufacture" (Temple, J, managing director of Plessey, cited in Electronic News, April 1990:21). Others, however, relying on component sales for a proportion of their turnover, argued that the component industry needed time to get off the ground (see Kaplan, 1990:126).

The BTI (1986:118-38) also recognised the importance of the export market and argued that:

> Local manufacture with moderate protection with a view solely to the local market offers limited possibilities....The development and survival of the domestic electronics manufacturing industry are to a large extent dependent upon its ability to enter the export market.

To encourage manufacturers to export, the BTI (1986) recommended, that:

- An aggressive, co-ordinated campaign to market South African electronics internationally was necessary and that those manufacturers who achieved success should receive strong financial support.

- The government should help promote marketable products at international fairs and through the establishment of overseas marketing houses.

- South Africa should participate in 'exchange trade' by exporting unique products required by other countries in exchange for products which cannot be manufactured locally.

- Unique products should be targeted to market niches[1], especially in view of the current low level of production capacity.

> The South African electronics manufacturing industry should identify market segments in which it can compete on the world market; although these segments are small for the world's large industrial countries, they are of sufficient size to make a viable South African industry possible. In this respect, the emphasis must be placed on products that depend on a high content of expertise and require small to medium batch production; and there should be less emphasis on products that depend on economies of scale .....original and unique products for new market niches should receive preference (BTI, 1986:125-34).

---

[1]Some respondents questioned the 'niche' market approach. One of them argued that: "As soon as the market becomes large enough to interest international conglomerates, your market would become swamped". This firm argued that "operating in a specialised market, which does not require innovative or unique products, and is overlooked by the large 'profit hungry' conglomerates, is more favourable".

The IDC has recently published a general policy document (Modification of the Application of Protection Policy, 1990). The main thrust of this document, arising out of its long held view that there is little scope for further import substitution, was to recommend across the board reductions in tariff protection. The IDC argued:

> Greater neutrality must be brought about between import replacement and export production both in international policy and in industrial policy and the cost pressure due to the system of import charges must be reduced.

These proposals represent a shift to a more neutral and outwardly orientated trade regime and a rejection of detailed intervention with regard to protection, export promotion or the selective targeting of sectors. It can be argued, however, that South African industry, in general, is not sufficiently competitive to enter the international market and that a structure which tied protection and other assistance, to export performance criteria, and which was linked to a broader industrial policy, would be more successful.

7.5.2 Proposals from the Electronics Industry

The survey was used to determine the industry's perspective regarding import controls, local procurement and export incentives.

- **Protection of the market**

  Most respondents felt that the industry had remained insulated for too long in the local market and that greater export orientation was appropriate. As a result, many firms were in favour of reduced tariff protection (Table 7.1).

Table 7.1

Industry's Perspective with Regard to Import Duties & Tariffs

Type of Firm	No. of respondents	In favour of More	In favour of Less
Producer	21	48%	52%
Other	25	16%	84%

Note: Other includes firms specialising in assembly, R & D or marketing.

Seventy percent of respondents recommended that the government reduce current import controls. One respondent advocated that the government should:

> Remove surcharge fees & duties on imported goods. Allow free trade. This will cause the local manufacturer to get his act together. (company correspondence).

Although the majority of respondents were in favour of less import controls, 48 percent of producers still considered tariffs, selectively administered, to be necessary tools for developing the industry[1]. These respondents generally believed that the market in South Africa was too small for the efficient production of electronic components and that firms should concentrate on end level products which have high levels of value added. A number of these producers argued that duties and tariffs on imported components should, therefore, be abolished but that duties on finished products could be continued.

♦ **Local procurement**

Respondents were asked to indicate whether they were in favour of the allocation of more, or less, long-term

---

[1]Producers favoured import controls more than other firms. $\chi^2 = 32$ at 1df which is significant at the 1% level.

contracts by government for its procurement from the industry. It was established that, although many producers favoured public sector procurement, there was no unaminity in the industry (Table 7.2).

Table 7.2
Industry's Perspective with Regard to Long-Term Contracts

Type of Firm	No. of Respondents	In favour of Less
Producer	13	38%
Other	22	64%

Note: Other includes firms specialising in assembly, R & D or marketing.

Many of those producers who favoured the allocation of more long-term contracts were found to rely on the government for a large proportion of their sales turnover. Purchases made by the state under long-term contracts were, in most cases, found to be highly profitable (see also Kaplan, 1990). It was apparent, however, that many producers and assemblers doubted the overall effectiveness of long-term contracts in generating growth in the industry. One concluded that:

> The 'Buy South African' policy should be real. A combined Government/Industry forum to explore ways and means of making it work, is needed (company correspondence).

- **Export incentives**

Ninety-eight percent of firms recommended more export incentives. Many respondents argued that, although government maintained it was becoming more export-oriented (see IDC, 1990), production in South Africa's electronics industry was still essentially directed at substituting imports. Furthermore, respondents, arguing that tariffs and

surcharges had reduced their ability to compete, suggested the need for greater export subsidies.

7.5.3 Alternatives from the International Front

Much government intervention was evident in all facets of the development of 'the Three', and was directed at the ultimate attainment of international competitiveness. Trade policy in the form of infant industry protection, local procurement and export incentives, were widely utilised.

- **Protection of the local market**

Similar protectionist policies were used by Korea, Taiwan and Japan during the early development of their industry. Certain capital-intensive industries were targeted and the technological development of these sectors was promoted. Although in many cases the nature of this capital intensity was considered inappropriate, it proved to be strategically cogent in the long-term. In the case of Japan, for example, the steel, chemicals and electronics industries, were targeted.

> The MITI decided to establish in Japan industries which require intensive employment of capital and technology, industries that in consideration of comparative cost of production should be the most inappropriate for Japan, industries such as steel, oil refining, industrial machinery of all sorts, and electronics....From a short-run, static viewpoint, encouragement of such industries would seem to conflict with economic rationalism. But, from a long-range viewpoint, these are precisely the industries where income elasticity of demand is high, technological progress is rapid, and labour productivity rises fast (OECD cited in White, 1988:6).

To protect their infant industries and balance of payments, Korea, Taiwan and Japan imposed trade control on certain

imports[1] (Wade, 1988:139; Scott, 1979). The protectionist measures included: import duties, quotas, import licensing and under-valued exchange rates (Petri, 1988; Weiss, 1986; Wade, 1988). Local industries were also fostered through favourable monetary and fiscal policy including, inter alia, reduced corporate tax rates, accelerated depreciation and easier access to loan finance. It was intended that these protectionist measures would facilitate the development of local infant industry to the point where it would become internationally competitive.

Protection was implemented indirectly (Wade, 1988; Allgeier, 1988). For example, in Japan's computer industry, firms wishing to obtain an import permit for a foreign computer were often asked by MITI why they could not use a domestically produced model. In certain cases the MITI made it compulsory for firms to use locally manufactured computers by restricting imports of foreign computers (Anchordoguy, 1988:2). Import controls were also differentiated by industry and often by product (Wade, 1988; Weiss, 1986; Allgeier, 1988). This was done in accordance with promulgated long-term development plans and was intended to stimulate investment to certain sectors of industry. Rates of protection were generally higher for finished goods, whilst raw materials and components, where there was no domestic producer, were allowed in free of duty. Where local suppliers existed, every effort was made to ensure that the manufacturer was not disadvantaged by higher prices.

Whilst Taiwan has concentrated on a type of niche marketing, Japan and Korea have predominantly exported to existing markets, mostly in the United States. Due largely to increasing international pressure, especially from the United States, they 'appear' to be slowly liberalising

[1]Taiwan did not suffer from balance of payments problems and only implemented import control to protect the infant industry.

their markets to foreign competitors. In many cases, however, indirect protection is still applied. For example, even with reductions in import controls, the importation of 37 percent of all electrical products listed in Korea, in 1984, was restricted (World Bank, 1987:203).

- **Local Procurement**

The Three also supported their respective industries through local procurement programs. For example, the Korean government supported a joint venture for the development of an indigenous electronic switching system being incorporated into the public telecomms network[1] (World Bank, 1987:203).

In Japan, the Japan Electronic Computer Company (JECC) was established by the government to create a large local market for domestically manufactured computers. This organisation purchased computers from a selected group of local manufacturers and then leased them out to the Japanese public. As the JECC purchased in large quantities, its suppliers were able to forecast sales and did not have to undertake extensive marketing or the financing of rentals. Also, since the JECC purchased locally manufactured computers on the grounds of their performance and market demand, local manufacturers invested heavily in the development of competitive machines (Anchordoguy, 1988).

- **Export Promotion**

Throughout the process of protecting the indigenous industry, the Three used the threat of foreign competition to encourage local manufacturers to improve their

[1]The policy used by the Korean government to foster the development of its domestic telecomms industry is very similar to that used by SAPT.

competitiveness. Protection was never offered as a permanent fixture and it was understood that the industry should eventually become internationally competitive. In many cases firms were also expected to export while still receiving protection from imports and the government would often consider the export performance of the firm when determining the rate of protection. In order to promote exports, the Three used a plethora of export incentives including:

- Long-term loans and tax deductible allowances. Preferential treatment in the allocation of other assistance was also offered to exporters.

- Cheaper rates for electricity and freight railage.

- The establishment of foreign trade houses - such as the Korean Trade Promotion Corporation (KOTRA). This organisation was established to assist exporters to undertake marketing surveys and establish foreign subsidiaries (see Rhee et al 1984:52).

- Greater wastage allowances which enabled firms to import components, free of tariffs, in excess of their export requirements thus stimulating investment to the sector.

In order to assess the level of assistance to be offered, the governments of Korea, Taiwan and Japan met with certain firms to forecast expected exports. The extent of state assistance offered to firms in the industry was, in many cases, proportionate to these forecasts and when firms failed to fulfil projections they were penalised and assistance subsequently reduced. The state also used these meetings to discuss with firms any problems they experienced and how the state could formulate policy to assist them to meet their export quotas.

Korea, Taiwan and Japan have all used a policy of import substitution, intertwined with export promotion, to 'guide' their industry's into achieving international competitiveness and substantial growth. Although it may appear that these countries were outward-orientated, use was made of both trade policies to

protect certain industries while promoting exports in others.

7.5.4 Policy Recommendations

The South African electronics industry has developed only marginally and has, for the most part, not reached a level of international competitiveness. It can be argued that the industry is a product of trade barriers and state procurement and that it may retrogress in the face of international competition, were imports freely allowed on to the domestic market[1].

Although the current import substitution policy has been fraught with problems, it is possible that well-conceived infant industry protection could further the development of the industry. Many of the criticisms discussed previously referred to ill-conceived import substitution policy rather than to the concept in general. In his study of state intervention in the South African economy, Zarenda (1977:175) suggested that "instead of concluding that the import substitution process is exhausted or limited....there may be considerable opportunity for further replacement". However, while temporary protection could be granted to selected sectors of the industry, it is important that this policy does not increase input costs elsewhere.

It is recommended that protection is offered on a sector specific basis to allow firms, within a short period of time, to develop the necessary momentum and financial reserves required to enter the competitive export market. High rates of protection offered circumspectly, for a short period of time are, therefore, advocated. To ensure that firms become competitive within this

---

[1]Even certain electronics industries in developed countries such as the U.K and France are grappling to maintain competitiveness. Following the recent acquisition of ICL by Fujitsu, the French government wants European firms to unite in order to 'fight off Japanese competition'. It has recently injected nearly FFr4 billion of capital into one of its ailing computer manufacturers, Bull. This is in addition to a FFr2.7 billion research grant the firm receives over the next four years (Financial Times, 5 April, 1991).

period, policy should be reappraised annually and, when proving ineffectual or too costly, alternatives should be sought. Recipients should also be expected to export from an early stage.

Public sector purchases could also be incorporated into development plans with the objective of stimulating firms towards becoming internationally competitive. However, the state should also considered the requirements of newly established firms and assist them, where possible, with an initial market.

The state could also attempt to prevent the miss-allocation of resources through rent seeking, duplicated R & D or excess competition among local manufacturers. To do this it could endeavour to consolidate the industry towards the singular objective, namely, the attainment of success on the export market. By achieving this aim the industry could reap the benefits of economies of scale, technology flows and enhanced national or corporate 'pride'.

> A small country must have its individual exporting industries quite heavily dependent upon their exporting activities because its domestic markets are too small to sustain a wide range of industries or to sustain sufficient growth in those industries which there are. The question is which industries to create in the knowledge that they will each be overwhelmingly export-dependent (Helleiner, 1972:25).

Assistance to exporters could be offered, for example, through the allocation of preferential financial assistance and tax deductible allowances. These incentives could be allocated in accordance with other assistance schemes and should aim to promote the establishment of a competitive, export-orientated, industry.

As these incentives have opportunity costs, the state should attempt to ensure that returns justify them. This can be done by selectively allocating assistance, setting performance targets and by monitoring the progress of firms. In cases where firms

continue to prove incapable of meeting targets the state should re-direct resources to other sectors of the industry.

In order to successfully promote exports, the government should provide the necessary infrastructure abroad to assist firms to undertake market surveys and feasibility studies. Such an organisation could maintain information on buyers and sellers in the export market and play a key role in introducing local firms to foreign markets.

The formulation of an effective trade policy is highly complex and the state must establish a policy which considers the industry as a collection of individual agents who co-exist in a dynamic environment. While the above section has provided a number of recommendations to be considered by the policy maker, extensive research is still required.

7.6 Conclusion

This chapter has set out to provide a number of alternatives which policy makers may consider in the establishment of effective policy for the further development of the industry. The state is currently reviewing its industrial policy and it is an opportune time to correct present shortcomings. In order to intervene more effectively the state needs to develop long-term development plans which target certain sectors of the industry in accordance with their potential comparative advantage. To do so it is necessary for the government to consult extensively with industry[1]. Furthermore, government mediation should go beyond simple intervention in industry and should strive to **motivate** the entire economy towards meeting determined goals. However, critical to this stance, is the premise that future intervention will be both competent and effective.

