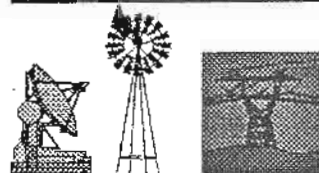
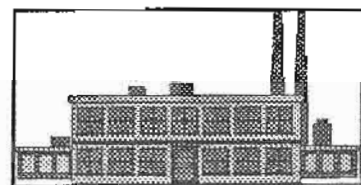


# **SOUTH AFRICAN INDUSTRIAL POLICY AND THE LEARNING FIRM:**

**A CASE STUDY OF BELL EQUIPMENT LTD.**

---

**Raphael Kaplinsky and  
Edmund Mhlongo**



DEVELOPMENT POLICY RESEARCH UNIT  
UNIVERSITY OF CAPE TOWN  
NOVEMBER 1996

---

## Foreword

The first phase of the Industrial Strategy Project commenced in 1992. The Project has its origins in the Congress of South African Trade Union's (COSATU) efforts to develop policy responses to the malaise afflicting South African manufacturing.

The first phase of the ISP submitted its final report in 1995. This comprised 11 sectoral studies, a number of cross-sectoral studies, and a synthesis volume that proposed an overall industrial strategy for South Africa.

The ISP is now in its second phase and comprises four research themes. One of these examines the relationship between industrial development and the environment, a second focuses on firm-level innovation, a third examines issues in human resource development, and the fourth is concerned with identifying mechanisms to strengthen manufacturing competitiveness at regional and local levels.

This paper is one of a series of studies that examine mechanisms and capacities for innovation in selected South African firms. Certain of the firms chosen for this study have a demonstrated record of success in international markets, while others have been more constrained in their innovative capacity. The research attempts to derive lessons from their varying experiences that will help guide industrial policy and corporate strategy. These micro studies will be complemented by a survey of innovation in some 250 manufacturing firms. This survey is the product of collaboration between the Industrial Strategy Project and the Foundation for Research Development and will be published in February 1997.

These are working papers intended to catalyse policy debate. They express the views of their respective authors and not necessarily the Industrial Strategy Project.

The second phase of the ISP is funded by the FES, HIVOS, the IDRC and the Olof Palme International Centre.

**David Lewis - Director: Industrial Strategy Project**

**David Kaplan - Research Co-ordinator: Firm-level Innovation Strategies**

# TABLE OF CONTENTS

1. Introduction.....	1
2. Locating Bell in the International Division of Labour.....	4
3. Bell in Historical Perspective.....	9
4. How does Bell Measure up to International Benchmarks? .....	11
4.1 Labour and Material Costs.....	11
4.2 Capital Costs.....	12
4.3 Exchange Rate Depreciation.....	14
4.4 Product Strength.....	14
4.5 Fortuitous Timing.....	15
5. Strengths and Weaknesses in Internal Operations.....	16
5.1 Strategy: Flexibility and Customer Focus.....	16
5.2 Innovation as an Organizing Theme.....	18
5.3 Manufacturing (Mis)organization.....	22
5.4 Human Resources and Industrial Relations.....	24
6. Managing with a Weak Supplier Infrastructure.....	26
7. The Future?.....	32
8. The Wider Implications of the Bell Experience.....	36
9. The Role of Industrial Policy.....	38
9.1 Infant Industry Policy.....	38
9.2 Support in External Markets.....	39
9.3 Anti-dumping Legislation.....	39
9.4 The Functioning of South Africa's Capital Markets.....	39
9.5 Supply Chain Development, particularly for SMEs.....	40
9.6 The Need for Sectoral Policies.....	41
9.7 Strengthening the Human Resources Fabric.....	41
9.8 Implications for Trade Unions.....	42
9.9 The Role of Local Government.....	42
9.10 Science and Technology Policy.....	43
10. Conclusions.....	44
11. Bibliography.....	45

## 1 INTRODUCTION

The debate on industrial policy is often counterposed between two truisms. On the one hand, market-based resource allocation is clearly important - "it is not nations which compete, but individual firms". On the other hand, firms operate in the context of "created endowments" such as physical infrastructure and the education and training of their labour forces, so it is not so much that enterprises compete, but rather that they do so in the context of national endowments which are open to augmentation by government action (Reich, 1991).

These two positions are often used to reflect an ideological divide between those who believe, on the one hand, that government should get off the back of industry and allow it to pursue the path that it alone knows best, and on the other hand those who believe in a comprehensive role for pervasive government intervention in industrial resource allocation. However, a reasoned assessment of international experience points to two central features. First, there are very few cases where sustained industrial growth has not involved a key role played by government, albeit a role which allows for a substantial degree of entrepreneurial independence. And, secondly, the effective role played by governments has to be moderated by the individual historical and strategic circumstances of each country. Lessons can be learnt from comparative experience, but each country (as well as each sector, region and firm) will have to pursue an individual path which reflects the particular circumstances in which it operates.

The South African economy has been built on rich natural resources, and its industrial sector pursued a predominantly inward-oriented path from the 1920s, particularly in the latter years of the Apartheid era. The post-Apartheid legacy includes a sustained period of falling per capita incomes, stagnation of manufacturing output, high levels of unemployment, a highly segmented profile of

consumers, a particularly unevenly stratified skill distribution amongst its labour force and a pattern of industrial relations which reflects the tensions of the Apartheid era (Joffe et al, 1995, Kaplinsky, 1995b). Like the economy at large, its corporations have failed to specialise effectively and have tended to encompass a wide range of products and activities, most notably reflected in the dominant position of five very large conglomerates whose activities span a large range of sectors. But like other previously inward-oriented economies, South Africa is being forced into a competitive global economy, one which requires very different patterns of industrial activity. Sustainable economic growth can only be achieved in this new environment if the corporate sector responds appropriately, and international experience suggests that this will require an appropriate form of governmental support.<sup>1</sup>

For the corporate sector, competing in this global economy requires the ability to:

- produce flexibly and to respond rapidly to changing customer requirements
- introduce new products rapidly and to tailor these to the needs of particular market segments
- produce to ever-growing demands of quality,
- meet customer requirements for ongoing product support in the consumer durables and capital goods sectors and
- reduce production costs


International experience has shown that these inter-linked objectives can be met through four sets of innovations (Kaplinsky, 1994). The first involves the introduction of a range of Japanese-inspired *organisational techniques* such as just - in - time

1. Thanks are due to the staff of Bell Equipment and, in particular, to Gary Bell and Guy Harris for the time which they set aside to assist this research project. Robin Bloch, David Kaplan, David O'Brien and James Hodge provided invaluable assistance at various stages of the research. The usual disclaimers apply. The research for this working paper was conducted in late 1995, before the significant devaluation of the rand.

production (JIT) and total quality control. The second requires the linked introduction of *electronics-based systemic automation techniques*. (However, primacy must be given to the prior adoption of these new forms of organisation if successful use is to be made of the new electronics technologies). Third, *new forms of inter-firm organisation* are required. JIT production involves frequent and reliable deliveries of small batches, and the ability to respond rapidly to changing market requirements; Total Quality Control (TQC) requires that suppliers are able to produce to exacting and predictable levels of quality. Growing technological complexity often involves each part of the production chain focusing on its core competence so that suppliers are increasingly capable of mastering the ability to innovate sub-assemblies. Growing technological complexity also often requires firms to engage in *cross-border technological agreements*. Finally, particular challenges are also faced in the process of *design and innovation* itself. Not only do the more competitive global conditions invariably require an increase in the level of effort, but also in the nature of the design process itself. Here success is enhanced through the shrinking of design cycles and the reduction of production costs arising from the use of "concurrent engineering", in which design is no longer the prerogative of the R&D function alone, but emerges from close interaction with other functional divisions such as marketing, purchasing and production. (It is also another area in which new forms of inter-firm cooperation are important). Design also needs to incorporate the principles of design-for-manufacture ("value engineering"), and gains particularly from the utilisation of electronics technologies such as computer-aided-design (CAD).

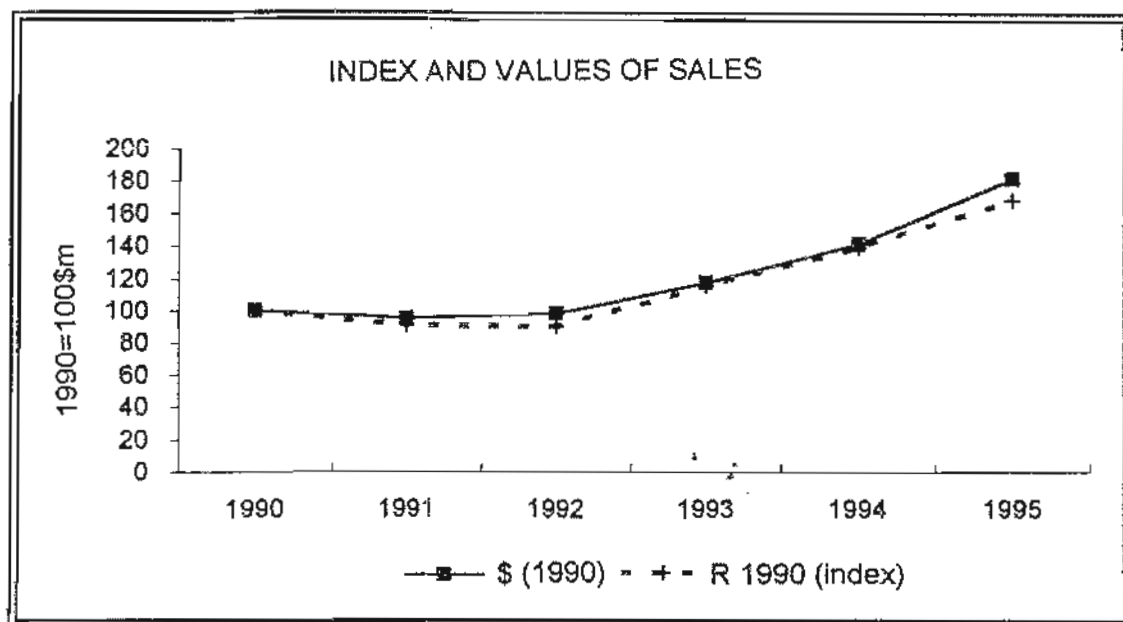
As the South African economy opens up, and the import regime becomes less restrictive, it will be necessary to meet the new competitive challenges sketched out in the preceding paragraphs. Moreover, penetrating external

markets poses additional barriers as firms learn to overcome the barriers to external marketing and product support. With a few striking exceptions South African firms have not shown the capacity to meet these challenges. Some have, however, and the question arises as to what explains this exceptional performance. What is there about these particular firms which explains why they have managed to confront and overcome those obstacles which have led the mass of industry to remain focused on the relatively undemanding domestic market? Does the success of these firms arise solely from their internal structure and the drive of their owners and management, or does it also reflect the particular sector in which they operate or the beneficial hand of government, or a combination of these? And what lessons can be learnt - both for other firms and for government policy - which might assist South African industry as it restructures to meet the challenges of the new, open trading environment?



Bell Equipment Ltd (hereafter Bell), which is located in Richards Bay in KwaZulu Natal, manufactures a range of earthmoving, forestry and cane cutting and moving equipment. It competes with some success in an extremely competitive global sector against some of the world's largest and most well-known firms and has a record of consistent innovation, both in relation to new product development and in the variety of the products which it manufactures. Its overseas sales exceeded \$45m (representing nearly 40 percent of the total in 1994) making it one of the most significant South African

Figure 1:



exporters of manufactured capital goods,<sup>2</sup> and in 1995 Bell was rewarded with South Africa's premium export award. But more significantly, these goods are constructed to Bell's own designs and without recourse to foreign design technology and ownership. For these and other reasons, the experience of Bell makes compelling reading and opens insights into a series of policy issues of relevance to government, the corporate sector and to workers' organisations in South Africa. But since in many respects the South African economy is similar in character to other middle income LDCs, especially those in Latin America (Joffe et. al., 1995), its experience of

the respective roles played by governments and enterprises in technological development and industrial restructuring is of wider relevance. It is with this purpose in mind that we can gain wider insights by exploring the evolution of the factors underlying Bell's past growth from infancy to adolescence and its potential future growth to adulthood.

<sup>2</sup> The bases of these calculations are a Rand/\$ rate of 0.387 in 1990, 0.363 in 1991, 0.351 in 1992, 0.306 in 1993, 0.282 in 1994 and 0.275 in 1995 (all figures drawn from the IMF Financial Yearbook). Bell's financial years run until the end of February, and since most of each year's sales occur in the preceding year a convention has been established in which Bell's "1995 sales" are allocated to the year 1994, and similarly for preceding years.

2 LOCATING BELL IN THE INTERNATIONAL DIVISION OF LABOUR

In 1995 Bell made the transition from a private to a public company. Its sales had almost doubled in the three years since 1992 (Figure 1), exceeding \$185 in 1995. It produces equipment for two sets of markets. The first are the related markets of cane and forestry cutting and handling, where a range of three wheeled cutting and loading machines and haulers have a proven track

record. The second set of industries are those in mining and construction, where Bell has developed a series of machines which are utilised in the loading and transport of various forms of dry materials. As can be seen from Figure 2, sugar is the smallest of these sectors despite the fact that this was the industry in which Bell first operated, a further reflection of the distance which the firm has moved in the forty years since it was established.

Figure 2:

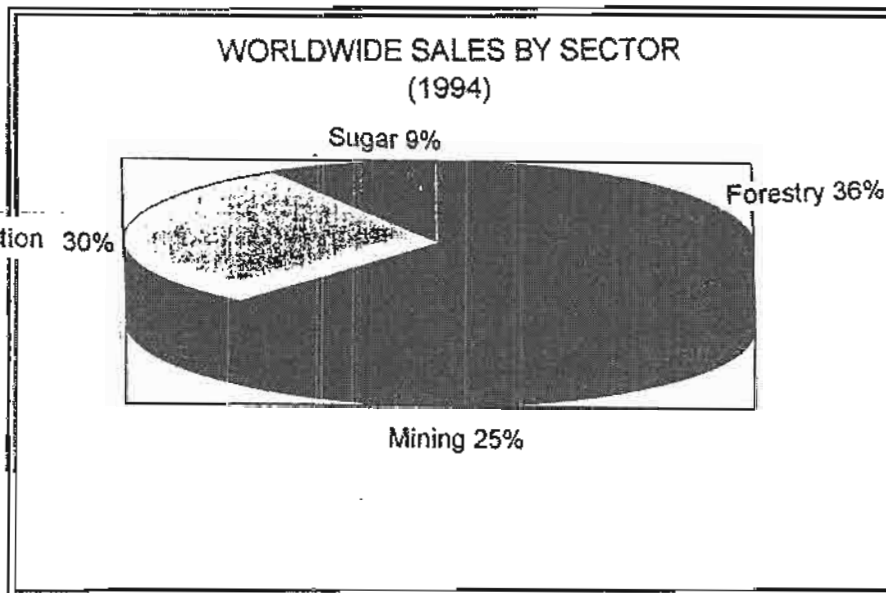
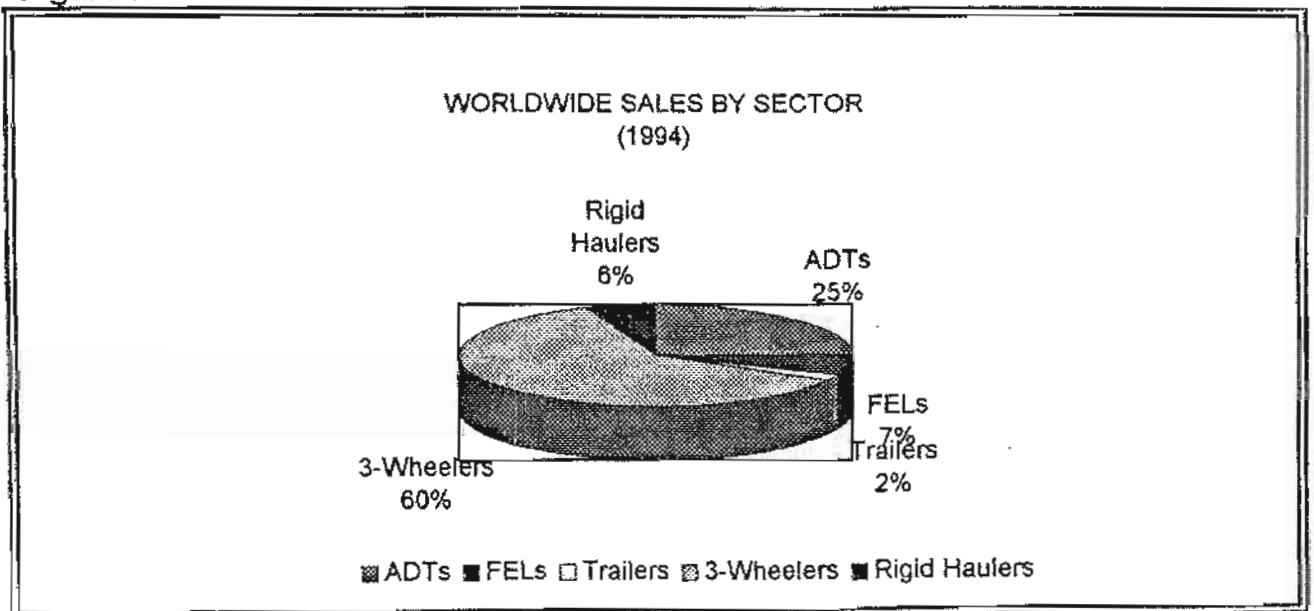


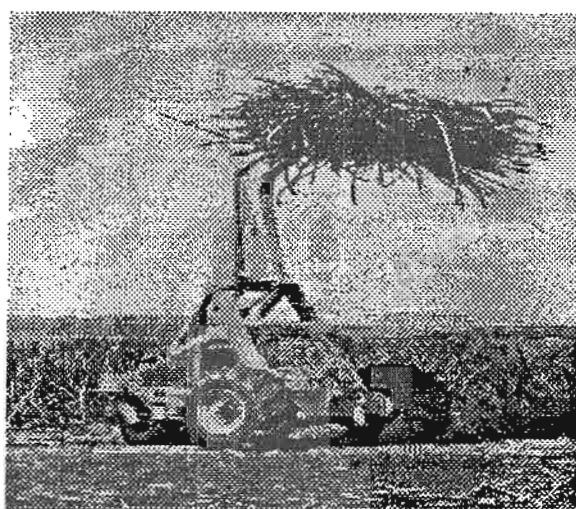
Figure 3:



It is perhaps easier for the outside observer to view Bell in terms of the types of equipment it manufactures (Figure 3). By the far the greatest share of sales is accounted for by a family of three-wheeled machines which are utilised for cutting cane and wood, and for loading these cut pieces onto purpose designed, low-level trailers, which are then pulled by a range of haulers (Figure 4). Although Bell has a significant share of the

market for these three-wheeled cane and timber cutting and loading machines in most of the countries where it competes, these three-wheelers comprise only a small proportion of haulage equipment in these sectors. By value, the dominant items are rigid haulers (in the sense that their carrying bays are attached directly to the cab of the vehicle and are thus inflexible) and trailers.

Figure 4: Three wheeled cane loader



Bell also manufactures a range of articulated dump-trucks (ADTs) (Figure 5). In these products, the carrying bay is flexibly attached to the cab and drive-train so that the trucks can be used for hauling materials on wet and clay soils - this is less efficiently done with rigid haulers. Over the past decade these ADTs, operated in tandem with front-end loaders (FELs) (hydraulic excavators) (Figure 6), have begun to supplant the traditional rigid trucks and scrapers, particularly in Western Europe and the North Eastern seaboard of the USA where wet clay underfoot conditions are

widespread. However, in recent years ADTs have also begun to filter backwards into cane and forestry since the spreading of the load onto six wheels has a less adverse environmental impact than the rigid four wheel haulers which have traditionally been utilised in these sectors. The ADT market is growing rapidly, and being in its early stage, provides not only potential for future growth, but space for new entrants. This represents not only a potentially large market for Bell, but also provides scope for further product innovation.

Figure 5: Articulated Dumptruck

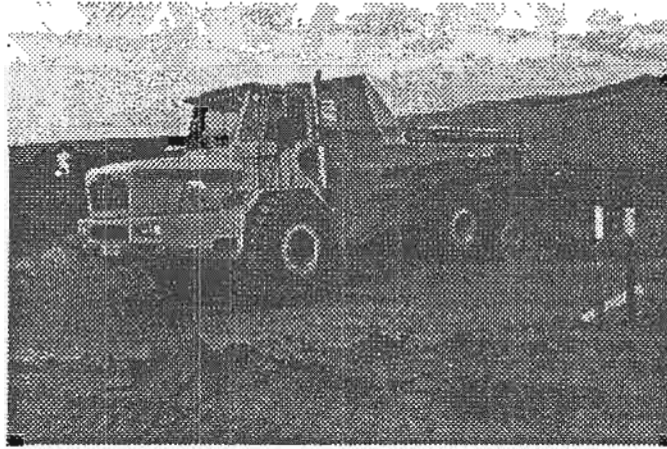
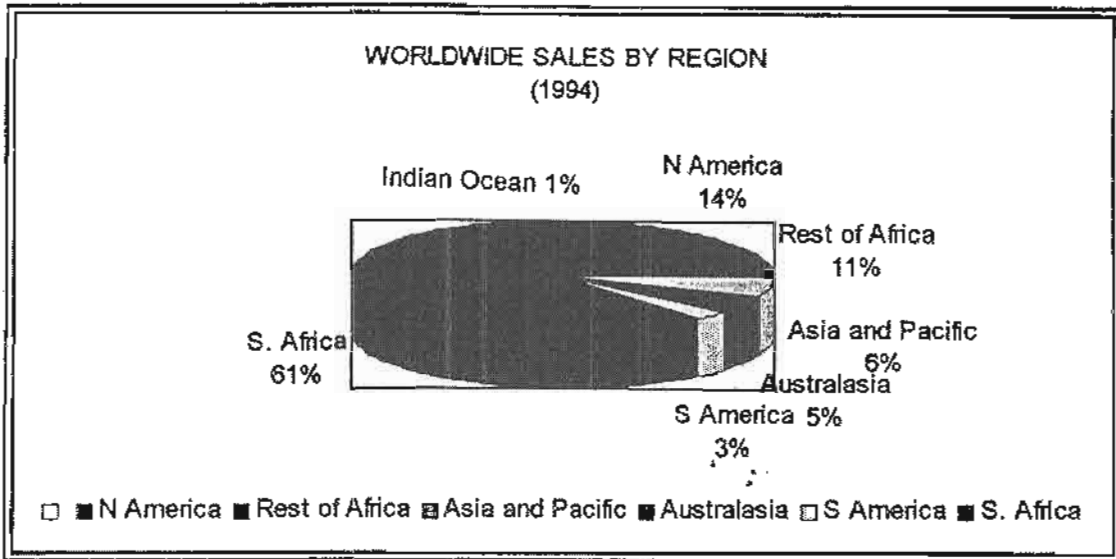


Figure 6: Front End Loader



Figure 7:



Approximately 40 percent of Bell's sales occur in external markets, of which around one-third are exported from its South African factory; the balance is provided by two plants which it operates in Mauritius (traditionally serving much of Sub-Saharan Africa) and in New Zealand (which targets the timber markets in Australasia, Chile and South East Asia). As can be seen from Figure 7, the two major markets outside of South Africa are North America and the Rest of Africa. However, this structure of output and geographical distribution of sales is likely to change significantly, since Bell already commands much of the relevant timber and cane markets - it is virtually the sole supplier in the timber markets of Australasia and S.E. Asia, accounts for 28 percent of Chilean demand and around 18 percent of the US timber market. Partly for this reason, and partly because the ADT market (which originated in Western Europe) shows the potential for long-term growth, Bell has targeted this sector for its future growth, particularly in North America, where there is no indigenous

production, and which is served by European-based producers.