---

[1]The survey ascertained that 98 percent of respondents favoured greater communication between the industry and the state. The industry is clearly enthusiastic about the prospect of dialogue with the government in order to obtain a mutual understanding and plan the industry's future direction.

CHAPTER EIGHT

CONCLUSION

As a result of the important role played by the electronics industry in the process of industrialisation, the South African government has intervened at a number of levels to promote its local development. The reasons outlined for this in Chapter One are the industry's strategic value, its ability to create employment and market opportunities and its role in the process of technological development.

In Chapter Two, two forms of state intervention, namely trade and technology policy, were discussed. Both policies have a different effect on the industry: trade policy is used to affect prices in favour of the local or export markets; technology policy, on the other hand, is responsible for the establishment of an infrastructure suitable to the development of a technology intensive industry. It was established in the analysis that outward and inward-orientated policies should not be considered as mutually exclusive and that a single cohesive policy, combining both, could be used effectively for the protection of infant industry and the promotion of exports, in different sectors of industry. The importance of outward-orientation was emphasised.

In Chapter Three the methodology of a nation-wide survey was outlined. It encompassed roughly 40 percent of the industry, by turnover, and was designed to assess the effectiveness of state intervention in the South African electronics industry.

An analysis of data pertaining to the South African electronics industry was made in Chapter Four. This highlighted the industry's limited development and the subsequent burden it placed on foreign exchange reserves through its reliance on imported electronic equipment and foreign technology. It was

noted that exports from the industry, in 1990, constituted only 3.5 percent of its imports and that, while domestic production capability does exist, it is limited.

In Chapter Five an appraisal was made of the various policies which have been implemented by the government in order to stimulate growth in the industry. Those discussed included trade protection from imports, export incentives, state procurement and financial and R & D assistance.

In Chapter Six it was argued, however, that the state has not taken cognisance of the structural requirements of the industry in its intervention. For example, one of the greatest constraints hampering the development of the industry is the shortage of adequately skilled labour. Respondents argued that the shortage of technically trained manpower was most prominent. Although this shortage was deplored, it was established through the survey that only 1.6 percent of the industry's turnover was invested in in-house training and it was argued that this was an area where the state could have intervened more effectively.

While the industry has difficulty in satisfying its labour requirements, it also finds it difficult to export competitively. Although the General Export Incentive Scheme was initiated to assist exporters, it has been found to be largely ineffective. Not only do exporters rely heavily on imported inputs, which are subjected to duties and tariffs, but export incentives are reimbursed over a period of 12 months. As a result many exporters currently rely on a 'favourable' rand exchange rate for any advantage. Respondents also argued that no adequate infrastructure exists to give assistance to firms wishing to establish export markets.

By protecting the local components market the state has, unfortunately, hampered the development of firms in the domestic market. It was shown that the effective rate of protection offered to value adding activities was substantially reduced as a result of higher input costs.

A further shortcoming of the current trade policy is that it was not established with the aim of stimulating the development of an internationally competitive industry. There are no established timetables for the lifting of protection or any requirement for firms to undertake exports, in-house training or R & D. As a result, the industry has relied, to a large extent, on a protected market and has done little to improve its competitiveness or technological capability. For example, only an estimated 3 percent of the electronics industry's turnover is spent on R & D. As a result of this, over 50 percent of local producers had to make use of licenced technology which was found to restrict the industry's growth because of royalties and various restrictions imposed by licencees.

One reason for this high reliance on foreign technology was argued to be that the public sector invests heavily in basic and applied research for the development of new technologies whereas the assimilation and adaptation of existing technology would be a more worthwhile process and would assist in reducing those restrictions placed on the industry by the use of imported technology. The state also offered financial assistance, in the form of grants, to firms undertaking R & D. These are, however, argued to be too limited and spread over too wide a field to offer any real assistance.

Besides offering financial aid to firms the state is also the industry's largest single market. However, it procures mainly from the telecomms and military sectors, through long-term contracts, and from the components sector, through arms-length agreements and the benefits of these purchases have been captured by only a few well positioned companies.

It was, therefore, concluded in Chapter Six that the state has not effectively used the measures available to it to develop an internationally competitive and dynamic industry. This has reduced the industry's ability to provide the necessary indigenous technological capability to the surrounding environment with which to assist South Africa's industrial

competitiveness.

In Chapter Seven a number of policy alternatives were set out. Analysis was made of proposals given by the various state organisations and by respondents in the survey. The development of a number of other countries, whose industries have benefitted from state support, was also examined. Various recommendation emanated from this analysis.

In order for the industry to develop, steps must be taken to remedy the skills shortage facing the industry by the establishment of more facilities, particularly schools and technikons. Respondents placed great importance on the appropriateness of the skills emanating from these institutions, arguing that they should be conceived around the requirements of industry.

It was also recommended that the state should selectively support sectors in accordance with their future comparative advantage and that the state should set out to determine, in conjunction with industry, which sectors to target. While various measures could then be used to support these sectors, the state must ensure that certain performance requirements are met, including the sector's ability to undertake exports and become internationally competitive.

While it can be argued that the industry must export to become competitive, there is still scope for effective infant industry protection, to provide a valuable market from which firms can expand. However, although protection could be effective in developing the initial market, it is recommended that firms should be expected to undertake exports from an early stage. The attainment of international competitiveness should be a priority.

The state can also assist firms in these sectors through the allocation of finance, tax allowances and the necessary infrastructure required for development. As assistance has certain opportunity costs, however, the state should ensure that

resources are effectively utilised. Established performance criteria, based on the extent of exports, in-house training or R & D undertaken, should be met by all recipients and firms which prove ineffective, should be excluded from further assistance. By selectively affording assistance, the state can effectively increase the likely success of its policy.

The effectiveness of the state to select appropriate sectors and use the measures available to it to promote the development of the industry, requires it to consolidate its resources. At present different institutions are responsible for implementing state policy and the policy of the Reserve Bank may, therefore, conflict with that of the Board of Trade and Industry or the Department of Customs and Excise. It should be stressed that in order for the state to intervene successfully in the development of a viable electronics industry, a cohesive and comprehensive policy should be implemented in pursuance of technological development and international competitiveness.

BIBLIOGRAPHY

Abramovitz, M: Resources and Output Trends in the United States since 1870, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Adelman, I: Beyond Export-Led Growth, World Development, Vol. 12, No. 9, pp937-949, 1984.

Agarwal, S: Electronics in India: Past Strategies and Future Possibilities, World Development, Vol. 13, No. 3, pp273-292, 1985.

Alcock & Swift: Choosing distributed control systems, Control and Instrumentation, May, 1988.

Allen, G: Japan's Economic Expansion, Oxford University Press, 1965.

Allen, G: How Japan Competes, The Institute of Economic Affairs, 1978.

Allgeier, P: Korean Trade Policy in the Next Decade: Dealing with Reciprocity, World Development, Vol. 16, No. 1, pp85-97, 1988.

Amin, A and Goddard, J.B: Technical Change, Industrial Restructuring and Regional Development, Newcastle Upon Tyne, London, Allen & Unwin, 1976.

Amsden, A: Taiwan's Economic History, Modern China, Vol. 5, No. 3, pp341-380, July, 1979.

Amsden, A: The State and Taiwans's Economic Development, in Evans, P; Rueschmeyer, D and Skocpol, T (eds): Bringing the State Back in, Cambridge University press, 1985.

Amsden, A: A theory of Government Intervention in Late Industrialisation, Draft for Forthcoming in Putterman, L and Rueschemeyer, D (eds), The State and Economic Development, 1990.

Ansal, H: Technical Change and Industrial Policy: The Case of Truck Manufacturing in Turkey, World Development, Vol. 18, No. 11, pp1513-1528, 1990.

Archordoguy, M: Mastering the market: Japanese Government Targeting of the Computer Industry, International Organisation, Vol. 43,No. 3, World Peace Foundation and the Massachusetts Institute of Technology, 1988.

Arrow, K: Economic Welfare and the Allocation of Resources for Invention, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Balassa, B: The Tokyo Round and the Developing Countries, World Bank Staff Working Paper, No. 370, February, 1980.

Balassa, B: The Policy Experience of Twelve Less Developed Countries, 1973-1978, World Bank Staff Working Paper, No. 449, April, 1981.

Balassa, B: Developmental Strategies in Semi-Industrial Economies, Baltimore: John Hopkins University press, 1982.

Balassa, B: Incentive Policies and Export Performance in Sub-Saharan Africa, World Development, Vol. 18, No. 3, pp383-391, 1990.

Balmforth, C: The impact of SMT on a spectrum analyser, Electronic Engineering, March, 1987.

Barber, C: Canadian Tariff Policy, Canadian Journal of Economic and Political Science, 12, pp513-530, November, 1955.

Barber, J and White, G: Current Policy Practice and Problems from a U.K Perspective, in Dasgupta and Stoneman (eds): Economic Policy and Technological Performance, Cambridge University Press, 1987.

Barer, J: Instrumentation and Control for the Process Industries, Elsevier Applied Science Publishers, London and New York, 1985.

Barrow, C: How distributed should they be?, Electronics and Instrumentation, September, 1983.

Bastos, M: State Policies and Private Interests; The Struggle over Information Technology Policy in Brazil, forthcoming in Schmitz, H and Cassiolato, J (eds): Hi Tech for Industrial Development, Institute of Development Studies, University of Sussex, 1990.

Bauer, P.T: Reality and Rhetoric: Studies in the Economics of Development, London, Wiedenfelds and Nicolson, 1984.

Baumol, W: Welfare Economics and the Theory of the State, 2nd Edition, G. Bell & Sons Ltd, London, 1965.

Bergen, S.A: The R&D/Production Interface: A Four-country Comparison, International Journal of Operations and Production Management, July, pp5-13, 1987.

Beyer, L: The rush to India, Time, June 12, 1989.

Bhagwati, J (ed): International Trade, The MIT Press, Cambridge, 2nd Edition, 1987.

Bhagwiti, J: Trade, Tariffs and Growth, Weidenfield and Nicolson, London, 1969.

Bhalla, A & Fluitman, A: Science and Technology Indicators and Socio-economic Development, World Development, Vol. 13, No. 2, pp177-190, 1985.

Black, A: The Crisis in South African Manufacturing growth: Issues and Alternatives for the Future, Paper presented at the Laussanne Colloquium, Switzerland, 1989.

Black, A: State and market in Industrial Strategy: The implications of rapid growth in the newly industrialised countries for South Africa, Unpublished ADE Discussion Paper, October 1990.

Blaug, M: A Survey of the Theory of Process-Innovations, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Bosworth: Statistics of Technology (Invention and Innovation), Review No. 28, Reviews of U.K Statistical Sources, Heineman Educational, London, 1980.

Bradford, C: Trade and Structural Change: NIC's and next Tier NIC's as Transitional Economies, World Development, Vol. 13, No. 3, pp299-316, 1987.

Browett, J: The Newly Industrialized Countries and Radical Theories of Development, World Development, Vol. 13, No. 7, pp789-803, 1985.

Brown, M: Integrating motor controls, Control and Instrumentation, October, 1988.

Bruton: The search for Development Economics, World Development, Vol.13, No.10/11, pp1099 - 1125, 1985.

Buchanan, J: Rent seeking and Profit Seeking, in Buchanan, J; Tollison, R; Tullock, G (eds): Towards a Theory of Rent-Seeking Society, College Station, University Press, 1980.

Business Equipment Association of South Africa: A strategic report on the future of the South African Information Technology Industry presented to the Board of Trade and Industry, Nov. 15, 1988.

Business and Marketing Intelligence: The South African Electronics Industry, Management Report & Global Scenario, August, 1985.

Business and Marketing Intelligence: The South African Electronics Industry, Vol. 1, Third Edition, January, 1988.

Business and Marketing Intelligence: The South African Electronics Industry, Fourth Edition, January, 1989.

Business and Marketing Intelligence: The 1991 South African Electronics Industry Diary, 1991.

Card, D: Instrument makers comeback to CASE: Beat it or join it, Electronic Business, July 1, 1988.

Chen, T: Comparing technical efficiency between Import-substitution orientated and export orientated foreign firms in a developing economy, Journal of Development Economics, Vol. 26, No. 2, 1987.

Chenery, K: Interaction between theory and observation of development, World Development, Vol. 11, No. 10,1983.

Chenery, K and Srivivasan: Handbook of Development Economics, Vol. 1, Elsevier Science Publishers B.V, 1988.

Choksi, A: State Intervention in the Industrialization of Developing Countries: Selected Issues, World Bank Staff Working Paper, No. 341, July, 1979.

Chow, P: Causality between export growth and Industrial Development, Journal of Development Studies, Vol. 26, No. 1, 1987.

Clarke, R & Harwood, J: Thermal flowmeter join the work horses, Control and Instrumentation, May, pp123-125, 1988.

Clevett, K: Process Analyzers Move On-line, Control and Instrumentation, September, pp51-56, 1988.

Cline, W: Can the East Asian Model of Development be Generalized, World Development, Vol. 10, No. 2, pp81-90, 1982.

Cline, W: Reply [to Ranis, 1985], World Development, Vol. 13, No. 4, pp547-548, 1985.

Cohen, B: Comparative Behaviour of Foreign and Domestic Export Firms in a Developing Economy, The Review of Economics and Statistics, October, pp190-197, 1972.

Coombs, R; Saviotti, P & Walsh, V: Economics and technological change, Macmillan Education, 1987.

Corbo, V & Woo Nam, S: Korea's Macroeconomic Prospects and Policy Issues for the Next Decade, World Development, Vol. 16, No. 1, pp35-45, 1988.

Corden, W: The Structure of a Tariff System and the Effective Protective Rate, Journal of Political Economy, Vol. 74, No. 3, pp221-237, 1966.