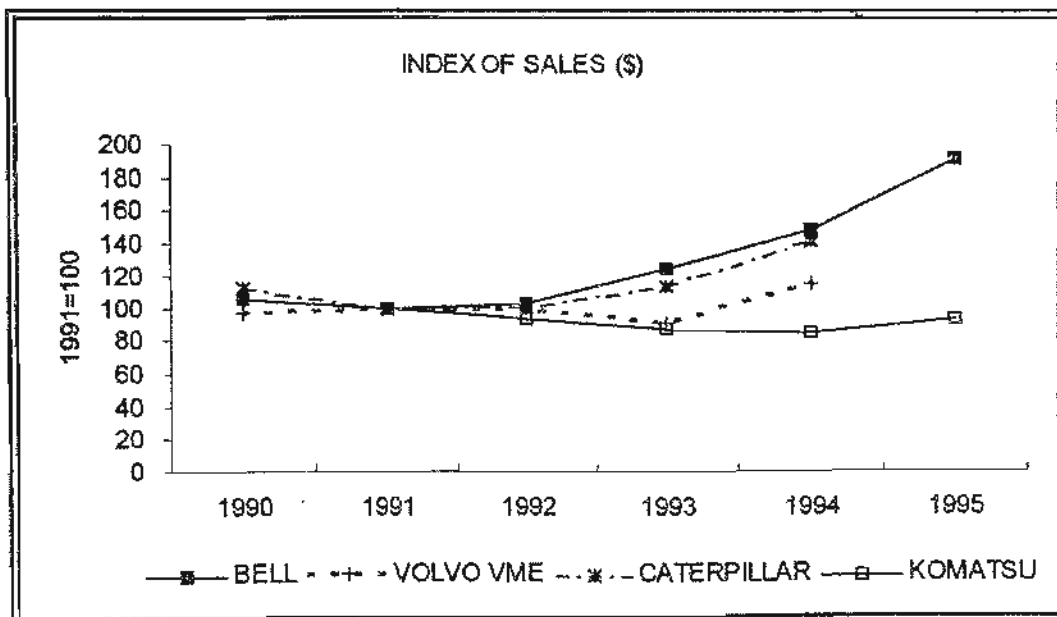
Bell is not alone in foreseeing the growth-potential of the ADT market. The major producers in the earthmoving and construction equipment industry have similar designs, but Bell alone has shown a significant growth in market share in the period 1990-1995, from virtually nothing in the late 1980s, to 13 percent in 1994 (Table 1). Bell is also the only major producer not manufacturing in Europe, since Volvo produces in Sweden, Caterpillar in the UK (where it has just taken over its long-time OEM supplier, David Brown), Komatsu in Norway (through Moxy, its joint venture), and Terex (an American firm) manufactures in the UK. So, if a single indicator of Bell's ability to hold its own position in testing global markets is required, then its performance in the rapidly expanding and highly-competitive ADT sector represents a suitable benchmark. But it is also reflected in the more rapid rate of sales growth of Bell as a whole (that is, for all products, not just ADTs) when compared to its rivals (Figure 8).

**Table 1:**  
**Global Shares in Production of Articulated Dumptrucks (ADTs), 1990-1994.**

	Location	1990	1991	1992	1993	1994
Volvo VME	Sweden	37	61	54	57	53
Caterpillar	UK	24	18	17	21	21
Moxy	Norway	18	3	12	12	14
Terex	UK	11	9	9	8	9
O&K	Germany	7	6	6	2	0
JCB	UK	3	2	1	0	0
Aveling Barford	UK	1	1	1	1	2
Others	NA	0	1	1	0	0
Bell	South Africa	NA	7	7	5	13
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Non-South Africa data from Off-Highway Research, London.

Figure 8:



### 3 BELL IN HISTORICAL PERSPECTIVE

**H**ow did Bell get to be in this position where it commands a dominant share in the cane and timber cutting and hauling sectors in South Africa, Australasia, Chile and North America, and where it has made rapid inroads into the expanding and highly competitive ADT industry which is dominated by global giants such as Caterpillar (with global turnover of \$11.1bn) and Volvo (turnover of \$1.6bn)?

In the post-war period Irvine Bell had been employed in the Natal coal-mines. Technically untrained, his hobby was to rifle the neighbouring coal scrap yard for interesting bits and pieces. His first 'invention' during the 1950s was a water borehole designed to drill quicker and deeper. Irvine then moved from working on the mines to the agricultural sector where he was forced to confront the back-breaking task of cane-cutting and loading. Thus he then designed a rugged, self-loading trailer with winch and a chain which he began to manufacture in 1954 (when Bell Equipment was formed). It worked well on the farm, but it had limitations, and Irvine saw the scope for someone on the truck to control the picking of materials. Consequently, in the early 1960s he introduced a three-wheeled hydrostatically-driven lifter which he then patented.

Bell and his brother-in-law (who had become his partner) were primarily occupied with farming and their general engineering operations which had been given a boost as the Richards Bay mining and port complex was being constructed. They thus licensed the manufacture of this cane equipment to a Johannesburg-based firm, C.H. Funkey and Company Ltd. But by 1976 the major structural works on the

Richards Bay harbour had been completed and the demand for general engineering services declined. Hence Bell decided to take back the manufacturing rights to the three-wheeled machines from Funkey. Sales took off rapidly as the cane-cutting machines were rapidly picked up by the local sugar industry. It also raised the prospect of export sales, but given South Africa's political isolation, it became necessary to produce off-shore. So in 1977 an assembly plant was established in Mauritius, working on completely knocked-down kits (CKDs) from South Africa and supplying Mauritius, Reunion, Egypt, Zimbabwe, Kenya and the Caribbean. A similar plant, but this time aimed at the timber industry, was then established in New Zealand in 1981.

At about this time, Bell's three sons (Peter, Gary and Paul) began to play an active part in the business. They began by applying the principles of the three-wheeled cane cutter and loader to the timber industry, which proved to be very successful. But easily bored, they decided to move to new challenges, and a process of diversification was set in train. The route to this lay in their bidding for a coal-hauling contract for a Vryheid mine. For this, they built a rugged two-wheel drive (2WD) rigid hauler, with an automatic gearbox, engine and transmission purchased off-the-shelf, and operated this contract successfully for a number of years. When the mine closed they saw the possibility of manufacturing and selling 2WD haulers for other parties. Moreover, there was an obvious progression from these 2WD haulers - since they were already hauling, why not also not undertake the loading? This turned into a basic, cheap and rugged front-end loader (FEL) in 1982.

At about this stage the horizons of the Bell family were widening and they then turned back to the industries they knew - forestry and cane - and sold haulers and

grabbers to these sectors as well. Also at this time - the early 1980s - Volvo withdrew from South African market, and other foreign suppliers began to tread carefully in the politically charged environment. Not only did this tend to lessen the intensity of competition, but it also provided an immediate gap in the market for handling equipment for sawmills which provided a further platform off which production could grow.

A new factory site was built in 1983, in Richards Bay. This was not ideally-located for Bell's expanding markets, but it was close to the family farm and home, an important feature for a family-owned private firm. Sales expanded and were further boosted by the introduction of the first rigid dumper truck in the mid-1980s, and then in 1989 (after the eldest brother Peter had gone to Europe and witnessed the new Volvo ADTs in operation) the first ADT was produced.

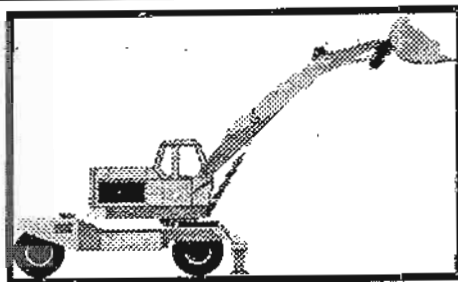
In 1986 Bell decided to export to the US market. The opportunity for this bold geographical diversification was opened by the intra-family division of labour; the eldest son, Peter, was clearly adept at technical innovation, and the middle son, Gary was an adroit marketer. This left a role to be found for the youngest brother, Paul, who was dispatched to the USA to develop this market. The geographical dispersion of sales continued (both to Latin America and S.E. Asia) and Bell's expansion took off (see Figure 1). But it required significantly increased levels of working capital and it was for this reason that, in 1991, Bell raised R45m (\$16.3m) in equity from a group of banks. The understanding provided to the lending banks was that at some stage Bell would go public, to allow them to realise capital gains. This was accomplished in 1995, but under terms which has left the Bell family with effective equity control - 17.25% with the three brothers and 12% with the brother-in-law's family. Thus,

although Bell is now formerly a public company, it remains a tightly held family operation and this, as we shall see below, is an important feature of Bell's emerging global strategy.

Hence, the key to Bell's drive to adulthood lay in the combination of keen technical minds and entrepreneurship in both generations resulting in a consistent programme of product-driven innovation. In hindsight it might appear as if Irvine Bell has constructed a long-term strategy for Bell's eventual entry into world markets. (Caterpillar's major challenger, Komatsu of Japan, did this in 1964 when it decided to mould its growth with the objective of "encircling and overwhelming" Caterpillar - Bartlett and Ghoshal, 1994). However, this does not seem to have been the case, and instead Bell progressed in an unplanned and stumbling manner through a pattern of linked and complementary product innovations.<sup>4</sup> Significantly, as in the case of many entrepreneurial family firms, none of the core family members had advanced education. Instead, between them they covered the range of skills required for basic innovation, product development and, crucially, marketing.

Here it is important to bear in mind the particular niche in which Bell operates, particularly in the haulage and FEL markets. Individual items of equipment will often sell for more than \$200,000 and will work in extremely tough terrain and operating conditions. Crucially, therefore, the equipment must not only be robust, but be available for continuous operation. Hence servicing and spares availability is a major incentive to users. Globally, it is in

<sup>3</sup> A similar process of confronting bottlenecks arising from previous phases of innovation drove the machine tool industry forward in the eighteenth and nineteenth centuries (Rosenberg, 1994).



its extensive global network - manufacturing in 12 countries, with 187 dealers in 128 countries - that Caterpillar's competitive advantage is to be found. But in South Africa, where Caterpillar, Volvo and other manufacturers have found it difficult to operate, this is a role which has been commanded by Bell. Not only does it have 19 service sites capable of providing near-instantaneous servicing of equipment, but Bell has invested in a high-profile set of helicopters which it uses to reinforce this image of rapid response to operating problems. Although not a profitable operation in its own right, the availability of these helicopters, often piloted by Gary Bell himself, has proven to be a major marketing strength, providing not only high-quality support services, but also reinforcing the 'localness' (an important attribute, especially during the siege years of Apartheid) and family nature of Bell's South African operations.

But this mix of skills, although suitable for a nationally-based, sub-\$100m manufacturing enterprise, faced limitations when it was forced to compete on the international stage. So, as the 1990s progressed, so did the professionalisation of Bell senior management. It remains an unusually informal and 'intimate' firm, with managerial and support staff on first-name terms and informal dress the rule. But this is increasingly complemented by the growing professionalisation of each of the major functional divisions, with the partial exclusion of manufacturing itself (see below).

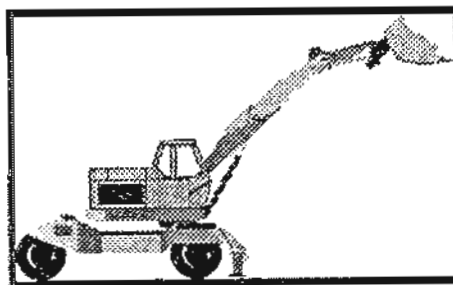
#### 4 HOW DOES BELL MEASURE UP TO INTERNATIONAL BENCHMARKS?

As we have seen, Bell is the dominant supplier of certain sets of equipment in the cane and forestry sectors and is the solitary global producer to witness a significantly growing market share in the production of ADTs (which it has targeted as its major sector for future growth). It might appear from this that Bell holds a particular technological or cost edge to make this impressive performance possible. But consider the following factors.

##### 4.1 Labour and Material Costs

As can be seen from Figure 9, sales per worker in Bell fall significantly short of those in either of two of its major competitors, Caterpillar and Volvo. A number of factors explain this:

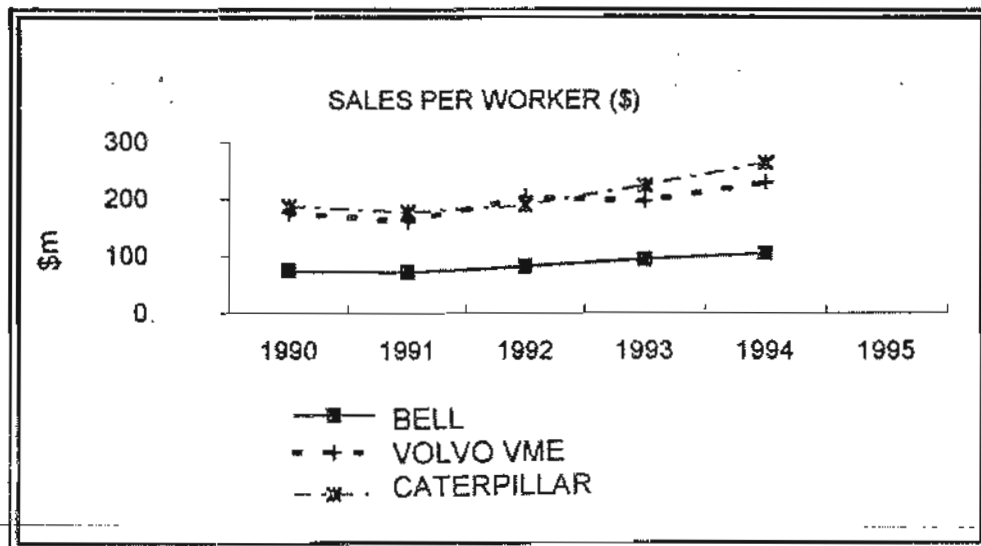
- a significantly higher level of internal value added - currently 25 percent (and formerly 33 percent) versus 12 percent in Komatsu
- Bell's product mix (the cane and forestry machinery tend to have low unit sales prices and involve a relatively large share of labour-costs compared to FELs and ADTs)
- significantly lower levels of automation in Bell which has no robots or flexible manufacturing systems, few CNC machines and limited numbers of sophisticated metal-cutting machinery, and
- an outdated form of plant layout and work organisation (which we will discuss below).



On the other hand, this low labour productivity is to some extent counter-balanced by lower wages. Here Bell has an undoubted advantage compared to the UK producers with whom it competes.

Whilst the average industrial weekly wage for unskilled labour in Caterpillar's UK ADT factory 1995 was R1,750 (\$412), that in Bell's South African plants was only approximately R400-450.

Figure 9:



But labour costs are only a small proportion of total costs and here Bell suffers from a range of disadvantages. Despite South Africa being a low-cost steel producer, there has been considerable controversy because South African users of ISCOR steel pay significantly more than the export price.<sup>4</sup> Moreover, as we shall see, Bell has begun to make more use of imported steel alloys, which face not only transport costs, but also a tariff of five percent. Similarly, most of the core components utilised in its products are either imported (for example, transmissions) and consequently face tariff charges of approximately 10 percent or

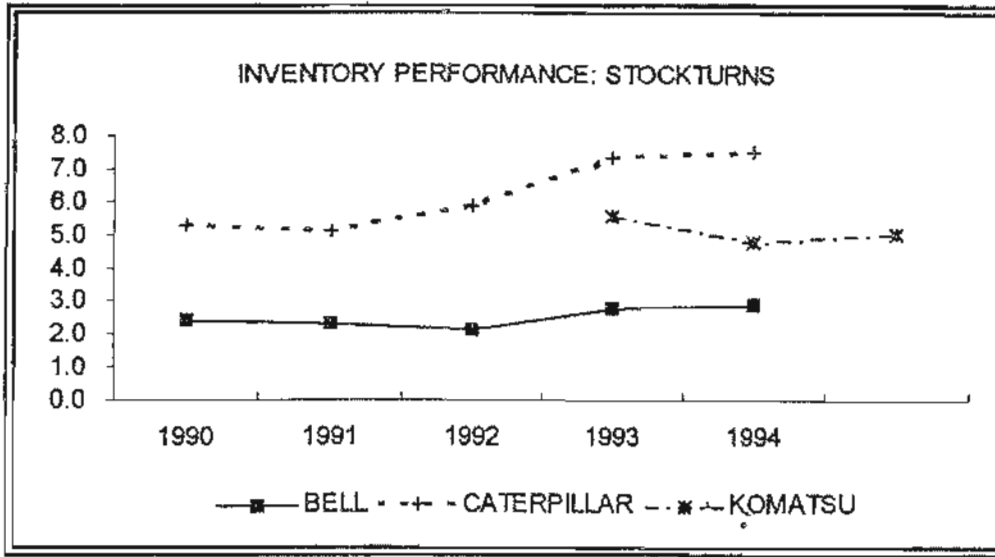
are produced by high-cost local suppliers (as, for example, in the case of diesel engines).

#### 4.2 Capital Costs

For some years macro-economic planners in South Africa have been confronting the problem of high inflation. One of the key policy instruments utilised has been the interest rate, and used together with other policy instruments designed to reduce aggregate demand, the government has had some success in moderating the rate of inflation. However, for borrowers, the consequences of this policy have been adverse, and South Africa now has one of the highest real interest rates in the world, approaching 10 percent in late 1995/early 1996. For Bell, this has meant that its long-term loans have been contracted at a range of 12-16.25 percent at a time when the inflation rate has fallen below eight percent.

<sup>4</sup> Bell's steel stockholder has been the subject of intense criticism on the steel pricing issue since it not only has a near-monopolistic control over exports, but also charges more to domestic customers than to export customers. In Bell's case the supplier used its good offices with ISCOR both to obtain a reduction in steel prices (although these still remain above export prices) and to obtain local substitutes for some of the imported alloys.

Figure 10:



To some extent, Bell is unable to do anything about these capital costs since much of the borrowings has been sunk in capital equipment and buildings. But a significant portion is also utilised in the more liquid form of inventories (R177.6m in 1995), and these are within the control of Bell's management. In later sections we will explore the reasons for the limited success which Bell has had in improving its inventory management, but here it is instructive to observe its comparative performance. The most notable benchmark is with Caterpillar which has since the late 1980s made intensive efforts to absorb the principles of JIT production from its Japanese rivals.

While it is true that there are some intrinsic reasons why Caterpillar's absolute inventory performance should be superior to that of Bell - for example, Bell's longer leadtime on imported components, its higher ratio of value added and its more active participation in distribution (where Caterpillar makes greater use of independent distributors) - it is not just the distance in absolute performance between Bell and Caterpillar which is so notable, but also Caterpillar's superior rate of improvement

(Figure 10).<sup>5</sup> Moreover, a stockturn of 2.9 is relatively low, even by cross-industry standards in South Africa (Joffe et al, 1995).<sup>6</sup>

5 Stockturns are a ratio used to estimate efficiency of inventory use. It is calculated by dividing end-of-year sales with end-of-year stocks; the higher the ratio, the better the performance, since the lower the stocks. Caterpillar's stockturn figure of 7.9 in Figure 7 is based upon its global inventory performance (as is the case for Komatsu). However the performance of the former David Brown subsidiary which manufactures all of Caterpillar's ADTs (and which is now owned by Caterpillar), is virtually identical, at 7.8.

6 It is interesting that not all Japanese firms make efficiency use of their inventories. Komatsu tends to manufacture in large batches, since it is reluctant to change over machinery. Consequently, as can be seen from Figure 7, its stockturn ratio in 1995 was only 5.05, similar to the Caterpillar figure in 1992, but significantly lower than Caterpillar's 1994 performance of 7.6. Caterpillar is not the only construction equipment firm to show an improvement in inventory management. Terex of the US increased its stockturn ratio from 2.08 in 1992 to 4.79 in 1994.

4.3 Exchange Rate Depreciation

Because plant production costs (which are incurred in South Africa Rands) have to be translated into local currency in export markets, changes in the exchange rate can play an important role in the profitability of external sales. But it is not adequate to focus on the exchange rate itself (the "nominal exchange rate") since account

the depreciation of the South African Rand against the \$, the higher rate of inflation in South Africa eroded all of these gains, so that the real exchange rate under which Bell operated remained effectively unchanged during the 1990-1995 period.

Taking these various elements together, therefore, there is little to suggest that

Table 2.  
Nominal and real Exchange Rate Indices, 1990-1995.