Correa, C: Software Industry: An Opportunity for Latin America, World Development, Vol. 18, No. 11, pp1587-1598, 1990.

Costa, A: The pressure towards protection, is it systemic? A legacy of the recession, World Development, Vol. 12, No. 10, pp1051 - 1061, 1984.

Critchley, O: The enigma of the engineer, IEE Proceedings, May, 1988.

Dahlman, C and Westphal, L: Technological Effort in Industrial Development: A Survey, in Stewart, F and James, J (eds): The Economics of New Technology in Developing Countries, London, Frances Printer, 1982.

Dahlman, C; Ross-Larson, B; Westphal, L: Managing Technical Development, World Development, Vol. 15, No. 6, pp759-777, 1987.

Dasgupta, P and Stoneman, P (eds): Economic Policy and Technological Performance, Cambridge University Press, 1987.

Dasgupta, P: The Economic Theory of Technology Policy, in Dasgupta, P and Stoneman, P (eds): Economic Policy and Technological Performance, Cambridge University press, 1987.

De Vries, B: Export Promotion Policies, World Bank Staff Working Paper, No. 313, January, 1979.

Denison, E: United States Economic Growth, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Dosi, G: Technological Paradigms and Technological Trajectories: A suggested Interpretation of the determinants and directions of technical change, World Development, Research Policy, Vol. 11, No. 3, 1983.

Du Plessis, S: Effective Tariff protection in South Africa, South African Journal of Economics, Vol. 44, No. 2, pp158-170, 1976.

Dumortier, D: New technologies, new packages and new linear products, Electronics and Instrumentation, May, 1983

Eckaus, R: Observations on the conditionality of international financial institutions, World Development, Vol. 10, No. 9, pp767-780, 1982.

Eckaus, RS: Some Temporal Aspects of Development - A Survey, World Bank, No. 626, 1983.

Edgar, TF: Current Problems in Process Control, IEEE Control Systems, April, 1987.

Edwards, S: Financial Deregulation and Segmentation Capital Markets: The Case of Korea, World Development, Vol. 16, No. 1, pp185-194, 1988.

Egea, A: Choice of Technique Revisited: A Critical Review of the Theoretical Underpinnings, World Development, Vol. 18, No. 11, pp1445-1456, 1990.

Electronics News: Various Issues, Systems Publishers (Pty) Ltd, Publico.

Engineering Week: Various Issues, Systems Publishers Pty) Ltd, Publico.

Engstrom, G: Electronics in future power systems, Electronics and Instrumentation, March, 1983.

Enos, J: Government Intervention in the Transfer of Technology: the Case of South Korea, IDS Bulletin, Vol. 15, No. 2, 1984.

Enos, J and Park, W: The Adoption and Diffusion Of Imported Technology: The Case of Korea, Croom Helm, 1988.

Erber, F: The Development of the 'Electronics Complex' and Government Policies in Brazil, World Development, Vol. 13, No. 3, pp293-309, 1985.

Ergas : The Importance of Technology Policy, in Dasgupta, P and Stoneman, P (eds): Economic Policy and Technological Performance, Cambridge University Press, 1987.

Ernst, D: Automation and the Worldwide Restructuring of the Electronics Industry: Strategic Implications for Developing Countries, World Development, Vol. 13, No. 3, pp333-352, 1985.

Evans, WA: Design of a portable thermocouple calibrator, IEE Proceedings, January, 1988.

Evans, D; Alizadeh, P: Trade, Industrialisation, and the Visible Hand, Journal of Development Studies, Vol. 21, No. 1, 1984.

Feder, G: On Exports and Economic Growth, World Bank Staff Working Paper, No. 508, February, 1982.

Feinstein, A: Lessons from the Korean Economic Miracle, Unpublished paper, King's College, Cambridge, 1990.

Financial Mail: Inflation: Botha's baby, July 28, 1989.

Findlay, R: The Foreign Exchange Gap and Growth in Developing Countries, in Bhagwati et al (eds): Trade, Balance of Payments and Growth, North Holland, Amsterdam, 1971.

Fitzgerald, K: Technology '88 : Instrumentation, IEEE Spectrum, January, 1988.

Forsyth, D: Technical Rigidity and appropriate Technology in LDC's, World Development, Vol. 8, No. 5/6, 1980.

Foster-Carter, A: Korea and dependence Theory, Monthly Review, Vol. 37, No. 5, 1985.

Fosu, A: Exports and Economic Growth: The African Case, World Development, Vol. 18, No. 6, pp831-835, 1990.

Frank, A: The Development of Underdevelopment, Monthly Review, Vol. 18, No. 4, pp17-31, September, 1966.

Frank, A: Capitalism and Underdevelopment in Latin America: Historical Studies of Chile and Brazil, New York, Monthly Review Press, 1967.

Frank, I: Trade Policy Issues for the Developing Countries in the 1980s, World Bank Staff Working Paper, No. 478, August, 1981.

Frankland P, Teaching new dogs old tricks, Control and Instrumentation, October, 1988.

Fransman, M & King, K : Technological Capability of the Third World, MacMillan, 1984a.

Fransman, M: Explaining the Success of the Asian NICs: Incentives and Technology, IDS Bulletin, Vol. 15, No. 2, pp50-56, 1984b.

Fransman, M: Conceptualizing Technical Change in the Third World in the 1980's: An interpretive Survey, Journal of Development Studies, Vol. 21, No. 4, pp573-639, 1985.

Fransman, M: Technology and Economic Development, Wheatsheaf Books, 1986a.

Fransman, M: International Competitiveness, Technical Change and the State: The Machine Tool Industry in Taiwan and Japan, World Development, Vol. 14, No. 12, pp1375-1396, 1986b.

Fry, T: Made to Measure & Control, Food industries of South Africa, February, 1987.

Galef, B: Diffusion of Analytical Instruments, Yale University, Unpublished PhD, 1983.

Ganser: Innovation, Technical assistance, and development, World Development, Vol. 16, No. 6, 1988.

Geldard, N: Process control for boilers, Electronics and Instrumentation, April, 1982.

Gilder, C: A modular instrumentation system using the VMEbus, Electronic Engineering, April, 1986.

Girvan, N & Marcelle, G: Overcoming Technological Dependency: The Case of Electric Arc (Jamaica) Ltd, A Small Firm in a Small Developing Country, World Development, Vol. 18, No. 1, pp91-107, 1990.

Gomulka, S: The Theory of Technological Change and Economic Growth, Routledge, London, 1990.

Gray, J: The State and the Rural Economy in the Chinese People's Republic, in White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

Greenaway, D: Economic Development and International Trade, St. Martins Press, New York, 1988.

Griffiths, M: Old techniques are keeping pace, Control and Instrumentation, March, 1989.

Griliches, Z: Hybrid Corn and the Economics of Innovation, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971a.

Griliches, Z: Research Costs and Social Returns: Hybrid Corn and Related Innovations, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971b.

Griliches, Z: The Sources of Measured Productivity Growth: United States Agriculture, 1940-1960, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971c.

Griliches, Z et al: The Value of Patents as Indicators of Inventive Activity, in Dasgupta, P and Stoneman, P (eds): Economic Policy and Technological Performance, Cambridge University Press, 1987.

Gulhati, R: Industrial Strategy for Late Starters: The experience of Kenya, Tanzania and Zambia, World Bank Staff Working Paper, No. 457, May, 1981.

Guterl, F: Technology '84 : Instrumentation, IEEE Spectrum, January, 1984.

Guterl, F: Technology '85 : Instrumentation, IEEE Spectrum, January, 1985.

Guterl, F: Technology '86 : Instrumentation, IEEE Spectrum, January, 1986.

Hammond, E: Trades unions changing role, Control and Instrumentation, October, 1988.

Haraman, E: The design of a bench top oscillator, Electronic Engineering, October, 1985.

Harvey, K: 'Why calibrate? - That is the question, Electronics and Instrumentation, February, 1983.

Hasan, P: Growth and Structural Adjustment in East Asia, World Bank Staff Working Paper, No.529, March, 1982.

Havrylyshyn, O & Alikhani, I: Is there cause for Export Optimism?, Finance and Development, Vol. 20, 1983.

Havrylyshyn, O: Trade among Developing Countries: Theory, Policy Issues, and Principal Trends, World Bank Staff Working Paper, No. 479, August, 1981.

Helleiner, G: Manufactured Exports From Less Developed Countries and Multinational Firms, The Economic Journal, March, pp21-47, 1973.

Helleiner, G: Intrafirm Trade and the Developing Countries, Journal of Development Economics, Vol. 6, pp391-406, 1979.

Helpman, E and Krugman, P: Market Structure and Foreign Trade, The MIT Press, Cambridge, 1986.

Henley, N: A reappraisal of the capital goods sector in Hong Kong - The Case for Free Trade, World Development, Vol. 13, No. 6, pp737-749, 1985.

Herbert-Copley, B: Technical Change in Latin American Manufacturing Firms: Review and Synthesis, World Development, Vol. 18, No. 11, pp1457-1469, 1990.

Hewitt, T: Employment and Skills in the Brazilian Electronics Industry, in forthcoming Schmitz, H and Cassiolato, J: Hi-Tech for Industrial Development, Institute of Development Studies, University of Sussex, 1990.

Hoffman, K: Microelectronics, International Competition and Development Strategies: The Unavoidable Issues - Editors Introduction, World Development, Vol. 13, No. 3, pp263-272, 1985a.

Hoffman, K: Clothing, Chips and Competitive Advantage: The Impact of Microelectronics on Trade and Production in the Garment industry, World Development, Vol. 13, No. 3, pp371-392, 1985b.

Hone, A: Multinational Corporations And Multinational Buying Groups: Their Impact On The Growth Of Asia's Exports Of manufactures- Myths and Realities, World Development, Vol. 2, No. 2, pp145-149, 1974.

House, C: A marriage of computers and test equipment, IEEE Spectrum, January, 1985.

Hove, J: Export Instability : An Alternative Analysis of Causes, Journal of Development Studies, Vol. 21, No. 2, 1984.

Iqbal, F: External Financing for Korea: The Next Phase, World Development, Vol. 16, No. 1, pp137-155, 1988.

Ishikawa S: Essays on technology, employment and institutions in Economic Development : Comparative Asian experience, Tokyo, 1980.

Iso, H & Yoshida, T: Instrumentation and Control for a Refining Process in Steelmaking, IEEE Control Systems Magazine, October, 1987.

Jacobsson, S: Industrial Policy for the machine tool industries of South Korea and Taiwan, IDS Bulletin, Vol. 15, No. 2, 1984.

Jacobsson, S: Technical Change and Industrial Policy: The Case of Computer Numerically Controlled Lathes in Argentina, Korea and Taiwan, World Development, Vol. 13, No. 3, pp353-370, 1985.

Jones, S: Economic growth in the long-run and in the short run, Economic History Society of Southern Africa, July, 1988.

Jones,D & Womacvk, J: Developing Countries and Future of the Automobile Industry, World Development, Vol. 13, No. 3, pp393-407, 1985.

Kamien, H and Schwatz, N: Market Structure and Innovation, Cambridge, Cambridge University Press, 1982.

Kaplan, D: Machinery and Industry: The Causes and consequences of the Constrained Development of the South African Machine Tool Industry, Social Dynamics, Vol. 13, No. 1, 1987.

Kaplan, D: The South African Capital Goods Industry, with special reference to the manufacture of Machine tools and Telecommunications equipment: A comparative study, Department of Economic History, University of Cape Town, Unpublished Report, 1989.

Kaplan, D: The South African Telecommunications Industry: State Policy and Technological Change, Unpublished Draft of Manuscript, 1990.

Kaplinsky, R. : The International context for Industrialisation in the coming Decade, Journal of Development Studies, Vol. 21, No.1, 1984a.

Kaplinsky, R: Automation: the Technology and Society, Longman, 1984b.

Kaplinsky, R:Electronics-based Automation Technologies and the Onset of Systemofacture: Implications for Third World Industrialization, World Development, Vol. 13, No. 3, pp423-439, 1985.

Katrak, H: Imports of Technology and the Technological Effort of Indian Enterprises, World Development, Vol. 18, No. 3, pp371-381, 1990.

Keesing, D: Outward-Looking Policies and Economic Development, The Economic Journal, pp303-320, June, 1967.

Kellman, M & Landau, D: The Nature of Japan's Comparative Advantage 1965-80, World Development, Vol. 12, No. 4, pp433-438, 1984.

Kemper, R: The Tokyo Round: Results and Implications for Developing Countries, World Bank Staff Working Paper, No. 372, February, 1980.

Kim, K & Mills, E: Korean Development and Urbanization: Prospects and Problems, World Development, Vol. 16, No. 1, pp157-167, 1988.

Kim, J: The effects of Tariffs and export subsidies on entry barriers and investment, University of California, Berkley, 1987.

Kim, W & Yun, K: Fiscal Policy and Development in Korea, World Development, Vol. 16, No. 1, pp65-83, 1988.

Kim, K: Korea in the 1990s: Making the Transition to a Developed Economy, World Development, Vol. 16, No. 1, pp7-18, 1988.

Kindelberg and Herrick: Economic development, Third Edition, Mc Graw-Hill, 1977

Kitamori, T, Suda, N, Shimemura, E & Masubuchi, M: Control Engineering in Japan: Past and Present, Control Systems Magazine, November, 1984.

Kletz T: Wise after the event, Control and Instrumentation, October, 1988.

Koselka, R: Made in the USA, Forbes, June 15, 1987.

Krueger, A: Import Substitution versus Export Promotion, Finance and Development, pp20-23, 1985.

Krueger, A: The Effects of Trade Strategies on Growth, Finance and Development, pp6-8, June, 1988.

Kwack, S: Korea's Exchange Rate Policy in a Changing Economic Environment, World Development, Vol. 16, No. 1, pp169-183, 1988.