	1990	1991	1992	1993	1994	1995
Nominal Exchange Rate Index	100	94.1	91	79.4	73.1	71.2
Real Exchange Rate Index	100	101.5	104.4	95.6	93.2	99.3

has to be taken of inflation, in the South African market where the products are produced, in imported input prices and in the final market where the products are sold. (This is referred to as the "real exchange rate"). Table 2 shows the movement of both the nominal and real exchange rate indices for the period 1990-1995 for sales from South Africa to the USA, the primary market focus for sales expansion; this was before the sharp depreciation of the Rand in March-April 1996.<sup>8</sup> From this it is evident that despite

production costs (broadly conceived to include exchange rate factors) have been a decisive competitive factor in Bell's global progress. Indeed if anything it operated under a cost disadvantage since it is also some distance from major global markets and faced significantly higher capital costs. There is also no evidence that it competes in these external markets through lower prices.<sup>8</sup>

4.4 Product Strength

Given that Bell benefited from little real cost advantage, the major source of Bell's competitive advantage may lie in the nature, design and mix of its products. Here comparative measurement is difficult, since all of Bell's major competitors produce a far larger range of equipment types than does Bell. But within individual product families the following points are evident:

- In cane and forestry equipment, Bell's products are clearly superior to those of its competitors, as is evidenced by its large market share in

<sup>7</sup> The USA is an imperfect comparator for exchange rate movements, since not all sales take place there and not all inputs are priced in US\$. However it is the best single point of reference since it is the focus of the export drive. Moreover, calculation of a weighted real exchange rate would have to decompose the source of all Bell imports, including to its suppliers as well as the destination of all of its exports, for which data was not available. And the general order of magnitude of the exchange rate shifts reflected in Table 2 are such as to outweigh the significance of this more finely-tuned calculation. (The real exchange rate was calculated through using the US capital goods price index, and the South African home and consumer goods price index; no capital goods price index was available for

South Africa; 1995 price index calculated for September).

<sup>8</sup> Discussion with Colin Timms, Off-Highway Research, London.

a variety of individual markets. The weakness of this segment is that it has a finite size and there is little room for Bell to increase its market share, although it has begun to target new timber markets in S.E. Asia as a route to sales expansion. On the other hand, the strength of this market dominance by Bell is that it has provided a cash-cow which Bell can milk to subsidise the extensive costs - especially in constructing a marketing network - in its targeted growth-sector, ADTs.<sup>9</sup>

- In **front-end loaders**, Bell operates as a small bit-player in a highly-competitive and technologically complex market niche. Hitherto it has been protected in its domestic market, partly because of high tariffs, and partly as one of the positive spin-offs of the international sanctions campaign against South Africa. But, post-Uruguay Round, South Africa's tariffs are falling and a number of competitors have already begun to make their presence felt, especially the Korean firms who are currently dumping FELs into South Africa at very low prices. Moreover, unlike the cane and forestry segment, Bell holds no great product advantage in this market and few FELs are exported.
- In the domestic **ADT** market Bell has made headway by customising its products to meet the demands of individual users. But this is more difficult in external markets, although a recent order for 18 vehicles has been won in Taiwan largely on the basis of customisation. More importantly, though, at present Bell's ability to compete in the global ADT market has been hampered by the relative lack of sophistication of its

products, in terms of cabin comfort and ergonomics. It is for this reason that it has targeted its export drive on the North American market which is less demanding of ergonomic features.

### 4.5 Fortuitous Timing

Thus Bell's global success has little to do with its cost structure, and is only partly explained by its product strength in key niche markets. Instead its recent disproportionate growth of production is largely explained by the fortuitous circumstances in which it has been operating, and the availability of government support in various forms (see below). The dying years of Apartheid were characterised by a severe slowdown in investment in South Africa, one of the reasons underlying Bell's decision to move into exporting. Here, from the early 1990s it benefited from a sharp growth in global commodity markets in which its final customers operate, especially in the timber industry (where pulp and paper prices skyrocketed until the end of 1995). It is on the back of this demand that Bell based its production expansion in the first half of the 1990s, at a time when most of its major competitors were struggling to meet the growth in global demand. For example, in the ADT sector (which benefited less than the timber industry), sales grew in volume terms by 22 percent between 1992 and 1994. This growth in sales has been an important factor in providing the scale economies to support new product development and external marketing support.

<sup>9</sup> The concept of the "cash-cow" refers to sectors of high market share and low growth and was introduced by the Boston Consulting Group in the 1970s. The strategic function of these sectors is to provide the funds to promote diversification into high-growth sectors.

## 5 STRENGTHS AND WEAKNESSES IN INTERNAL OPERATIONS

**B**ell's ability to succeed where other South African manufacturing companies have failed to become significant global producers can be traced to two key elements of its internal operations - its flexible and entrepreneurial strategic focus, and its commitment to innovation. But it is important to bear in mind the aphorism "best is the enemy of better" that is, there is no such thing as "best practice", but only "better practice". Thus, although Bell appears to be a significant cut above most of South Africa's manufacturing sector, as we have seen in the preceding discussion of its relative global performance with inventories, there is always scope for improvement. So the discussion of Bell's internal strengths needs to be counterposed by an assessment of internal weaknesses which may possibly undermine operations. What follows is designed to draw out both these strengths and weaknesses. These weaknesses are primarily expressed in its manufacturing organisation and in its industrial relations and human resource endowments; there are, too, shortcomings in its design strategy, despite the overall strength of this function within Bell.

### 5.1 Strategy: Flexibility and Customer Focus

It is easy to overstate the absence of an explicit strategy during the first three decades of Bell's existence. But as we have seen, during this period Bell's changing structure reflected a series of largely reactive responses to bottlenecks (for example, the three-wheelers grew out of the greater efficiency of the low-level cane trailers), opportunities (winning the tender for haulage on a coal mine led to the production of haulers) and family circumstances (the "availability" of a brother led to exports to the US market).

But from the mid-1980s, a more explicit approach was adopted towards strategic focusing, particularly with the recognition that Bell's future lay in its ability to compete in global markets. This is most concretely expressed in its targeting of the global ADT market as its vehicle for sustained expansion.

In order to understand the current strategic thrust of Bell it is necessary to enlarge on a point made earlier, that is that Bell operates in a "personal market" which is some distance from the "anonymity" of buyer-seller relations in economic theory. Although some consumers may buy products in largish numbers - for example, the recent sale by Bell of 19 ADTs to Taiwan - more typically (and especially in the South African context) the user may be relatively small scale and only possess less than ten large items of such equipment (albeit items which may have cost more than \$200,000 each). The user also requires continuous equipment availability, and any supplier who is unable to guarantee near continuous uptime, including through the provision of after-sales service and parts availability, would not survive for long.<sup>10</sup> Bell's rapid growth in South Africa arises directly from its ability to master these market conditions. Moreover, its closeness to its customers has also involved a large degree of customisation of design, in part through its use of its customer base to develop new products.

This approach towards customisation has not only given Bell a close-to-market presence, but has also allowed it to shrink its time-to-market for new products. Instead of designing and then testing new products in-house, Bell has preferred to deliver newly designed products to customers and to let them "test" these in the field. During this period Bell provides very close support, adjusting the design of

<sup>10</sup> Bell's 19 service centres in South Africa aim for 85 percent "first-pick availability" from stores.

future models as field operation shows the need, and continuing to do so for some years after an initial design had been "completed". But although this closeness has provided it with a real competitive edge of customisation and continuous improvement, it has also had a downside. Parts proliferation has exploded, with serious implications both for manufacturing and for future servicing of customer needs. Currently Bell has 46,000 different "live" parts, but since some of these are sub-assemblies, the real number is more like 100,000. In a recent case, the manufacturing division examined the specification of a complex product which it was assembling and compared the parts actually utilised against the original Bill of Materials. Only 40 percent of these corresponded, even though they were only on the 14th unit manufactured since the product was first introduced.

This strategy of customisation and "personal selling" is a much more difficult to pursue in external markets, particularly one so large and diverse as in the USA. Here Bell initially entered the market by establishing its own parts and servicing network (under the management of the youngest of the three brothers), but this has not proved to be viable. The reasons for this are obvious really, that is, individual users in the "personal market" in which Bell operates require brand-name recognition to assure them that the very large items of equipment which they are purchasing are of adequate quality and will be professionally serviced in due time.

This is Caterpillar's global advantage and Bell's competitive advantage in its South African market. Yet it lacks this customer awareness in the USA and has thus decided to hold back on its independent marketing network, and instead to use the services of a number of independent John Deere agents who do not, as yet, have equivalent products in their portfolio; currently 12 of its 20 US service centres

are also Deere agents.<sup>11</sup> With this background it is possible to grasp the logic of Bell's current strategic thrust. This is to:

1. become a global operator. This is the most significant element in Bell's growth from infancy to adulthood, and finds its expression in an important change in design philosophy. Previously Bell would design its products for the South African market and then add in features (often to do with safety, ergonomics and driver comfort) for exported products. Instead it is now designing for global markets and then "subtracting" features to meet the needs of the less exacting domestic market.
2. rationalise the range of products, reducing from six families to three or four. The rule of thumb which has been adopted is that the only products which will be continued are those whose sales exceed 20 units in the first year, 40 in the 2nd year and 100 in the third year. But at the same time, recognising that Bell is small by global standards, it has targeted niche sectors (such as ADTs and cane and timber equipment) in which it will specialise.
3. target the ADT sector as its primary product focus, bearing in mind that its penetration of the cane and forestry industries is already high.<sup>12</sup> Bell has set itself the aim of becoming one of the world's largest ADT producers, with annual output in the range of 1-2,000 units.
4. develop a geographical focus in which it focuses on the ADT market in the USA and Latin America; mining and construction in South Africa; mining,

<sup>11</sup> John Deere manufactures a range of agricultural machinery, but this excludes cane and forestry cutters as well as ADTs.

<sup>12</sup> Although, as we have seen, the possibility has now arisen of entering the cane and forestry haulage market with ADTs.

construction and timber in the Rest of Africa; and timber and cane in S.E. Asia. However, the major short-term thrusts will be in North America and S.E. Asia, since the European market for ADTs is especially demanding and the prospect of market growth in Latin America and, surprisingly, the Rest of Africa are considered to be relatively bleak.

5. reduce its own manufacturing to a share of product value added which is much more like those of its international rivals. Until recently it produced more than 33 percent of added value; it is now 25 percent and it is hoped that this will fall to less than 20 percent in the short- to medium-run. (By contrast, Komatsu only adds 12 percent value in its product range).

This agenda for the future is both credible (with the possible exception of becoming the world's leading producer of ADTs) and is effectively backed by detailed plans of action. But underlying this focus lies a single core strategic objective informing all of Bell's operations. This is that it should remain a family-owned and controlled firm. Given the particular nature of the South African capital market (an issue to which we shall return in later discussion) this has created two particular, linked problems. First, as we have already seen, the R45m equity which Bell acquired in 1991 forced it to go public in 1995. But secondly, a combination of rapid growth and poor manufacturing organisation (see below) during the 1990s forced up Bell's gearing (the ratio of its debt to equity) from a historical average of about 50-60 percent to 65 percent in 1995. Having being stung once when its debt forced the family to dilute equity, the Bells are determined to reduce borrowing. This has meant that a decision has been made to stabilise 1996 sales at the 1995 level, *despite the opportunities for continued expansion*. We will return to this issue in the discussion below on

manufacturing strategy and on government policy.

## 5.2 Innovation as an Organising Theme

Theorists of technical change make the important distinction between invention (a novel idea) and innovation (the first commercial application of novel ideas). Successful invention, as the British have long found, does not automatically translate into viable innovations and separate types of skills are required if both are to occur, especially within a commercially rewarding time-frame. It is also frequently observed that the process of invention has become increasingly complex, so that the idea of the single, brilliant inventor has had to give way to the reality of teams of people working on a complex problem which is not bounded by time (the gestation periods are long and close interaction with users is required), by location (spanning different sites, often in different countries) or by institution (involving inter-firm collaboration, or collaboration with research institutes).<sup>13</sup> Bell's growth to adulthood reflects its success in mastering these related tasks of invention and innovation. As can be seen from Table 3, the four decades between 1954 and 1995 reflect both the inventive genius of the Bell family and the growing commercialisation of these efforts to meet particular market needs. But in recent years, the design function has moved from the individual ideas and tinkering of the father and one of the sons (Peter) to a team of personnel in the Design Department

<sup>13</sup> Both of these observations are attributable to Schumpeter, and are discussed in greater detail in Freeman, Clark and Soete (1982).