Kwon, J: Capital Utilisation, Economies of Scale and technical growth of total factor productivity : An explanation of South Korean manufacturing growth, Journal of Development Economics, Vol. 24, No. 1, 1986.

Lal, D: The Poverty of Development Economics, London, Institute of Economic Affairs, Hobart Paperback, No. 16, 1983.

Lall, S; Khanna, A & Alikhani, I: Determinants of Manufactured Export Performance in Low-income Africa: Kenya and Tanzania, World Development, Vol. 15, No. 9, pp1219-1224, 1987.

Leach, T: Test and Measurement Market Trends, Electronics and Wireless World, Industry Insight, February, pp150-151, 1988.

Lee, K: Rational and Non-rational Expectations of Inflation in Korea, World Development, Vol. 16, No. 1, pp195-205, 1988.

Leipziger, D: Editors Introduction: Korea's Transition to Maturity, World Development, Vol. 16, No. 1, pp1-5, 1988a.

Leipziger, D: Industrial Restructuring in Korea, World Development, Vol. 16, No. 1, pp121-135, 1988b.

Lerner, E: Technology '82 : Instrumentation, IEEE Spectrum, January, 1982.

List, F: The National System of Political Economy, Translated by Lloyd, Longmans and Co., London, 1904.

Little, I: An Economic Reconnaissance, in Galenson, W (ed): Economic Growth and Structural Change in Taiwan, Cornell University Press, New York, 1979.

Little, I: Economic Development: Theory, Policy and International Relations, Basic Books, 1982.

Little, I, Scitovsky,T & Scott, M: Industry and trade in some Developing Countries: A comparative study, Oxford University Press, London, 1970.

Love, J: The Decline In Export Instability, University of Strathclyde - Bulletin, pp355-358, 1987.

Luedde-Neurath, R: State Intervention and Export-orientated Development in South Korea, in White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

Macdonald, N: Precise temperature measurement important for Accuracy, Electronics and Instrumentation, October, 1981.

Magogunje, A: The Development Process : A spatial perspective, Hutchinson, 1980.

Maiola, F: Programmable Controllers and their impact on productivity, Electronics and Instrumentation, April, 1982.

McClenahen, JS: Global averaging, Investment Week, February 15, 1988.

McGeehin, P: Developing optical sensors, Control and Instrumentation, December, 1988.

McMohon, V: The 'last' industrial timer, Electronics and Instrumentation, February, 1982.

Meier, G and Balwin: Economic Development - theory, history and policy, Wiley, 1963.

Meier, G: Leading Issues in Economic Development, New York, Oxford University Press, 1976.

Miller, M: Pressure gauges and indicators, Control and Instrumentation, March, 1989.

Milner, L: Trade Strategies and Economic Development: Theory and Evidence, in Greenaway, D (ed): Economic Development and International Trade, St Martin's Press, New York, 1988.

Mintz, S: Standard Instrumentation gives exports full measure, S&MM, September 12, 1983.

Mittermaier, K & Torr, C: The Appropriate Role of Government in the Future Economic Development of South Africa, Biennial conference paper, South African Economic Society, University of the Witswatersrand, September, 1989.

McLain, D: Conductive plastic potentiometric transducers, Electronics and Instrumentation, March, 1983.

Montague, G & Morris, A: Consideration in Control Scheme Development for Fermentation Process Control, IEEE Control Systems Magazine, April, 1988.

Moore, M: Miracles and Mysteries in the Economic Take off of Taiwan and South Korea, Journal fur Entwicklungspolitik, No. 2, pp2-12, 1987a.

Moore, M: Private versus State Capitalism? A Reply to Chen and Wiedemann, Draft of paper for Journal fur Entwicklungspolitik, The Institute of Development Studies, 1987b.

Moore, M: Economic Growth and the Rise of Civil Society: Agriculture in Taiwan and South Korea, in White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

Morishima, M: Western technology and the Japanese ethos, Cambridge University Press, 1982.

Nayyar, D: Transnational Corporations and Manufactured Exports from Poor Countries, The Economic Journal, March, pp59-84, 1978.

Nelson, R: The Simple Economics of Basic Scientific Research, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Nelson, R: Government and Technical Progress, Pergamon Press, 1982.

Nelson, R: Understanding Technical Change as an Evolutionary Process, Professor Dr. F de Vries: Lectures in Economics, Theory, Institutions, Policy, Elsevier Science Publishers B.V, 1987.

Nethersole, MJ: Marketing electronic instrumentation and control equipment in South Africa, MBL, UNISA, March, 1974.

Newton, T: Ministering to the need, Control and Instrumentation, October, 1988.

Newton, M: Systems integrator keeping on line, Control and Instrumentation, June, 1988.

O'Connel, K.J: Uses and abuses of technology, IEE Proceedings, May, 1988.

O'connor, D: The Computer industry in the Third World: Policy Options and Constraints, World Development, Vol. 13, No. 3, pp311-332, 1985.

Olson, M: The Rise and Decline of Nations, Yale University Press, New Haven, 1982.

Opie, R: 30 Years in the C&I industry, Control and Instrumentation, October, 1988.

Opie, R: Level measurement in tough conditions, Control and Instrumentation, March, 1988.

Opie, R: Sensing: Old or new?, Control and Instrumentation, October, 1988.

Opie, R: On-line density measurement, Control and Instrumentation, December, 1988.

Opie, R: Living on the bread line, Control and Instrumentation, July, 1988.

Opie, R: Electronic testing equipment, Control and Instrumentation, November, 1988.

Ozawa, T: Japan Technological Challenge to the West, 1950-1974: Motivation and Accomplishment, MIT Press, Cambridge, 1974.

Pack, H & Westphal, L: Industrial Strategies and Technological change, Theory vs Reality, Journal of Development Economics, Vol. 22, No. 1, 1986.

Page, J: Small Enterprises in African Development: A Survey, World Bank Staff Working Paper, No. 363, October, 1979.

Park, S: Labour Issues in Korea's Future, World Development, Vol. 16, No. 1, pp99-119, 1988.

Parsons, P: Auto-zero facility for instrumentation amplifier, Electronic Engineering, April, 1986.

Perez, C: Microelectronics, Long Waves and World Structural Change: New Perspectives for Developing Countries, World Development, Vol. 13, No. 3, pp441-463, 1985.

Petri, P: Korea's Export Niche; Origins and Prospects, World Development, Vol. 16, No. 1, pp47-63, 1988.

Poznanski, K: Patterns of Technology Imports: Interregional Comparison, World Development, Vol. 14, No. 6, pp743-756, 1986.

Prebisch, R: The Economic Development of Latin America and its Principal Problems, New York, United Nations Economic Commission on Latin America, 1950.

Price, D: The science/technology relationship, the craft of experimental science, and policy for the improvement of high technological innovation, Elsevier Science Publishers B.V., North-Holland, March, 1983.

Purchon, G & Pegg, T: The digital control-architecture of a microwave sweeper, Electronic Engineering, March, 1987.

Qi, W: South Korea and Taiwan: A Comparative Analysis of Economic Development, Institute of Development Studies, November, 1988.

Qureshi, U: One-off calibration of DVMs, Electronic Engineering, April, 1986.

Rajapatirana, S: Industrialisation and Foreign Trade, Finance and Development, Vol. 24, No. 3, 1987.

Ranis, G: Can the East Asian Model of Development be Generalised? A Comment, World Development, Vol. 13, No. 4, pp543-545, 1985.

Rath, A: Science, Technology, and Policy in the Periphery:A perspective from the Centre, World Development, Vol. 18, No. 11, pp1429-1443, 1990.

Readman, G: 'Low cost micros and distribution, Control and Instrumentation, May, 1988.

Redding, B: Wireless control and measurement, Control and Instrumentation, May, 1988.

Reeve, A: Quality assurance for future survival, Control and Instrumentation, March, 1988.

Reeve, A: Not a drop to spare, Control and Instrumentation, August, 1988.

Reeve, A: Promoting the C&I profession, Control and Instrumentation, October, 1988.

Reeve, A: The loop stops here, Control and Instrumentation, October, 1988.

Reeve, A: Identifying uncertainty in measurement, Control and Instrumentation, January, 1989.

Renaud, B: Economic Fluctuations and Speed of Urbanization: A Case study of Korea 1955-1975, World Bank Staff Working Paper, No. 270, November, 1977.

Rhee, Y & Westphal, L: A Micro, Econometric Investigation Of Choice Of Technology, Journal Of Development Economics, No. 4, pp205-237, 1977.

Rhee, Y & Ross-Larson, B : Korea's Competitive Edge - Managing the Entry into World Markets, A World Bank Publication, The John Hopkins University Press, September, 1984.

Roberts, G: South Korea to 1990 - Liberalization for growth, The Economist Intelligence Unit, Special Report No. 225, 1985.

Robinson, A: Appropriate Technologies for 3rd World Development: Proceedings of a Conference held by the International Economics Association London, MacMillan, 1979.

Rolls, T: Instrumentation in the heat treatment industry, Electronics and Instrumentation, August, 1982.

Rosenburg, H: The Economics of Technological Change, Harmondsworth, Penguin, 1971.

Rosenburg, N: Inside the Black Box: Technology and Economics, Stanford University, Cambridge University Press, 1982.

Ruttan, V: Usher and Schumpeter on Invention, Innovation and Technological Capability, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Saeed, K: Government Support for Economic Agendas in Developing Countries: A Behavioral Model, World Development, Vol. 18, No. 6, pp785-801, 1990.

Samuelson, P: Economics, 10th Edition, McGraw-Hill, Koyakuka, Tokyo, 1976.

Sarris, A and Adelman, I: Incorporating Uncertainty into Planning of Industrialization Strategies for Developing Countries, World Bank Staff Working Paper, No. 503, 1982.

Scalipino, P.A: The Foreign Policy of Modern Japan, University of California Press, United States, 1977.

Scherer, F: Industrial Market Structure and Economic Performance, 2nd Edition, Rand McNally, Chicago, 1980.

Scherer, F: Innovation and Growth: Schumpeterian Perspectives, The MIT Press, Cambridge, 1986.

Schmitz, H: Industrialisation Strategies in Less Developed Countries: Some Lessons of Historical Experience, Journal of Development Studies, Vol. 21, No. 1, 1984.

Schmookler, J: Invention and Economic Growth, Harvard University Press, 1966.

Schonberger, R: Japanese Manufacturing Techniques, The Free Press, 1982.

Schware, R : Software Industry Development in the Third World: Policy Guidelines, Institutional Options, and Constraints, World Development, Vol. 15, No. 10/11, pp1249-1267, 1987.

Schydlowsky, A: A policy makers guide to comparative advantage, World Development, Vol. 12, No. 4, April, pp439 - 451, 1984.

Scott, M: Foreign Trade, in Galenson, W (ed): Economic Growth and Structural Change in Taiwan, Cornell University Press, New York, 1979.

Shapiro,H and Taylor, L: The State and Industrial Strategy, World Development, Vol. 18, No. 6, pp 861-878, 1990.

Sharpston, M: International Subcontracting, World Development, Vol. 4, No. 4, pp333-337, 1976.

Singer, H: Commentary: The World Development Report 1987 on the Blessings of 'Outward Orientation': A Necessary Correction, The Journal of Development Studies, Vol. 24, No. 2, 1988.

Singer, H and Gray, P : Trade Policy and Growth of Developing Countries: Some New Data, World Development, Vol. 16, No. 3, pp395-403, 1988.

Slob, G: Computerizing Apartheid, Export of computer hardware to South Africa, Komitee Zuidelijk Afrika, Amstredam, May 1990.

Smith, S & Toye, J: Three stories about Trade and Poor Countries, Journal of Development Studies, 1979.

Smith, R: Where is our industry going?, Control and Instrumentation, October, 1988.

Sodersten, B: International Economics, Second Edition, Macmillan Publishers, London, 1980.

Soete, L: International Diffusion of Technology, Industrial Development and Technological Leapfrogging, World Development, Vol. 13, No. 3, pp409-422, 1985.

Soisson, HE: Instrumentation in Industry, A Wiley Interscience Publication, 1975.

Solow, R: Technical Change and the Aggregate Production Function, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

South African Federated Chamber of Industries: Team RSA: Exports and Europe 1992, September, 1989.

Steinberg, D: Sociopolitical Factors and Korea's Future Economic Policies, World Development, Vol. 16, No. 1,pp19-34, 1988.

Stewart, F: Technology and Underdevelopment, Westveiw Press, May, 1977.

Stewart, F and James, J: The economics of new Technology in Developing Countries, London, Frances printer, 1982.

Stewart, F: The Fragile Foundations of the Neoclassical approach to Development, Journal of Development Studies, Vol. 21, No. 2, 1985.

Stiglitz :Learning to Learn, Localised Learning and Technological Progress, in Dasgupta, P and Stoneman, P (eds): Economic Policy and Technological Performance, Cambridge University Press, 1987.

Stoneman, P: The Economic Analysis of Technological Change, Oxford University Press, 1983.

Stoneman, P: Some Analytical Observations of Diffusion Policies, in Dasgupta, P and Stoneman, P (eds): Economic Policy and Technological Performance, Cambridge University Press, 1987.

Streeton, P: Trade strategies for development, Cambridge, Overseas Study Committee, Macmillan, 1972.

Swindells, R: Petrochemicals in perspective, Control and Instrumentation, October, 1988.

Swords-Isherwood, N & Senker, P: Microelectronics and the Engineering Industry, Science Policy Research unit, Frances Printer Ltd, London, 1980.

Taussig, F: The tariff History of the United Nations, New York, Putman, 1914.

Taylor, R.A: Trends in process control, Electronics and Instrumentation, April, 1982.

Teitel, S : Science and Technology indicators, Country size and Economic Development: An International Comparison,World Development, Vol. 15, No. 9, pp1225-1235, 1987.

Terry, W: The History of Instrumentation, Electronic Engineering, March, 1988.

Teubal, M: The Role of Technological Learning in the Exports of Manufactured Goods: The Case of Selected Capital Goods in Brazil, World Development, Vol. 12, No. 8, pp849-865, 1984.

Teubal, M; Halevi, N and Tsiddon, D: Learning and the Rise of Israel's exports of Sophisticated Products, World Development, Vol. 14, No. 12, pp1397-1410, 1986.

The Economist: Business : Chipmakers suffer delusions of middle age, July 1, 1989.

The Economist: A good recession, July, 1989.

The Economist: High - tech jingoism, July 1, 1989.

Tiffin, S; Adjebeng-Asem, S and Afolabi, O: Technological innovation and Technical Entrepreneurship for the Development of a Nigerian Agricultural Machinery Industry, World Development, Vol. 15, No. 3, pp387-398, 1987.

Tinham, B: Controllers can put safety first, Control and Instrumentation, January, 1988.

Tinham, B: Is flow technology still in its infancy?, Control and Instrumentation, February, 1988.

Tinham, B: PC graphics are key to low cost automation, Control and Instrumentation, February, 1988.

Tinham, B: Pneumatic control puts on the pressure, Control and Instrumentation, April, 1988.

Tinham, B: Northern C&I Manchester show, Control and Instrumentation, May, 1988.

Tinham, B; Distributed systems embrace advances, Control and Instrumentation, May, 1988.

Tinham, B: Measuring the pace of temperature, Control and Instrumentation, July, 1988.

Tinham, B: Evolution of the control species, Control and Instrumentation, October, 1988.

Tinham, B: 30 years on, Control and Instrumentation, October, 1988.

Tinham, B: ISA Houston shows new vibrancy, Control and Instrumentation, November, 1988.

Tinham, B: Micro controllers get macro power, Control and Instrumentation, January, 1989.

Torfs, P: With Europe's market unity comes IS urgency, Datamation, March 1, 1989.

Toye, J: Dilemmas of development, Oxford, Basil Blackwell, 1987.

UNIDO: General Issues of Industrial Policy, UNIDO Monographs on Industrialization, No. 20, November, 1967.

WPMP: Optimising Technology Development in South Africa, confidential report, January, 1987.

UNIDO: The Capital Goods Industry in Africa: A general Review and Elements For Further analysis, Sectoral Studies Series, No.14, 1984.

UNIDO: Industrial Policies and Strategies in Developing Countries: An analysis of local content regulations, Industry and Development, 1986.

United Nations: The capital Goods sector in Developing Countries, United Nations Conference on Trade and Development, 1985.

Usher, A: Technical Change and Capital Formation, in Rosenburg, N (ed), The Economics of Technical Change, Penguin Books, England, 1971.

Van Zyl: The economics of instrumentation on gold mining reduction plants, MBA Research paper, University of Cape Town, November, 1979.

Vessuri, H: O Inventamos O Erramos: The Power of Science in Latin America, World Development, Vol. 18, No. 11, pp1543-1553, 1990.

Vitta, P: Technology Policy in Sub-Saharan Africa:Why the Dream Remains Unfulfilled, World Development, Vol. 18, No. 11, pp 1471-1880, 1990.

Voelcker, J: Technology '87 : Instrumentation, IEEE Spectrum, January, 1987.

Wade, R: State Intervention in 'Outward-looking' Development: Neoclassical Theory and Taiwanese Practice, in White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

Wade, R: The Role of Government in Overcoming Market Failure: Taiwan, Republic of Korea and Japan, in Hughes, H (ed): Achieving Industrialisation in East Asia, Cambridge University Press, 1988.

Warren & Lowe: The production of school science equipment: a review of developments, Commonwealth Secretariat, London, 1975.

Watanabe, S: Exports and Employment: the Case of the Republic of Korea, International Labour Review, pp495-526, 1973.

Weiss, J: Japans Post War Protection Policy : Some implications for Less Developed Countries, Journal of Development Studies, Vol. 22, No. 2, 1986.

Weiskopf, T: Economic Development and the development of economics: some Observations from the left, World Development, Vol.11, No. 10, 1983.

Welber, I: Factory of the Future, IEEE Control Systems Magazine, April, 1987.

Westphal, I: Empirical Justification for Infant Industry Protection, World Bank Staff Working Paper, No. 445, Washington DC, 1981.

Westphal, L, Rhee,Y & Pursell, G : Korean Industrial Competence: Where it Came From, World Bank Staff Working Paper, No. 469, July, 1981.

Westphal, L: Managing technological Development: Lessons from the Newly Industrialized Countries, World Development, Vol. 15, No. 6, pp759-775, 1987.

White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

White, G: State and Market in China's Socialist Industrialisation, in White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

White, G; Wade, R: Developmental States and Markets in East Asia: an Introduction, in White, G (ed): Developmental States in East Asia, Macmillan Press, 1988.

Wiegner, KK: Focusing in, Forbes, July, 1983.

Willsky, SA: Challenges to Control in Signal Processing and Communications, IEEE Control Systems Magazine, April, 1987.

Wong: Intermediate technology for development, World Development, Vol. 14, No. 10/11, pp1329 - 1347, 1986.

Wonham, W.M: Some Remarks on Control and Computer Science, IEEE Control Systems Magazine, April, 1987.

World Bank: World Development Report, 1987

World Bank: The Tokyo Round and the Developing Countries, No. 370, 1980.

World Bank: The Tokyo Round and the implication for Developing Countries, No.372, 1980.

World Bank: Korean Industrial Competence : Where it came from, World Bank Staff Working Paper, No. 469, 1981.

World Bank: Trade patterns in developing countries 1970 - 1981, World Bank Staff Working Parers, No. 642.

World Bank : Korea Development in a Global Context, A World Bank Country Study, Washington, 1984.

World Bank: Incorporating uncertainty into planning of industrialisation Strategies for Developing Countries, World Bank Staff Working papers, No.503, 1982.

Yamazawa, I: Trade Policy and Changes In Japan's Trade Structure, Developing Economies, Vol. 13, No. 1, pp374-399, 1975.

Yurkovich, S: Control Education, IEEE Control Systems Magazine, April, 1989.

Yusuf, S: KOREA - Development in a Global Context, A World Bank Country Study, December, 1984.

Zarenda, H: The Policy of State Intervention in the Establishment and Development of manufacturing Industry in South Africa, Unpublished Masters Thesis, University of the Witswatersrand, Johannesburg, 1977.

Government Publications:

Board of Trade and Industry: Guide to the Policy and Procedure Relative to Customs Tariff Protection and Tariff Relief, RSA, 1980.

Board of Trade and Industry: Verlaging van die Reg op Sekere am-en Voltmeters, Report Number 2438, RSA, 1984.

Board of Trade and Industry: Investigation into the South African Electronics Industry, Republic of South Africa, Report Number 2455, Unpublished, 1986.

Board of Trade and Industry: A Policy and Strategy for the Development and Structural Adjustment of Industry in the Republic of South Africa, RSA, 1987.

Central Statistical Services, RSA, Various.

Customs and Excise: Monthly Bulletin of Trade Statistics, January to December 1989, RSA, 1989.

Customs and Excise: Monthly Bulletin of Trade Statistics, January to February 1990, RSA, 1990.

De Waal Committee: Die Elektronika-Behoeftes van die Publieke Sektor, Verslag van die Ondersoekkomitee in opdrag van 'n ad-hoc Ministeriele Komitee met Sy Edele Hendrick Schoeman as Voorsitter, December, 1983.

Industrial Development Corporation of South Africa: Die Elektroniese Bedryf in Suid-Afrika, 1981.

Industrial Development Corporation of South Africa: Modification of the Application of Protection Policy, Policy Document, RSA, 1990.

Standing Committee for Electronics: Guide on Local Process-Control and Technical Skills, Republic of South Africa, Issue 1, March, 1987.

Working Group (The) for the Promotion of the Electronics Industry: Final Report, Government Paper, South Africa, 1983.

Working Group (The) for the Promotion of the Electronics Industry: Summary report of the working group for the promotion of the electronics industry, Government Paper, June, 1988.

Working Group (The) for the Promotion of the Electronics Industry: Final Report, Government Paper, South Africa, 1987.

SURVEY CONCERNING THE FURTHER DEVELOPMENT

OF THE ELECTRONICS INDUSTRY IN SOUTH AFRICA

July 1990

Questionnaire concerning the further development of the local electronics industry. All results will be treated in the strictest confidence - companies will not be mentioned by name. Please indicate correct answer, where appropriate, with a X.

SECTION 1 - PROFILE OF THE COMPANY.

1.1 Please attach business card.

1.2 List four of your major products or services offered. If of a confidential nature please list as "confidential".

Product or Service	Percentage of Turnover(R)	Description
TOTAL	%	

1.3 Major operation: Please indicate what activity the company specialises in (Indicate as a percentage of Total Activity undertaken).

Activity	%	Description
Research & Development		
Production		
Assembly		
Marketing Agent		
Other (specify):		
Total Activity	100%	

- IE. What Business are you in?

1.4 Date that business started....._____

1.5 Fixed assets (in Rands):

0 - 1 000 000		1 000 000 - 2 000 000	
2 000 000 - 4 000 000		4 000 000 - 8 000 000	
8 000 000 - 15 000 000		15 000 000 - 20 000 000	
20 000 000 - 40 000 000		40 000 000 - 60 000 000	
60 000 000 - above			

1.6 Is there interaction between yourselves and a state agency (eg. IDC, SBDC, Saponet, Armscor)?

YES/__/

NO/__/

1.6.1 If yes, what is the relationship between the company and the state agency(s)?

Relationship	X	Agency concerned	Description
Share Holding			
Loan Capital			
Short term finance			
Grants			
Long Term Contract			
Advisory Service			
Other (specify):			

1.6.3 If no, give reasons for this._____

SECTION 2 - PROFILE OF HOLDING COMPANY.

2. IF INDEPENDENT PLEASE MOVE TO SECTION THREE.

2.1 What is the holding company's name? _____

2.1.1 What is its address? _____

_____

2.2 Is, or was, the ultimate holding company a multinational? YES /__/

NO /__/

IF YES, ANSWER THE FOLLOWING:

2.2.1 Indicate three of the most important advantages experienced through multinational affiliation:

Technology	/__/	Finance	/__/
Management-Skills	/__/	Designs	/__/
Markets	/__/	Other	/__/

2.2.2 Was this relationship affected in any way by sanctions and political instability?

YES /__/ NO /__/

2.2.3 If yes, discuss how your business was affected (eg. sale by holding company).

_____

2.2.4 If yes, has this had any long lasting effect on the viability of the business?

YES /__/ NO /__/

Give details: _____

SECTION 3 - PROFILE OF THE BUSINESS.

3.1 Turnover: In 1989 in Rands

0 - 2 000 000		2 000 000 - 4 000 000	
4 000 000 - 8 000 000		8 000 000 - 16 000 000	
16 000 000 - 30 000 000		30 000 000 - 40 000 000	
40 000 000 - 80 000 000		80 000 000 -120 000 000	
120 000 000 - above			

3.2 Exports as a percentage of turnover. _____%

3.3 Total production costs (TPC) as percentage of turnover. _____%

3.4 Research and Development undertaken as a percentage of Turnover.

_____%

3.4.1 What percentage of R&D undertaken is in the form of Basic and Applied Research?

_____%

3.5 Give indication of source of materials and components used (by value).

Locally sourced materials and components _____%

Imported materials and components _____%

100%

3.6 Four major imported material inputs:

1. _____

2. _____

3. _____

4. _____

SECTION 4 - PROFILE OF EMPLOYEES

4.1 Number of employees....._____

4.2 Give an estimate of the percentage of employees presently employed by the company in the following categories:

Administrative Management	
Technical management	
Clerical (eg. secretarial)	
Skilled (eg. technicians)	
Semi - skilled (eg. apprentices)	
Unskilled (eg. cleaners)	
TOTAL	100%

4.2.1 How many employees are involved only in Research and Development?

_____

4.3 Have you experienced any difficulty in satisfying your manpower requirements?

YES /__/ NO /__/

4.3.1 If yes, give details? _____

_____

4.4 Do you have any formal on the job training? YES /__/ NO /__/

4.4.1 IF YES, ANSWER SECTION 4.5

4.4.2 IF NO, ANSWER SECTION 4.6

4.5 If training is undertaken then answer the following:

4.5.1 What are your training expenses as a percentage of total turnover?

_____%

4.5.2 Give an indication of the training provided and which skills are encouraged.

_____

4.5.3 Are these expenses recovered from the employee? WHOLLY /__/

PARTIALLY /__/

NOT AT ALL /__/

4.5.4 Do you experience a high turnover of trained labour? YES /__/

NO /__/

4.6 If training is not undertaken then answer this section:

4.6.1 Why does your company not offer training? _____

_____

4.6.2 Is trained labour attracted to your company? YES /__/ NO /__/

4.6.3 If yes, for what reason? _____

4.7 Do you consider there to be a shortage of skilled labour in your industry in South Africa?

YES /__/ NO /__/

If yes, then answer the following:

4.7.1 For what reason? _____

_____

4.7.2 What would you consider to be the four most effective methods of improving the situation? RANK IN ORDER OF IMPORTANCE (ie. 1-4).

Effective method	Rank
Better education facilities from school to university level	
Diversity of curriculum - with a view to career opportunities	
Company sponsored training	
Greater opportunities for all graduates	
Non - racial education system	
Other (specify):	

4.7.3 Would you consider the future of South Africa's industry to lie with the further education of the non- White population, in order that they may fill areas demanding skilled personnel?