Date	Innovation	Significance
1954	Self-loading sugar cane trailer	Eased task of cane cutting and loading
1962-3	Three-wheeled hydrostatically operated loader	Raised productivity in cane cutting and loading
Late 1970s	Loading equipment for timber industry	Application of principles from cane industry equipment
1978	Two-wheel drive rigid hauler	Significant step in expanding the technological content and value added in products
Early 1980s	Rigid haulers for coal mining industry	Diversification of user-base from agriculture to mining and haulage
1982	Front end loader; feller buncher for forestry	Extension of technological horizons and product complexity; extension of principles from cane cutting
1985	First ADT launched (25 tons), subsequently extended with low profile model for trackless mining	Based on observation of Volvo equipment in Europe, and recognition of growing niche market. Move to high unit value product (above \$200K)
1988	Application of logging equipment to US timber industry	Joint venture with Morbark Industries
1987	Extension of ADT capacity (18 and 30 tons) and high speed versions for open-cast mining	Extending the range of customers, and building volumes to underwrite future R&D.
1989	40 ton ADT	Extending the range of customers, and building volumes to underwrite future R&D.
Early 1990s	6 wheel driven and steered logging equipment	Based upon ADTs and innovating "backwards" into mature timber market; tapping market for environmentally friendly equipment in USA
1993	Extension of product variety in most product families	Filling-out of product portfolio, to provide both for scale and capacity to meet customer's full needs
1995	Larger FEL	To match growing size of ADTs and thus provide the capacity to meet customer's full needs

	1993	1994	1995	Types of education and training
Senior Design Managers	4	5	7	University trained
Engineers	3	5	7	University trained
Senior technicians	5	5	5	T4 plus 4-5 years experience
Seven Design Groups	25	35	35	3 have T4 plus 1-3 years experience; 4 are in training, have less than T4
Drawing Office	8	12	16	Between N3 and N6
Total	45	62	70	
Bell's R&D as % Sales*			1.3	
Volvo VMEs R&D as % of Sales	3.1	3.2		
Caterpillar's R&D as % Sales	3.9	3.0		

\* Bell counts the cost of prototype development as R&D, and by these calculations its R&D expenditure is 4% of sales. These prototypes yield revenue since they are sold to customers.

Table 4 details the size and nature of R&D function at Bell and shows a significant growth in numbers in recent years. However, at the same time, the level of relative effort allocated to R&D is significantly below those of Volvo and Caterpillar, the two firms dominating the earthmoving equipment industry, particularly the ADTs which Bell is targeting for expansion.<sup>14</sup> The Design Department is currently grappling with the proliferation of product types in Bell, as well as with the overwhelming variety of components arising from its historic commitment to customised production and to testing in the field. At the same time, the pressures of competition are forcing Bell into continually launching new products and updates of existing products. For example, during 1995 they worked on 11 products scheduled for 1996-early 1997 launch (two of which were major designs), and completed the designs for three new haulers. The pressure to produce more designs tends to increase during recessions and the softening of the market in late 1995 was adding to the pressure on the Design Department.

In confronting these manifold pressures the Design Department has been aided by its move towards in-house concurrent engineering. Over the past two years increasing effort has been placed on this, and with some success. Design is now scheduled to include representatives from

Design itself, Production, Industrial Engineering (responsible for manufacturing in-house jigs for assembly), Marketing, Purchasing and After-sales Service. In addition, there is an extensive system for reporting problems faced by customers either utilising Bell machinery (and confronting operating difficulties) or from potential customers who have chosen competitor's equipment for reasons other than price. In general this system of concurrent engineering works effectively, with the exception of the Production Department which has been reluctant to attend scheduled meetings in the past (see below). In particular, the links between Design and Marketing are strong, with a number of ex-Design staff now filling leading positions in the Marketing Department. But despite this growing strength and professionalisation of design in Bell, there are some acute remaining weaknesses which may hamper growth in the future, particularly as Bell enters more demanding global markets for more complex products, as is occurring in the case of ADTs. These are:

- the links between Design and Production remain weak. Production generally fails to attend the design meetings. On the other hand it feels that the Design Department has not done enough to impose order in the proliferation of parts variety. This often leads to high-cost production. For example, in one case the Production Department pointed out that the chassis of one of its products was difficult to assemble and was almost certainly significantly over-specified; but this had little impact on the design of this product.<sup>15</sup>

<sup>14</sup> Two caveats are in order here. First Caterpillar's effort is devoted to a much larger portfolio of products, many of which are more complex than the cane and forestry equipment which Bell produces (a mature product). And, secondly, it is common in comparisons between high- and low-wage economies to underestimate the actual levels of R&D in the low-wage economies, since its scientists and engineers are paid a fraction of those in the high-wage economies. Thus the comparative R&D figures in Table 4 will tend to underestimate Bell's relative commitment to R&D.

<sup>15</sup> It is a point that the oft-cited study of the global auto industry *The Machine that Changed the World* estimated that one-third of the Japanese cost-advantage arose from the application of design-for-manufacture principles (Womack et. al., 1990).

- progress on developing a library of parts, particularly in established products, has been slow. Amongst other things, this has meant that only slow progress has been made in the necessary journey towards modularisation of design and manufacture.<sup>16</sup>
- the CAD system is largely used as a drafting tool. Hence until very recently no use has been made of finite element analysis or any of the other tools required to scientise design, so there is every possibility that Bell is "throwing too much steel" at its design and producing unnecessarily heavy and costly products.<sup>17</sup> In recent years Bell has sent some of its design to a firm in Pretoria specialising in stress analysis, but it would clearly make more sense for this expertise to remain in-house if the principles of value engineering and concurrent engineering are to be successfully implemented.
- the failure to utilise CAD effectively as a design (as opposed to a drafting) tool undermines the prospects for low-cost customisation and for linking

design parameters directly to machine set-up in the future as more electronically-controlled equipment finds its way on to the shop floor.<sup>18</sup>

- although the push towards concurrent engineering has gone some distance inside Bell's internal operations, there is no sign that it is extending to its relations with its suppliers (see below).

Thus, invention and product innovation have been core strengths in the past, but the failure of Bell to fully professionalise this function suggests that it may come to be a strategic weakness in the future.

In theoretical terms, the tension which Bell experiences between the logic of standardisation and customisation can perhaps be understood in relation to the newly emerging literature on Complex Production Systems (Hobday, 1994). These describe sectors such as flight simulation, where the production process comprises the manufactures of only limited series of products. In these sectors, the design process involves close interaction with customers in specifying product characteristics, a process of continuous incremental change in design as experience builds up in product use, and the underlying potential in the sector for large technological jumps. The first of these two features have been central to

<sup>16</sup> For example, in the global commercial vehicle industry, which is not dissimilar to Bell's product structure, in the past proliferation of design led to severe diseconomies in production. Consequently the industry is currently moving towards modularity of platforms and "sub-skin" sub-assemblies, so that the customer's perception of variety is belied by the reality of growing standardisation. A similar process is occurring in the auto industry where the rush to variety during the late 1980s and early 1990s also led to growing costs in manufacture and, as importantly, in the inventories of spares required to meet customer needs.

<sup>17</sup> On the other hand, Bell monitors the relative weight of its products and in one case, found that its products were the second lightest out of a group of five competitors, with no apparent shortfall on operating efficiency.

<sup>18</sup> By contrast, a successful British manufacturer of specialised banking furniture has made its command over information a core strategic strength. For example, in its design system it holds a data-base of the average height of people in every different country, so that it can easily tailor the design of its furniture to meet these physical variations and enhance its product's appeal. The fact that this design system is linked directly to machine controls (via DNC communication) reduces the costs of variation, but this is also contingent upon an extensive library of parts in the CAD system and the modularisation of design in its products.

Bell's past operations, particularly in the South African market, and it is therefore tempting to put Bell into this category of CPSs. If this is the case, then there is little need for concern about the trajectory of the design function in Bell since proliferation of parts and design is an inherent element in producing viable products. But, on the other hand, it is also possible to see the proliferation of parts at Bell as reflecting the period of pre-mass craft-production. Here the failure to work to systematic design parameters meant that there was little interchangeability of parts and the key innovation (as in the production of the Enfield Rifle in the nineteenth century) was to move towards interchangeability; this became known as "the American System of Manufacture" (Best, 1990). If this more accurately reflects Bell's design dilemma, then there is both cause for concern about Bell's operations and the prospect of future cost-reduction if the challenge is met. On balance it would appear that Bell's present position is much closer to the need to move towards the American System of Manufacture than to the fact that it is producing in a CPS sector.

### 5.3 Manufacturing (Mis)organisation

The biggest short-term problem faced by Bell arises from its structure of manufacturing organisation - perhaps more appropriately described as manufacturing mis-organisation. Essentially the large factory is laid out on a functional basis with a single machining division, three paint areas and a range of assembly shops, one of which is in fact on a different site over the road from the main plant itself. Typical of functionally laid-out plants, work-in-progress (WIP) is pushed through the plant on a computerised MRP2-type system, which in Bell is so discredited, that most data entry is inaccurate and only serves to further confuse production control. Also typical of this functional layout is an

accretion of WIP through the factory, and it is not unusual for fork-lift trucks to be held waiting for up to an hour whilst WIP is moved out of the way. Moreover, some of the WIP in the plant is effectively "dead" since product specifications have changed some time ago. And, again typically of functionally laid-out plants, Bell has had to introduce progress-chasers to find individual job-lots which have gone "missing" somewhere on the shop floor.

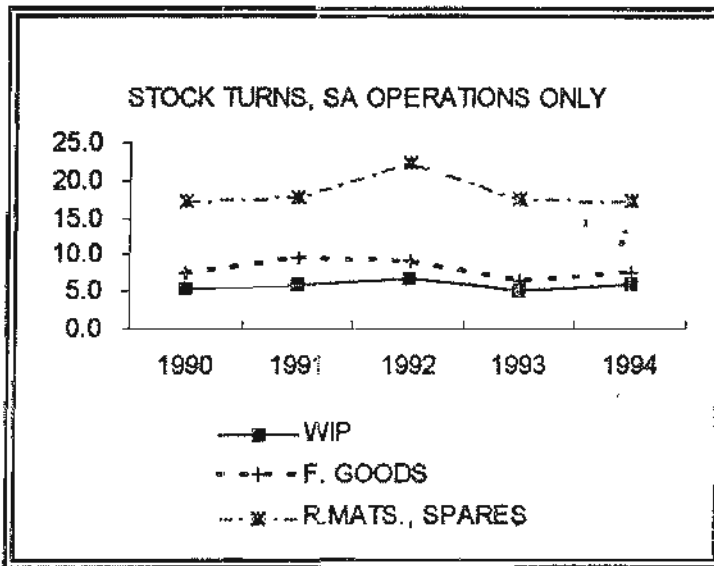
Consequently although Bell has not yet made the calculation of the ratio between actual and value-added time and distance, in some cases it is large. For example, in the assembly of some of the ADTs (which incorporates only a small proportion of total production time, since many of the components produced prior to assembly are stored as WIP for considerable periods), the necessary assembly-time is only two weeks, yet the product frequently takes three months to pass through the factory. These delays are exacerbated by the need to move WIP back and forth between the two factories during the process of manufacture.