YES /__/ NO/__/

4.7.4 What form of education facilities should be promoted?
Please Rank from 1 - 3 in order of importance.

School level	
Technikon level	
University level	
Other (specify):	

SECTION 5 - TECHNOLOGY

5.1 Do you have any licence, franchise or technology agreements with an overseas company?

YES /__/ NO /__/

5.2 If yes, answer the following:

5.2.1 With respect to what products?

_____

5.2.2 What percentage of your turnover is subject to these agreements?

_____%

5.2.3 Do these agreements constrain business activities? _____

_____

5.2.4 Does the cost of any such agreement materially affect your competitiveness as an **exporter**?

YES /__/ NO /__/

5.2.5 If yes, give details

_____

5.2.6 Is the process technology used by your firm of foreign origin?

YES/__/ NO/__/

5.3 IF **ANY** TECHNOLOGY USED IS UNLICENSED ANSWER THIS SECTION

5.3.1 Was the technology found in your main product lines developed in South Africa?

YES /__/ NO /__/

5.3.2 If yes, what percentage of your product turnover incorporates this "local" Technology?

_____%

5.3.3 If yes, what is the source of the technology?

Source of Technology	
Public Sector - Basic & Applied Research (eg. CSIR)	
Private Sector - Basic & Applied Research	
Public Sector - Development Research	
Private Sector - Development Research	
Local Adaptation or improvement	
Other (specify):	
TOTAL	100%

5.4 What can be done to improve the technology in terms of appropriateness or advancement ?

(RANK IN ORDER OF IMPORTANCE)

Methods of Increasing South Africa's Technological Base	Rank
Higher education (Technical and University level, with greater interaction with industry)	
Technical Parks)	
Government sponsorship (eg. CSIR)	
Multinational involvement	
Other (specify):	

SECTION 6 - PROFILE OF EXPORT MARKET.

6. FOR EXPORTERS ONLY.

If exports are not undertaken move to section 7.

6.1 To which countries are your products exported?

1st World Countries	
3rd World Countries	
TOTAL	100%

6.2 What are your four main products exported on the international market? If of a confidential nature please list as "confidential".

Products Exported	RANK Identification Number	Percentage of Total Exports
	1	
	2	
	3	
	4	

6.3 Do these products have any particular advantage on the international market?

YES /__/ NO /__/

IF YES, ANSWER SECTION 6.3.1

IF NO, ANSWER SECTION 6.3.2

6.3.1 If yes, indicate five areas (1-5) in which each of the above four products holds some form of advantage allowing it to be successful on the international market.

Reason for Success	Product 1	Product 2	Product 3	Product 4
Foreign Connections				
Marketing Skills				
Long term contracts				
Lower Overheads				
Lower labour costs				
Lower Input Prices				
Favourable Exchange Rates				
Subsidies				
Better Quality				
Superior Technology				
Skilled Labour				
RSA patents				
Technology peculiar to RSA				
Other (specify):				

6.3.2 If previous answer was no, state reason(s) why exports are still undertaken:

6.4 Are you influenced by requests and recommendations by foreign buyers for technical specifications, design, style, or packaging of your exports?

YES /__/ NO /__/

6.5 Has your firm benefited from technical information that buyers provide?

YES/__/ NO/__/

6.6 Do the present import tariff duties affect the competiveness of your exports in any way?

YES /__/ NO /__/

6.6.1 Give reason for answer:_____

6.7 Is the export market particularly hazardous? YES /__/ NO /__/

6.7.1 IF YES, RANK FOUR AREAS IN PARTICULAR:

Possible Hazards	Rank
Dumping on market by foreign firms	
Rate of Technological Advancement	
Political Influence (eg.Sanctions)	
Excessive Competition	
Market Trends	
Other (specify):	

6.8 Has your firm or its executives obtained any special awards or recognition for outstanding export performance?

YES/__/ NO/__/

SECTION 7 - GENERAL

7.1 Has government policy had an influence upon the effectiveness of your industry?

YES /__/ NO /__/

7.1.1 If yes, then indicate, with an X, in which respective areas policy to date has had a negative or positive influence upon the industry's effectiveness. This is a subjective question which must be understood to indicate your view regarding the possible influence of the following factors in the real situation compared with the ideal situation.

Possible Influence	Positive influence	No influence	Negative influence	Recommendation
Education system				
Taxation structure				
Trade policy				
Financing structure (eg. IDC)				
Racial policies				
Other (specify):				

7.2 Does government regularly consult with industry before initiating policy?

YES /__/ NO /__/

Discuss:_____

_____

7.3 In your opinion does government policy represent the interests of the industry?

YES /__/ NO /__/

Discuss:

_____

7.4 In your view what policies should government implement in order to generate development and growth within the electronics industry?

Discuss:

COMPLETE THE TABLE BELOW BY INDICATING WHICH GIVEN COMPONENT SHOULD HAVE GREATER, OR LESSER, PRECEDENCE THAN AT PRESENT, IN ORDER TO SUCCESSFULLY DEVELOP THE ELECTRONICS INDUSTRY.

Possible policy Recommendations	More	Less
Import controls (Import Replacement)		
Export Incentives (Export Promotion)		
Government control over Investable assets		
Long term contracts (eg. with SAPO)		
Low interest rate loans (eg.from IDC)		
Economic Services eg. IDC, BTI		
Communication between industry and the authorities		
Privatisation and Deregulation		
Government involvement in Tech. Research (CSIR)		
Other (specify):		

7.5 In your opinion, what is the reason for the slow growth rate of local electronics production in South Africa?

Appendix B

Survey Results

A.1 Major products or services offered, classified by sector:

Sector	No.	Percent
Components	20	31.8
Instrumentation	17	26.9
Communication	10	15.8
EDP	8	12.7
Consumer	6	9.6
Software	1	1.6
Office Equipment	1	1.6

n = 63

A.2 Major activity of firms:

Activity	Rank 1	Response 2	3
Research and Devel.	3	9	13
Production	23	10	2
Assembly	2	15	12
Marketing Agents	19	4	7
Other	6	5	2

n = 53

A.3 Average age of firm: 1968
Oldest firm: 1880
Youngest firm: 1989
n = 46

A.4 Fixed Assets in Rands:

Category	No.	Percent
0 - 1000 000	17	34.8
1000 000 - 2000 000	5	10.2
2000 000 - 4000 000	6	12.2
4000 000 - 8000 000	1	2
8000 000 - 15000 000	5	10.3
15000 000 - 20000 000	2	4
20000 000 - 40000 000	3	6.1
40000 000 - 60000 000	1	2
60000 000 -120000 000	9	18.4

A.5 Interaction with State agency:

YES 22 NO 29

A.6 The relationship held with the State agent:

Relationship with State	No. of Respondents.
Share holding	4
Loan Capital	7
Short term finance	4
Grants	12
Long term Contracts	11
Advisory service	5
Other	6

n = 22

A.7 Reasons if NO:
No need Could not get Inconvenience

A.8a No of firms linked to Holding Company:

No. 27

n = 53

A.8b Is or was the Holding company a multinational:

YES 12 NO 16

A.8c Indicate three of the most important advantages of multinational affiliation:

Advantages	Response: No.	Percent
Technology	17	27.9
Management skills	14	23.0
Markets	11	18.0
Finance	6	9.8
Designs	12	19.7
Other	1	1.6

n = 21

A.8d Relationship Effected by politics?

YES 13 NO 8

n = 21

A.8e Effected viability:

YES 8 NO 5

n = 13

The majority of respondents argued that it had actually improved there performance through the purchases of foreign subsidiaries.

A.9 Turnover in Rands:

Turnover	No.	Percent
0 - 2000 000	10	20.8
2000 000 - 4000 000	3	6.3
4000 000 - 8000 000	5	10.4
8000 000 - 16000 000	6	12.5
16000 000 - 30000 000	2	4.2
30000 000 - 40000 000	2	4.2
40000 000 - 80000 000	8	16.7
80000 000 -120000 000	1	2.1
120000 000 - Above	11	22.8

n = 48

Total Turnover R4680 million

A.10 Exports as a percent of Turnover

4 % of Total Turnover
R190 million
26 firms exported.

A.11 Total Production costs as Percentage Turnover

41.5%

A.12 Research and Development as a percent of Turnover

3% of Total
R134 million
34 did R&D

A.13 Basic and Applied research as percent of total expenditure

24.8%
n = 8

A.14 Source of materials and components used (by Value)

Local 38.6% Imported 61.4% (av. from survey)

n = 51

A.15 Employees Structure:

Category	%
Administrative Management	9.4
Technical management	11.7
Clerical (ie secretarial)	11
Skilled	28.2
Semi-skilled	27.2
Unskilled	12.5

n = 40

A.16 Employees involved only in R & D

4.27%
n = 24

A.17 Any difficulty in satisfying your manpower requirements?

YES 39 NO 11

A.18 Do you have any formal on the job Training?

YES 36 NO 16

A.19a Training expenses as a percentage of turnover: 1.65% of total
2.3% of 27 firms

A.19b Are these expenses recovered from employees?

Wholly 0 Partially 10 Not at all 26

A.19c Do you experience a high turnover of trained labour?

YES 9 NO 27

A.20 Is trained labour attracted to company?

YES 10 NO 4

For: salaries, opportunities, prospects, environment.

A.21 Do you consider there to be a shortage of skilled labour?

YES 44 NO 5

A.22a Most effective method to improve availability:

Effective Method	Rank: 1	2	3	4
Better education facilities	17	5	5	9
Diversity of curriculum	7	9	11	1
Company sponsored training	7	7	6	10
Greater opportunities	5	2	11	4
Non-racial education	4	16	6	3
Other	4			2

n = 44

A.22b Do you consider the future of the industry to lie with the further education of the black population?

YES 26 NO 0

A.23 Education facilities which should be promoted:

Facilities	Rank: 1	2	3
School	13	10	3
Technikon	12	11	3
University	1	5	19

n = 26

A.24a Do you have any licence agreement with foreign firms:

YES 30 NO 20 Licensors 2

A.24b Turnover subject to these agreements:

50% of total
52% of 30 firms

A.24c Do these agreements constrain business activities?

YES 18 NO 12

A.24d Does the cost of these agreements effect export competiveness?

Prohibited 2 YES 5 NO 10

A.25 If technology locally sourced, what is the source?

Source of Technology	%
Public sector R & D	1.3
Private sector R & D	58.3
Local Adaptation	26.3
Other	14.1

n = 25

A.26 Method to improve technology appropriateness and advancement:

Method to Improve	Rank: 1	2	3	4
Higher education standard	22	11	5	2
Technical Parks	3	9	14	7
Government sponsorship	6	5	9	14
Multinational Involvement	11	15	9	6
Other	3	2		1

n = 45

A.27 To which countries are your products exported?:

1st World 40%
3rd World 60%

A.28 Do your products hold an advantage on the International Market?

YES 16 NO 10

A.29 What is this advantage?:

Advantage Held	Responses
Foreign Connections	6
Marketing skills	8
Long term contracts	0
Lower overheads	5
Lower labour costs	5
Lower input costs	4
Favourable exchange	13
Subsidies	3
Better quality	9
Superior technology	9
Skilled labour	2
RSA patents	4
Technology specific to RSA	4
Other	1

n = 16

A.30 If no advantage why are exports undertaken?:

To obtain Market share, build markets, projects, currency.

A.31 Are you influenced by foreign buyers for technical specifications?:

YES 19 NO 8

n = 27

A.32 Has the firm benefitted from technical information that buyers provide?:

YES 10 NO 4

n = 14

A.33 Do the present import tariff duties effect your competitiveness?:

YES 12 NO 15

n = 27

A.34 Is the export market particularly hazardous?:

YES 21 NO 8

A.35 Areas which are hazardous:

Possible Hazards	Rank: 1	2	3	4
Dumping on market by foreign firms	1	0	2	6
Rate of technical advancement	5	8	4	0
Political influence	5	5	8	1
Excessive competition	9	4	2	1
Market trends	0	1	0	5
Other	1	2	0	0

n = 21

A.36 Has your firm received any special awards for exporting?:

YES 2 NO 11

A.37 Has government policy had an influence upon your industry?:

YES 42 NO 9

A.38 What is the effect of this influence:

Possible influence	Positive Influence	No Influence	Negative Influence
Education system	4	9	22
Taxation structure	1	8	26
Trade policy	5	21	11
Financing structure	9	15	10
Racial policy	2	3	29
Other	3	0	4

n = 42

A.39 Does government consult with industry before initiating policy?:

YES 7 NO 42

A.40 Does government policy represent interests of the industry?:

YES 7 NO 41

A.41 Recommendations for future policy:

Possible recommendations	Response: More	Less
Import controls	14	32
Export incentives	46	1
Government control over assets	3	37
Long term contracts	16	19
Low interest rate loans	35	5
Economic services	27	8
Communication between industry and gov.	43	1
Privatisation and deregulation	44	1
Government involvement in tech.	16	20
Other	0	1

n = 51

APPENDIX C

Imports of Electronic Equipment

TOTALS in RAND million

ITEM classification	Tariff Heading	1984	1985	1986	1987
Word processors	84.51.05.1	6.3	4.9	5.4	7.9
Cash registers	84.52.20	30.7	27.4	27.5	36.7
Digital computers	84.53.10	702.3	740.3	938.1	830
Analog computers	84.53.15	1	1.2	0.7	0.3
Magnetic /optical readers	84.53.25	1.4	2.2	2.8	2.2
Data Transcribers	84.53.50	1.7	3.5	1.9	3.8
Computer parts	84.55.60	119.5	371.6	246.5	335.8
Computer Accessories	84.55.70	5	4.5	5.1	5.2
Telephone apparatus	85.13.30	171.3	244.4	262	195
Telephone equipment	85.13.90	57.8	125.5	114.8	138.6
Microphones	85.14.10	1.8	1.7	2	1.9
Loadspeakers	85.14.25	15.1	6.1	13.1	14
Audio amplifiers	85.14.30	9.9	5.3	6.4	9.2
Radio telephone equipment	85.15.10.5	0	0	5	6.7
Microwave euipment	85.15.10.9	46.3	0.3	97.8	32.3
Radio/TV broadcast equip.	85.15.15.2	4	9.3	17.6	9.5
Television cameras	85.15.15.4	13.8	15.7	13.5	16.9
Portable radios	85.15.25	9.9	7.5	11.5	18.5
Motor car radio sets	85.15.55	28.6	17.4	37.4	46.9
Tuner/Amps/Recorders	85.15.57	16.2	8.4	14.8	22.3
Unassembled radio sets	85.15.58	0	0	0.4	0.9
TV monitors	85.15.65	7.4	3.3	3.3	11.2
Navigation aids	85.15.69	6.3	11.4	19.4	20.3
Radio remote control	85.15.77	0	0	0.3	1.8
TV and radio parts	85.15.99	43.3	47.5	58.5	52.3
Railway signalling	85.16.10	5.9	5.2	2.4	1.1
Capacitors fixed	85.18.10	22.6	22.9	25.2	32.4

Capacitors variable	85.18.50	1.9	1.7	2.1	2.2
Resistors	85.19.70	6.6	8.6	12.2	13.5
Relays	85.19.80	34.2	38.6	59	55.1
TV picture tubes	85.21.20.1	38.9	23.2	33.9	43.2
Thermionic valves	85.21.20.9	2.4	3	7.2	7.1
Photovoltaic solar cells	85.21.30	0	1	2	2.8
Diodes	85.21.40.0	7.3	7.5	8.7	9.4
Transistors	85.21.40.2	8.1	10	12.4	12.8
LED's	85.21.45	1.3	1.2	1.8	2.3
Integrated circuits	85.21.50	59.6	84	96.6	111
Other components	85.21.80	8	5.1	5.3	6.6
Test and measurement euip.	85.22.40	12.1	14.1	21.3	24
Test equipment other	85.22.90	21	41	59.2	47.8
Photocopiers and parts	90.10.45.1	56.6	37.6	62.6	75.5
Medical equipment	90.17.10	20	32.8	37.3	55
Hearing aid	90.19.10	1	2.5	2.9	3.6
Radiography equipment	90.20.00	33.6	40	74.7	85
Test and measuring equip.	90.28.90	155	190	201.5	266.9
Musical instruments	92.07.00	8	5.2	8	11
Turntables	92.11.35	7.3	2.7	5.3	6.8
Other audio equip.	92.11.50	5.6	2.8	5.7	8.4
Tape duplicators	92.11.55	0.4	0.3	0.1	0.1
Cassette resorders	92.11.70	27	15.5	22.7	23.5
Video recorders	92.11.80.1	2.3	41.3	81.8	61.7
Magnetic tape and disks	92.12.40	28.8	34	41.7	44
Total Imports	R Million	1875.1	2331.2	2799.4	2833

Imports of Electronics Equipment

		TOTALS	
ITEM Classification	New tariff Heading	1988	1989
Offset printing equip	8443.19	70.8	70.2
Typewriters	8469.10.1	21.1	10.3
Word processor	8469.10.2	8.6	7.5
Cash registers	8470.50	23.2	28.3
Calculators	8470.10	12.8	9
Calculators	8470.21	8.9	6.9
Calculators	8470.29	9.1	6
Digital computers	8471.20	659.8	485.7
Analog computers	8471.10	2.2	0.994
Computer accessories	8471.91	201.6	116.1
I/O devices	8471.92	371.1	350.2
Storage units	8471.93	73.1	70.1
Magnetic/ optical readers	8471.99.1	4.3	5.5
Punch machines	8471.99.2	0.149	0.499
Data transcribers	8471.99.4	3.8	3.6
Office duplicating equip.	8472.10	2.6	4.2
Computer parts	8473.30.1	530.2	557.4
Telephone sets	8517.10	15.8	20.1
Telephonic parts	8517.90	174.3	197
Telephonic Aparatus	8517.81	68.8	56.4
Microphones	8518.10	3.1	3.7
Loose loadspeakers	8518.29.1	11.9	8.6
Loose loadspeakers-other	8518.29.9	8.2	9.1
Loudspeakers in cabinets	8518.21.9	1.9	1.7
Loadspeakers - multiple	6518.22.9	5.5	4.5
Headphones/earphones/ mics	8518.30	3.9	4.4
Audio amplifiers	8518.40	11.4	9.6

Turntables	8519.31.1	3.8	1.1
Turntables	8519.31.2	1.5	0.434
Cassette player for cars	8519.91.1	1.4	4.5
Cassette player - other	8519.91.9	6.8	3.4
Dictating machines	8520.10	0.858	0.983
Telephone answering machines	8520.20	4.8	6.2
Cassette recorders port	8520.31.1	13	10.3
Cassette recorders other	8520.31.9	8.8	5.3
Other audio equipment	8520.90.9	0.715	0.81
Tape duplicators	8520.90.1	0	0.434
Video recorders	8521.10.1	87.7	37.2
Video recorders - other	8521.10.9	0.57	2
Pickup cartridges	8522.10	0.483	0.426
Unrec magnetic media	8523.11.1	5.1	1.7
- disc packs for EDP	8523.20.1	5.2	5.8
- other	8523.20.9	11.3	11.8
Recorded tapes for EDP	8524.21.2	4.4	1.2
Recorded mag. media	8524.21.9	0.654	0.833
Recordings on tape for EDP	8524.22.2	4.5	9.2
Recordings on tape > 6.5mm	8524.23.2	6.2	4.3
Other	8524.90.3	70.2	95
Laser discs	8524.90.4	5.3	9.1
Microwave equip.	8525.20.5	5.3	5.6
Radio/ TV Transmission	8525.10	11.9	33.8
Mobile Tx/Rx equip.	8525.20	1.2	8.1
Other	8525.20.9	40.4	85
CCTV, video, b'cast cameras	8525.30	30.6	35.7
Navigation aids	8526.91	37.4	16.7
Radio remote control apparatu	8526.92.9	0.487	0.765
Portable radios assembled	8527.11.3	23.8	4.2
Other	8527.11.4	3.9	1.6
Unassembled radios	8527.19.2	0.148	1.9

Other	8527.19.4	2.3	0.853
Motor vehicle radios	8527.21	49.3	39
Tuners/amps & recorders	8527.31.1	0.502	0.053
same	8527.31.2	0	0.066
same	8527.31.3	17.1	12.5
same	8527.31.9	31.3	7.7
Receivers for radio - staff locati	8527.90.1	0	3.1
Colour video recording apparat	8528.10.1	2.7	39.4
Colour monitors	8528.10.2	0	3.1
Other	8528.10.9	4	3.3
Mono monitors	8528.20.2	1	0.233
Other	8528.20.9	1.1	0.518
Aerials - domestic radio	8529.10.1	5.4	7.2
TV	8529.10.2	2.4	3
Other	8529.10.9	8.2	12.7
Parts for radio sets	8529.90.4	6.7	10.1
High frequency tuners	8529.90.6	14.7	11
Railway signalling	8530.10.1	7.9	0.25
same	8530.90.1	0.349	14.6
Indicators panels LCD	8531.20	2.1	2.3
Capacitors: 50 Hz power	8532.10	3.4	3.4
Capacitors: other fixed	8532.20	42.5	41.9
Capacitors: variables	8532.30	3.1	2.7
Capacitors: fixed	8533.00	27.4	30.5
Printed circuits	8534.00	16.4	21
Relays	8536.41/4	77.9	73.6
TV picture tubes	8540.11	80.8	83.5
TV tubes B/W	8540.12	7.7	6.9
Television camera tubes	8540.20	1.3	1.5
Thermionic valves	8540.89.1	1.2	3.9

Diodes	8541.10	15.4	18
Transistors	8541.21	11.2	13.4
Thyristors, diacs & Triacs	8541.30	5.8	6.9
Photovoltaic cells	8541.40.1	2.4	7.4
Photosensitive semi conductors	8541.40.2	1.2	1.4
LEDs	8541.40.3	3.7	4.7
Integrated circuit - digital	8542.11	53.9	53.4
Integrated circuits - other	8542.19	60.3	53.4
Hybrid ICs	8542.20	42.7	25.2
Other components	8542.80	57.3	84.9
Parts for ICs	8542.90	3.8	2.4
Partical generators	8543.10	0	0
Signal generators	8543.20	4.7	8.6
Other electrical machinery	8543.30	2.3	0.5
Test equipment	8543.80.1	19.7	23.7
Test equipment parts	8543.80.9	41.7	38.3
Test equipment spares	8543.90	6.7	3.8
Optical fibre cable	8544.70	0.741	0.5
Micrographics equip.	9008.20	5	4.5
Photocopiers & parts	9009.00	180.3	163.1
Laser equipment	9013.20	4.1	2.9
Medical equipment	9018.19	12.3	19.2
Hearing aids	9021.40	4.8	5.5
Radiography equipment	9022.11	52	50
same	9022.19	13.7	12.5
Test and measurement equip.	9026.80.1	8.3	7.3
same	9026.80.9	9	8.7
Electricity meters	9028.30	17.4	22.1
Radiation detectors	9030.10	1.8	1
Oscilloscopes	9030.20	7.2	7.7
Other instruments	9030.39	11.1	11.8
Multimeters	9030.31	5.7	7

Telecomms test equip.	9030.40	11	16.2
Musical instruments	9207.10	11.7	10.7
Musical instruments - other	9207.90	1.8	1.6
TOTAL	R Million	3816.056	4368

Exports of Electronic Equipment

TOTALS

ITEM Classification	Tariff Heading	1984	1985	1986	1987
Parts for typewriters	85.51.10	0.3	0.9	1.5	1.1
Cash registers	84.52.20	0.3	0.4	1	0.8
Digital computers	84.53.10	29.6	31.4	43.3	15
Analog computers	84.53.15	0.3	0.2	0.8	0.1
Magnetic/optical readers	84.53.25	0	0.1	0	0
Data transcribers	84.53.50	0	0	0.1	0
Hybrid computers	84.53.60	0	0.8	0.2	1.2
Parts for EDP equip.	84.55.00	24.9	49.3	36.6	26
Telephonic apparatus	85.13.00	5.2	8.5	13	5.1
Audio amplifiers	85.14.30	0.2	0.2	0.3	0
Microwave Rx/Tx Equip	85.15.10	1.2	2	1.4	2.2
Radio & TV broadcast equip.	85.15.15	0.4	1	1.3	0.6
Portable radios	85.15.25	0	0	0.1	0.2
Tuner/amps/recorders	85.15.57	0	0	0.3	0.2
TV Monitors	85.15.65	0.3	0.8	1	0.7
Navigational aids	85.15.69	0.5	0.7	1.4	0.5
Parts for radio sets	85.15.99	1.1	1.2	1.6	0.9
Transportation instruments	85.16.00	2.1	3	5	5.2
Capacitors	85.18.00	0.1	0.3	0.6	0.4
Radio/TV components	85.19.03	0.6	1.8	2.2	0
Relays	85.19.80	0.9	0.9	1	1
Tv tubes and valves	85.21.20	0.2	0.3	0.2	0.3
Diodes	85.21.40	0	0.1	0	0.1
Transistors	85.21.40	0.3	0.2	0.1	0
Integrated circuits	85.21.50	0.9	0.7	3.5	4.1
Other Components	85.21.80	0.1	0.4	0.6	0.3

Test equipment	85.22.40	2.5	2.7	2.4	1.8
Data communication cable	85.23.25	3	5.5	7.5	10.4
Photocopiers	90.10.45	0.2	1	1.8	2.5
Parts for copiers	90.10.65	1.5	3.8	5.2	0
Medical equipment	90.17.10	3.7	7.2	5.7	4.3
Radiography equipment	90.20.00	1.5	2.4	2	2.8
Other audio equipment	92.11.00	5.6	13	0	0
Sound recorders	92.11.70	0.3	0.7	0.2	0.1
Video recorders	92.11.80	5	12.3	0.8	0.8
Magnetic tapes and disks	92.12.40	0.5	0.9	10.1	0
TOTAL	R million	93.3	154.7	152.8	88.7

Exports of Electronic Equipment

ITEM Classification	New Tar. Heading	1988	1989	Jan to Feb 1990	Forecast 1990
Offset printing equip	84.43	6.3	8.3	2.6	15.6
Typewriters and word processo	84.69	2.5	2.3	0.269	1.6
Calculating machines and other	84.70	0.791	1.9	0.243	1.45
EDP equip & Other	84.71	17.5	20.3	3	18
Office machines - other	84.72	1.5	1.8	1.5	9
Parts and Accessories	84.73	38.4	48.5	6.8	40.8
Elec. app. for line communicati	85.17	24	29	3.9	23.4
Loadspeakers and microphone	85.18	0.685	0.896	0.086	0.516
Players - various	85.19	0.588	0.364	0.061	0.366
Tape recorders - other	85.20	0.719	0.375	0.044	0.264
Video recordrs & other	85.21	2.1	2	0.229	1.4
Prepared unrecorded media	85.23	3	1.6	0.205	1.2
Other recorder media	85.24	0.89	1.6	0.263	1.6
Transmission apparatus	85.25	2.9	12.8	11.5	69
Navigation aids	85.26	1.4	1.9	0.27	1.6

Reception Apparatus	85.27	1.3	1.2	0.112	0.672
Television receivers	85.28	1.3	1.5	0.205	1.2
Parts for apparatus	85.29	1.4	2	0.172	1
Electronic signalling devises	85.30	4.6	4.9	0.508	3
Capacitors total	85.32	1.4	1.6	0.047	0.282
Electrical resitors	85.33	0.236	0.583	0.096	0.576
Printed circuits	85.34	6.8	9.8	1.8	10.8
Switching apparatus	85.36	12.9	16	2.6	15.6
Tubes - various	85.40	0.919	0.212	0.007	0.042
Diodes transistors & other	85.41	0.729	1.1	0.147	0.882
Integrated circuits	85.42	6.9	9.5	0.345	2.1
Other electrical machinery	85.43	4.4	3.5	0.574	3.4
Photocopiers & parts	90.09	5.9	8.3	1.3	7.8
Radiography equipment	90.22	3.7	3.9	1	6
Test and measurement equip.	90.26	10.5	6.3	0.735	4.4
Measuring apparatus	90.30	2.1	2.6	0.515	3.1
TOTAL	R Million	168.357	206.63	41.133	246.65

STATE TENDER BOARD

TENDER NO. .....
(to be inserted by tenderer)

PREFERENCE CERTIFICATE

NB: BEFORE COMPLETING THIS CERTIFICATE, THE GENERAL CONDITIONS AND DEFINITIONS AS WELL AS THE DEFINITIONS AND DIRECTIVES APPLICABLE TO EACH PART AND/OR SECTION MUST BE CAREFULLY STUDIED BY TENDERERS.