In an earlier section we have already seen the result of this factory organisation in regard to Bell's comparative inventory performance (Figure 10). But Figure 11, which breaks down the performance of individual items of stock is more disturbing because it shows that the inventory performance on WIP showed no sign of improvement; in fact the value of WIP in September 1995 was R52m, more than double the figure at the end of February. The reason for this large increase in WIP through 1995 was that Bell estimated the theoretical factory capacity at 2,000 units and ordered the materials to meet this objective, but because of its manufacturing problems was only able to push just over half this number of units through the plant. This growth of WIP has had very serious consequences as we have seen, since the decision to consolidate production rather

than to continue growing in 1996 was made because of the lack of finance for working capital. Thus, if WIP stocks could be brought in line - and there was some improvement after September 1995 - this would liberate the resources to finance expansion, if the theoretical

capacity of the plant could be attained. All of these production issues - high inventories, "lost orders", under-utilisation of capacity, and so on - are inter-related and are classic symptoms of a multi-product functionally laid-out factory.

Figure 11:



A package of solutions, originally developed by Toyota in Japan, exists to resolve most of these problems (Kaplinsky, 1994). This includes moving to a cellular layout and the systematic adoption of a programme to reduce batch size and changeover times.<sup>19</sup> There are members of middle management in Bell who

understand the nature of this layout and production scheduling issue, but their voices are not being heard, partly because senior management has not been convinced and partly because the functional division managers within Production wield a great deal of power. The relative lack of education of these functional managers may be an explanation for this problem (for example, two have matriculation standard education and two have sub-matriculation education), but more likely this reflects a general historical weakness in Bell to problematise human resource development (see below).

<sup>19</sup> Production at Bell occurs on a Minimum Order Quantity (MOQ) basis. For example, because the changeover on the plasma cutters takes 30 minutes, these are limited to one changeover per day. But the speed of these cutters means that enough WIP is produced to cover two weeks WIP. Even if this 30 minute changeover were immutable, then the logic of building this WIP would be questionable. But with the application of SMED-type principles (single minutes exchange of dies) management estimated that the changeover could be reduced to 10 minutes.

Finally, production is also hampered by Bell's experience with quality management. Its final products have always necessarily been of high quality, but the issue has been how this quality has been achieved, that is, what has been the "cost of quality".

Because Bell was facing pressures from sophisticated customers in external markets, it made the decision to go for ISO9001 accreditation in 1991. But it failed twice in this quest - once in 1991 and once in 1993 - despite (or perhaps even because) it used external consultants. It was only in 1995 that they achieved certification. However, despite this certification, the plant is not rich in quality-related systems. There is little information available on the shop floor, and certainly none appears to be collected and displayed by the labour force. There is also as yet no plant-level information on levels of scrap or in-process defects, and the use of Statistical Process Control (SPC) is not being actively considered. There is also little use of quality system tools such as Ishikawa fish diagrams or the 20 Keys Programme to give substance to the weekly "home-zone" meetings (see below). Similarly, Bell is aware of the need to upgrade supplier quality, but as we shall see in a later section, it lacks the infrastructure to promote supplier development.

This lack of quality systems does not mean that quality awareness is low. All workers in the plant have been taken through at least one 45 minute session (comprising a mix of videos and discussion) on the need for quality, and even militant shop-stewards remarked that better quality had to become an important feature of their work, since if Bell failed to achieve the demands of greater quality, it would lose its customers and the workers' jobs would be at risk. Thus awareness is high, but quality systems in production are only at the most embryonic stage.

#### 5.4 Human Resources and Industrial Relations

If the restructuring of manufacturing organisation arises as the biggest short-term problem facing Bell, the most significant medium and long-term challenge lies in the realm of human resources and industrial relations. Here

Bell's ability to make progress is bounded not only by its internal procedures but also by the wider environment in which it operates. But before discussing these issues it is helpful to set these challenges facing Bell in the wider context of industrial change throughout the world.

Comparative economic performance has shown that from about the mid-1970s the global economy has been experiencing a change in industrial paradigm. It is one in which in addition to cost competitiveness, producers are having to respond increasingly flexibly to more diversified market needs, in which quality, time-to-market, and product diversity are critical. (all of these features are evident in Bell's market, as we have seen). Although new technologies such as electronics have an important role to play in this transition, the key advances are dictated by the changes in organisation, including in layout, inventory control and quality systems which were discussed in the preceding section. But central to these organisational changes is a restructuring of the role of the labour force; this is no longer seen as a cost to be minimised, but as a central resource, whose potential has to be systematically augmented. It is this restructuring of work organisation which lies at the root of Japanese success (Kaplinsky, 1994), behind the operations of the most progressive European firms (Andreasen et. al., 1995) and which is relevant for South African industrial restructuring (Joffe et. al., 1995). Amongst other things this requires:

- participation by the workforce in programmes of continuous change (*kaizen* in Japanese) through various forms of suggestion schemes
- a programme of task flexibility in work to speed-up machine changeovers and to increase capacity utilisation
- training programmes to facilitate not only multi-skilling (which is an essential complement to task-

flexibility), but also adaptation to rapidly changing technologies

- the optimisation of labour productivity in teams rather than through the performance of individual workers, and
- a restructuring of industrial relations away from patterns of domination and fear, towards cooperation and mutual trust.

These five sets of changes represent major challenges in all environments, but they are all the more daunting in the South African context,

given Apartheid's legacy of under-education and under-training, hostile industrial relations and racial tension on the shopfloor. These wider societal tensions are no less evident in Bell's internal operations.

Management has its own legacy of attempts to crush a militant union, reflected in a strike and retrenchments even during the early 1990s. Consequently, representatives of the workforce are not filled with goodwill or the desire to forge a new, more cooperative relationship; they describe themselves as "absolutely bitter", "very unhappy at Bell but there is nowhere else to go", "Bell's approach to the trade union has poisoned me against Bell", and so on.

Bell has belatedly begun to address these issues. Given that about 30 percent of its labour force is functionally illiterate (although Bell has not yet audited literacy), an internal programme for adult basic education has been instituted.<sup>20</sup> In addition, Bell also supports a Literacy Trust in the local community. In 1992 R4.2m was devoted to training, but this fell to R 3.8m in 1994, of which half was

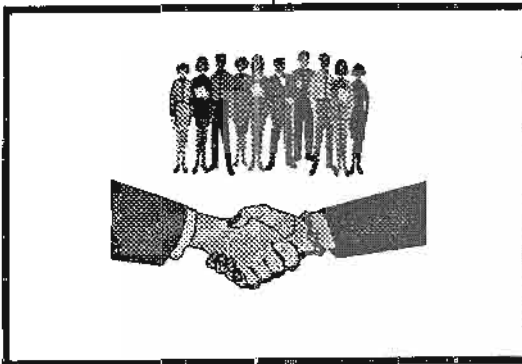
devoted to training 50 apprentices rather than in upgrading the existing (predominantly black) direct labour force. This represents a mere 0.73 percent of turnover and compares rather poorly with European and American discussion of the need for a 2 percent payroll training tax.<sup>21</sup>

However, a start has been made. In 1995 Bell made its first black managerial appointment, in the human resources division. This is an experienced manager, of considerable tact and competence, but although he was appointed as a human resource manager, the legacy of hostility

on the shop floor has driven him into personnel management and industrial relations, a fire-fighting role rather than one which is required to construct a suitably trained labour force. In addition, Bell has become involved in

a new agreement with the trade union to shrink the skill divide from 13 to five grades, and to discuss portability and what the Union refers to as the "wage-skills nexus".<sup>22</sup> It has also begun to allow the trade union to meet on company premises. But, clearly, much remains to be done.

But these responses only scrape the surface of the challenge facing Bell. Attitudes on the shop-floor remain entrenched. For example, Bell has instituted a QSP (Quality, Safety, Productivity) programme modelled on the Green Areas at Nissan's Pretoria plant. This involves group meetings in "home-zones" twice a week for 15 minutes, and a suggestion scheme. There has been some moderate success with the suggestion scheme - with 364 successful suggestions since 1990 - but most of these arise from the non-black



<sup>21</sup> See, also, Joffe et. al., 1995, for a discussion of the role which a payroll training tax might play in South Africa.

<sup>22</sup> For a discussion of the substance and relevance of these issues, see Joffe et. al., 1995.

<sup>20</sup> Involving 50 people for 25 days and a further 400 for five days at a cost of R1.5m.

labour force. When the HR manager attended one of these home-zone meetings, the discussion was in Afrikaans, and the black workers observed to him privately that they had not understood any of the proceedings! Black workers also observe that the previous racism of white junior management has been made even more complex by the insecurity which these relatively untrained white South Africans feel in the New South Africa.

The external observer is left with the feeling that whilst Bell has begun to engage with these issues, its progress is not just much slower than its international competitors, but also behind many other South African firms such as Nampak and South Africa Breweries. The challenge of restructuring work organisation is daunting everywhere, not just in South Africa - for example, Caterpillar which has been engaged in a major restructuring of work organisation in the US since 1990 has only just emerged from a debilitating strike of more than three years. But it is a challenge which cannot be dodged if Bell is to sustain its growth in the future.

## 6 MANAGING WITH A WEAK SUPPLIER INFRASTRUCTURE

In earlier discussion we observed that Bell had decided to emulate its global rivals and to cope with its internal manufacturing problems by pushing more of its value added on to its suppliers. This is potentially a dangerous strategy, since if the supplier base is inefficient, the only gain will be to hide manufacturing chaos behind external walls. Bell may find that it has a more manageable factory, but not only may there be no overall cost-savings in this strategy, but Bell may also suffer from an additional loss of flexibility.

For the problem which Bell confronts is one of systemic economic inefficiency, one in which South Africa has a particularly weakly developed infrastructure of small and medium sized enterprises (SMEs). Consider two examples drawn from Bell's network of major suppliers. The first manufactures a core product, in which the import content is 70 percent. Since the lead times for its imports are long, it offers Bell a five month delay in satisfying orders, which locks Bell into considerable inflexibility in its own inventory management and in its ability to meet variable customer orders. (This supplier's long lead-time is not only due to the delay in obtaining inputs, since its internal manufacturing organisation leaves much to be desired<sup>23</sup>). This lead-time could be reduced if more of this suppliers parts were sourced locally, such as many castings and machined shafts. But here it suffers from inflexible production from its own functionally laid-out suppliers who are unable to manufacture and deliver in small batches. Hence Bell's inability to respond flexibly to external customers is constrained not only by its own inflexibility

<sup>23</sup> For example, WIP management has been poor and approximately half of this is "dead", that is, items for which there is no longer final demand. The company has not provided training for any of its workers over the past six years.

(see above discussion), but also by that of its suppliers and its suppliers' suppliers. It is ironical that this core supplier achieved the award as Bell's Best Vendor for 1995, largely on the basis of its "JIT" deliveries. Yet these JIT deliveries are nothing of the sort, since they are based upon stocks of final products which are "stored" in the open under cellophane covers for approximately six weeks. The MD of this firm remarked wryly that he thought that this award from Bell was "unfair" since "we have just become Bell's warehouse".