GENERAL CONDITIONS:

1. The preference certificate must only be filled in if the items offered are produced, manufactured or assembled in the Republic of South Africa and/or a territory granted independance by or under any Act of Parliament of the RSA.

2. Failure on the part of a tenderer to fill in and/or sign the certificate may be interpreted that no preference is claimed.

3. Tenderers must note and accept that the State Tender Board has the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preference in any manner as the Board may deem fit.

4. In respect of items where supply, delivery and installation/erection/commissioning, or supply and delivery on site is a condition of tender, preference must be calculated on material/equipment only and not on any delivery, installation, erection and/or commissioning costs.

5. Each item may either qualify for the price preferences applicable to local content (part 1) or for the price preferences applicable to electronics (part 2) but not for both or a combination of the two types of preferences. In both cases additional preference/transport rebate for Deconcentration, Industrial and other designated Development Points (part 3) and/or preference for the South African Bureau of Standards' Standardisation mark (Part 4) may, however, be claimed, if applicable.

GENERAL DEFINITIONS:

6. "Local content" means that portion of the tender price which is not included in "imported content".

7. "Imported content" means that portion of the tender price represented by the costs of components, parts or material which have been or are still to be imported (whether by the tenderer or his suppliers or sub-contractors) and which costs are inclusive of the overseas costs plus freight and other direct importation costs such as landing costs, dock dues, import duty, etc., at the South African port of entry as well as transportation and handling charges to the factory where the supplies, which have been tendered for, are produced, manufactured or assembled.

PART 1: PRICE PREFERENCES FOR LOCAL PRODUCTION, MANUFACTURE OR ASSEMBLY

LOCAL CONTENT, IN RELATION TO THE TENDER PRICE, BEING:	PREFERENCE ALLOWED: PERCENTAGE	ITEM NUMBER(S) IN RESPECT OF WHICH PREFERENCE IS CLAIMED:
Not more than 5%	1	.....
Over 5% to 10%	2	.....
Over 10% to 20%	3	.....
Over 20% to 30%	4	.....
Over 30% to 40%	5	.....
Over 40% to 50%	6	.....
Over 50% to 60%	7	.....
Over 60% to 70%	8	.....
Over 70% to 80%	9	.....
Over 80%	10	.....

PART 2: PRICE PREFERENCES FOR ELECTRONICS

DEFINITION OF ELECTRONICS:

1. "Electronics" includes all components, products, equipment and systems manufactured for the purpose of processing, storing or transferring information by means of electro-magnetic phenomena, but excludes the raw materials from which such items are manufactured. A list of local manufacturers of electronic components, products, equipment and systems can on request be obtained from the Chief Directorate: Procurement Administration.

DIRECTIVES:

2. Preferences for electronics are divided in three sections viz -

   Section 1 for local design;

   Section 2 for local electronic systems; and

   Section 3 for local electronic components.

3. In respect of tenders for products complying with the definition for electronic systems, preference may be claimed under section 2 as well as section 1, if the product so qualifies. The total preference that will be allowed by the State Tender Board shall, however, not exceed 35%.

   In respect of tenders for products complying with the definition for electronic components, preference may be claimed under section 3 only.

4. The onus is on the tenderer to establish in respect of each item whether the relevant products could be classified as electronics, and if so, to claim the appropriate preference.

5. In the event of doubt as to the correctness and/or applicability of price preferences claimed for electronics, any decision by the State Tender Board, based on the advice of the Standing Committee for Electronics, shall be final.

6. Where electronic equipment or systems are locally manufactured, only local electronic components as defined shall be used, unless it can be proven that they are unsuitable. Where the price of local components is considered to be excessive, the tenderer must submit two prices, one based on local, and the other on imported components.

7. In regard to preference claimed for local design, tenderers must, apart from the fact that the preference must be certified by a professional engineer, submit a full motivation of the preference claimed in respect of each item.

SECTION 1 : LOCAL DESIGN:

Four categories shall apply, viz:

LD - for a complete local design

ALD - for an adapted local design

MD - for a manufacturing design

AMD - for an adapted manufacturing design.

DEFINITIONS:

1) LD: (Local Design) shall mean:

(a) The design of the logical structure (organisation) of the system (hardware and software) is done in the RSA.

(b) The circuit/software design of those elements of the system directly associated with the main function of the system is done in the RSA.

(c) Manufacturing design (MD) is done in the RSA. (See definition 3 for description of MD.)

2) ALD: (Adapted Local Design) shall mean:

(a) The design as stated in (a) and (b) under LD is not done completely in the RSA, but to an extent greater than 70%. (This is to be certified by a registered professional engineer.)

(b) Manufacturing design (MD) is done in the RSA.

3) MD: (Manufacturing Design) shall mean:

(a) The design of the physical structure, for example re-layout and repackaging of hardware or software, re-coding and assembly/compilation, is done in the RSA utilising an imported design in lieu of LD (a) and (b).

4) AMD: (Adapted Manufacturing Design) shall mean:

(a) The design as stated in (a) under MD is not done completely in the RSA but to an extent greater than 70%. (This is to be certified by a registered professional engineer.)

CATEGORY	PREFERENCE ALLOWED AS A PERCENTAGE OF TOTAL TENDER PRICE	ITEM NUMBER(S) IN RESPECT OF WHICH PREFERENCE IS CLAIMED
LD (Local Design)	20%	.....
ALD (Adapted Local Design)	15%	.....
MD (Manufacturing Design)	10%	.....
AMD (Adapted Manufacturing Design)	5%	.....

I, the undersigned ..... hereby certify that in respect of the preference/s claimed, the percentage/s stated is/are in accordance with the aforesaid definition/s of Local Design.

.....

SIGNATURE: REGISTERED PROFESSIONAL ENGINEER

.....

MEMBERSHIP NUMBER

DATE: .....

4/.....

SECTION 2 : LOCAL ELECTRONIC SYSTEMS:

DIRECTIVES AND DEFINITIONS:

1) "Electronic systems" are all products other than raw materials and components which comply with the definition of "Electronics".

2) Local content shall be determined by expressing the locally added value as a percentage of the tender price where:

Locally added value = Tender Price less -

the landed cost in factory of materials, components, assemblies, consumable items and equipment not manufactured in the Republic.

any licence fees payable abroad.

the cost of electronic components not scheduled in the list issued by the Chief Directorate: Procurement Administration.

3) The price preference shall be 1/3% for every full 1% by which a local content of 25% is exceeded, i.e. on a sliding scale up to a maximum of 25%.

4) Preference may be given to products manufactured in terms of the SABS 0157 (or equivalent) quality management system.

5) Local content calculations shall be certified by a firm of practising auditors.

LOCAL CONTENT AS A PERCENTAGE OF TOTAL TENDER PRICE	PREFERENCE ALLOWED AS A PERCENTAGE OF TOTAL TENDER PRICE	ITEM NUMBER(S) IN RESPECT OF WHICH PREFERENCE IS CLAIMED
0 - 25	0	
28	1	.....
31	2	.....
34	3	.....
37	4	.....
40	5	.....
43	6	.....
46	7	.....
49	8	.....
52	9	.....
55	10	.....
58	11	.....
61	12	.....
64	13	.....
67	14	.....
70	15	.....
73	16	.....
76	17	.....
79	18	.....
82	19	.....
85	20	.....
88	21	.....
91	22	.....
94	23	.....
97	24	.....
100	25	.....

I, the undersigned ..... hereby certify that the local content calculations in the abovenoted preference claim(s) for local electronic systems are correct.

.....
SIGNATURE : CHARTERED ACCOUNTANT SA

DATE: .....

5/.....

SECTION 3 : LOCAL ELECTRONIC COMPONENTS:

DIRECTIVES AND DEFINITIONS:

1) "Local Electronic Components" are those components which are published in a list issued by the Chief Director: Procurement Administration as being manufactured in South Africa.

2) The percentage local content shall be the sum of the values applicable to (a) Local Design, (b) Local Material and (c) Local Manufacture. The values must be indicated in the space provided.

(a) Local Design where the following are applicable -

Licenced design	0,0%
Adjustments to a licenced design to accommodate RSA requirements	3,0%
Major redesign of licenced product and local design of the production facilities	10,0%
Local designed product	20,0%

(a) = ...%

(b) Local Material calculated as follows -

$$\frac{\text{Total SA material value}}{\text{Total material value}} \times 20\%$$

(b) = ...%

(c) Local Manufacture calculated as follows -

$$* \frac{\text{Total SA material plus added value}}{\text{Selling (tender) price}} \times 60\%$$

(c) = ...%

Total _____

* SA material plus added value, constitutes local material plus labour, manufacturing cost, overheads and profit, but excludes any imported raw materials and/or licence fees payable abroad.

3) The price preference shall be 1% for each full 2% by which the local content exceeds 30%, i.e. on a sliding scale up to a maximum of 35%.

4) Preference claimed for local design shall be certified by a professional engineer, and local content calculations shall be certified by a firm of practicing auditors.

LOCAL CONTENT AS A PERCENTAGE OF TOTAL TENDER PRICE	PREFERENCE ALLOWED AS A PERCENTAGE OF TOTAL TENDER PRICE	ITEM NUMBER(S) IN RESPECT OF WHICH PREFERENCE IS CLAIMED
0 - 30	0	
32	1	
34	2	
36	3	
38	4	
40	5	
42	6	
44	7	
46	8	
48	9	
50	10	
52	11	
54	12	
56	13	
58	14	
60	15	
62	16	
64	17	
66	18	
68	19	
70	20	
72	21	
74	22	
76	23	
78	24	
80	25	
82	26	
84	27	
86	28	
88	29	
90	30	
92	31	
94	32	
96	33	
98	34	
100	35	

I, the undersigned ..... hereby certify that in respect of the preference(s) claimed for local design, the percentage(s) stated is/are in accordance with the preference(s) allowed.

.....
SIGNATURE: REGISTERED PROFESSIONAL ENGINEER

.....
MEMBERSHIP NUMBER

DATE: .....

I, the undersigned ..... hereby certify that the local content calculations in the abovenoted preference claim(s) for local electronic content are correct.

.....
SIGNATURE: CHARTERED ACCOUNTANT SA

DATE: .....

1/.....

PART 3: ADDITIONAL PREFERENCE/TRANSPORT REBATE FOR DECONCENTRATION, INDUSTRIAL AND OTHER DESIGNATED DEVELOPMENT POINTS

DIRECTIVES AND DEFINITIONS:

1. The manual on the implementation of the Regional Industrial Development Incentives (revised edition October 1985) issued by the Governments of the Republics of South Africa, Transkei, Bophuthatswana, Venda and Ciskei and Notice No 1101 as published in the Government Gazette of 27 May 1983, are applicable.

2. Only approved industries shall qualify for preference and transport rebate. It may, however, also be allowed, if claimed by agents, etc., provided the State Tender Board is satisfied that the product(s) offered is/are manufactured by an approved industry and provided delivery is effected ex factory or otherwise in a manner acceptable to the Board.

3. The percentage price preference claimed shall be as outlined in the relevant concession schedules, as approved by the appropriate Regional Industrial Development Authority.

PERCENTAGE PREFERENCE CLAIMED	PERCENTAGE TRANSPORT REBATE CLAIMED	ITEM NUMBER(S) IN RESPECT OF WHICH PREFERENCE/ TRANSPORT REBATE IS CLAIMED	DECONCENTRATION/INDUSTRIAL AND/ OR OTHER DESIGNATED DEVELOPMENT POINT APPLICABLE
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....
.....%	.....%	.....	.....

PART 4 : PRICE PREFERENCE FOR SABS STANDARDISATION MARK

1. A 2,5% price preference may be claimed only on products bearing the SABS standardisation mark at date of tender.

Tender item number(s) in respect of which 2,5% preference for SABS mark is claimed ....

DECLARATION

I/We, the undersigned, *..... certifies/certify that the item(s) mentioned in Parts 1 to 4 of the foregoing schedule qualifies/qualify for the preference(s) shown and acknowledge on behalf of the said tenderer that in the event of -

(i) a contract being awarded as a result of preference claimed as shown in Parts 1 to 4 the contractor may be required to furnish documentary proof to the satisfaction of the State Tender Board that the claims are correct;

(ii) the claims being found too high, the State Tender Board may, in addition to any other remedy it may have -

(a) recover from the contractor all costs, losses or damages incurred or sustained by the State as a result of the award of the contract; and/or

(b) cancel the contract and claim any damages which the State may suffer by having to make less favourable arrangements after such cancellation; and/or

(c) as provided for in State Tender Board Regulation 3(6), impose on the contractor a penalty not exceeding 5% of the value of the contract.

WITNESSES:

1. .....

2. .....

.....
Signature(s) of Tenderer

Date: .....

Address: .....

.....

.....

* Name(s) of the signatory/signatories, particulars of the authority under which the certificate is signed and the name of the person/firm/company represented.