The experience of a second major supplier is also indicative of the problems of achieving systemic efficiency in Bell's production chain. This is a firm which not only exports 30 percent of its output, but also supplies to Toyota, Mercedes Benz, Volkswagen and Nissan in South Africa; Bell only accounts for approximately 12 percent of its sales. The basis for its export sales are its abilities to produce in relatively low volumes - that is, by comparison with German manufacturers - and its stringent quality procedures. In the domestic market it delivers on a "JIT basis" daily to Toyota (using kanbans), fortnightly to Mercedes Benz/Honda and monthly to other customers, including to Bell. But these "JIT deliveries" are a charade, since it keeps three months final stock in its warehouse, and works to a ten weeks lead time (which has in fact deteriorated from earlier performance of four weeks). The factory requires this long lead time since, like Bell, it operates with a classical functional layout and produces in large batches. The outcome is unnecessarily costly production, since the need to keep three months final stock (arising from its inflexible production methods) has led it to construct a new final goods warehouse 48 kilometres from the factory and to use two pantechinons to ship output to this warehouse on a daily basis. Its quality procedures reflect similar

inefficiencies, since these are largely based on end-of-line inspection and rework, rather than on in-process quality-at-source. Clearly, therefore, Bell's ability to compete in global markets in the medium- and long-term depends upon the ability of its suppliers to also adjust their operating procedures. This is a challenge which is not unique to South Africa, and one which has been confronted by a range of countries struggling to catch up with the moving frontier presented by the Japanese. For example, the UK auto industry has recently become the focus for large-scale expansion, but has been hampered by poor quality suppliers. Considerable progress has been made in both quality and JIT production, and in the past two years the proportion of UK Nissan's European suppliers achieving a quality standard of less than ten defects per million has risen from 17 percent to 47 percent; yet this still lags behind the Japanese figure of 70 percent (Financial Times, 13/12/1995). This improvement follows intensive efforts by the major assemblers, and by host governments and regional authorities to promote quality-at-source procedures. Yet this is only the first stage in a larger struggle to upgrade the ability of designers to improve their design capacities and to engage in concurrent engineering practices spanning the production chain. For this reason, a large scale UK initiative, involving the auto assemblers, the national government and leading UK universities was launched in late 1995 to further upgrade supplier capacities.

Thus, part of the responsibility for changing supplier capacities lies with the final users. Observing the working of this process in Japan, and comparing this with traditional UK buyer-supplier relations, Sako draws the contrast between "arms-length" and "obligational" relations (Sako, 1992).<sup>24</sup> The former involves short-term

<sup>24</sup> See also Cusumano (1985), Hoffman and Kaplinsky (1988), and Womack et al., (1990) for a description of these contrasting processes in the global auto industry.

<b>Table 5</b>					
<b>Supplier Perceptions of their Relationship with Bell.</b>					
<b>(1=disagree with statement; 5=agree very strongly with statement)</b>					
* The higher this score the better Bell's performance compared to Toyota and PUTCO	Engine Component Supplier		Engine Supplier		
	Average of 7 Bell Vendors	Vendor's rating of relationship with Bell	Vendor's rating of relationship with Toyota	Vendor's rating of relationship with Bell	Vendor's rating of relationship with PUTCO
<u>Relations of Trust</u>					
Bell is committed to us and we have a long-term relationship	4.3	5	3	4	5
Our firm is never properly compensated for changes in the costs of raw materials	3.1	4	4	4	2
Unforeseen contingencies are sorted out on an amicable basis	4	5	2	4	4
When we have disagreement with Bell, Bell's view always prevails	3.4	4	4	3	3
Bell want a closer relationship but I am not sure that I can rely on them	2.4	1	3	1	2
Bell pays its bills with a much greater delay than other firms	2.1	3	3	1	1
I would like to have a broader customer base	3.1	3	3	5	NA
Bell always wants to drive the price down when the contract is up for renewal	3.4	2	4	4	5
Now that I am dependant on Bell there is pressure to cut costs	1.9	2		5	5
<u>Quality</u>					
Quality is more important to Bell than delivery or price	2.4	3	4	3	3
We would like to produce a better quality product, but Bell is not prepared to pay for it.	1.1	3	3	1	2
Bell are much tougher on quality now	2.8	3	3	3	3
Bell are now looking for price reductions, as well as quality	3.3	3	3	3	3
Bell is the customer who most insists on good quality and prompt delivery	3.4	4	4	1	3
Bell has helped us to save money and improve our quality	2.9	3	3	2	2
<u>Technical Assistance</u>					
Bell never help us with production or quality problems	1.9	3	2	1	5
My efficiency has increased because of Bell's help	3.2	4	3	2	1
My other customer(s) provide greater technical support	2.1	3	3	2	4
<u>Concurrent Engineering</u>					
I never suggest improvements to products or processes to Bell	1.4	1	2	4	5
Bell never explain to me why design changes are introduced	2.4	2	3	1	2
<u>Flexibility and Delivery</u>					
Bell tends to change its minds about how much it wants to buy	3.1	2	4	4	4
We have to deliver more frequently now	2.9	3	3	5	5
Sometimes Bell reduce their order and this leaves us with stocks in our plant	2.6	3	4	3	1

## DEVELOPMENT POLICY RESEARCH UNIT

agreements in which price is the dominant concern and in which suppliers and buyers meet only on issues of dispute and/or in contractual discussions. In obligational relationships, there is an agreement to work together in the long term, and for the supplier to develop the capacity to integrate production and design into the buyer's evolving needs. It is a relationship characterised by trust and one in which the buyer works closely with the supplier - often in improving production and quality procedures - to upgrade their capabilities.

Perceptions of the degree of "hand-holding" provided by particular buyers need to be seen in a relative context, that is by comparison with other buyers and in relation to past relationships. The nature of the buyer-seller relations in other sectors of South African industry suggests that they are firmly rooted in the arms-length camp (Manning, 1996). By comparison with this industry-wide poor performance, Bell not only scores high on relations of

trust, but also on the emphasis and on the support which it gives on quality and improving production efficiency (Table 5). However, it is clear from these responses that Bell still values low prices more than quality.

Bell also requires high levels of flexibility on its offtake, which partially reflects its needs to respond flexibly to customers. What is striking about this table is not just supplier perceptions of Bell's performance, but also that in the perceptions of two suppliers (one who manufactures for both it and Toyota, widely thought to be the most progressive South African manufacturing firm, and the other for a large transport operator, PUTCO) Bell outperforms both Toyota and PUTCO on most of these criteria (Table 6, on the other hand, suggests that the same supplier expects that Toyota will be moving forward more decisively in the future than Bell.

Table 6 Engine Components Supplier' View of Emerging Relationship between themselves and Bell and Toyota (1=unlikely; 5=very likely)			
	Likelihood of occurring at Bell	Likelihood of occurring at Toyota	Difference between rating of Bell and Toyota*
Direct deliveries to the line, without in-coming inspection	3	5	-2
More frequent deliveries	4	5	-1
Price reductions	4	4	0
Changes in volume with less notice	4	3	1
Speedier introduction of new products	3	5	-2

\* The higher this score the better Bell's performance compared to Toyota

One reason why Bell comes out relatively well with these suppliers is that in the weeks prior to our fieldwork it called a weekend meeting of its 16 largest and most important suppliers to discuss its emerging needs, stressing its requirement for enhanced price competitiveness,

quality, delivery reliability and flexibility. In each of these areas, particular targets will be provided to measure performance. As a consequence, as can be seen from Table 7, there is a reasonably close proximity of what Bell says it wants from its suppliers, and from suppliers'

perceptions of what they think they Bell

requires from them.

**Table 7**

**Bell's Statement of what it considers important from its Suppliers, and Supplier's perceptions of Bells primary requirements.**  
(1=not very important; 5=extremely important)

"How important are the following requirements for Bell?"	Bell	Engines	Engines	Filters	Metal Parts	Metal Parts	Metal Parts	Steel
<b>Bell's explicit criteria</b>								
Reliable delivery	5	5	5	5	5	3	5	5
Conformance to standards	5	5	5		5			
Price	5	5	4	5	4	3.5	4	4.5
Long term relationship	5							
Flexibility of offtake	3.5	5			5		3	
<b>Additional vendor criteria</b>								
New products		5	1				2	
Packing			1	4	4			
Quality of product				5		3.5		5
Accuracy of documentation					4			
Quick Response		5				4.5		

Thus, at face value, it would appear that Bell has a close relationship with its suppliers, that it assists its suppliers in upgrading efficiency and quality, and that it involves its suppliers in its concurrent engineering. However, this is a mis-taken perception and follows mainly from Bell's statement of intent (as we have observed, interviews with these suppliers were held soon after the weekend workshop with them) and from Bell's performance relative to a very undemanding group of buyers. Support for this conclusion can be found in Table 7, which details the performance of this group of core suppliers in relation to stockturns and leadtimes. In both cases performance is poor. (As a rule of thumb, efficient manufacturers have stockturns in excess of 6-8, depending of course on the degree of value added involved. When this is low, turnover is high and the stockturn figure is consequently raised).<sup>25</sup> More

revealing is the infrequency of contacts between suppliers and Bell, both in relation to visits to and visits from suppliers. And when these visits do occur, they tend to be from office to office, rather than from shopfloor to shopfloor. Only one of these suppliers has ISO Certification.

Nevertheless, some of Bell's suppliers are beginning to take corrective action. Its largest supplier is almost entirely owned by a parastatal and manufactures a core component under foreign licence. In recent years, as its protected market has become threatened by imports it has begun a process of diversification, reorganisation and exports. In terms of market placement it has decided to concentrate on niche-segments and has as a consequence become Bell's favoured supplier, in part because of its ability to tailor its product to meet Bell's desire to customise products for final customers. It

<sup>25</sup> The Japanese auto assemblers have stockturns in excess of 20 and those in

the USA achieve turns of more than 12 (Lamming, 1993).

## DEVELOPMENT POLICY RESEARCH UNIT

is also favoured by Bell because its high degree of local content involves a smaller pipeline to satisfy after-sales service requirements. In turn, this supplier has redefined its own market strategy based upon its own expectations of Bell's export growth in the future, so that the relationship between supplier and customer is increasingly inter-dependent. The combination of mutual inter-dependence and customisation has meant a change in both the range and intensity of contacts with Bell and despite being located more than 1,000kms. distance, it is in daily contact, visits the Bell plant once per month (involving both engineering and commercial staff), trains Bell staff in maintenance, and customises designs by sending designers to work at Bell. As a consequence it has been able to significantly reduce the time-to-market of

new products. Working together with a UK consultancy firm, this supplier has also begun to reorganise its internal manufacturing operations and has, in fact, made much more progress in this regard than has Bell. Between 1991 and 1994, labour productivity has risen significantly, the scrap rate has fallen (from 5.8 to 3.5 percent), stockturns have increased (from 1.15 to 5.3) and assembly time has fallen (for example by 26.2 and 20.6 percent in two major component types). As a consequence costs have fallen, by 10 percent in current prices between 1990 and 1995, compared to an increase in the consumer price index of 50 percent and a doubling of final product prices by its major customers. But, like Bell itself, this supplier is very much an exception to the trend in South African manufacturing in general as well as in Bell's other suppliers.

**Table 8**  
Operating Parameters at Suppliers and Frequency of Contact between Suppliers and Bell.

	Bell	Engines	Engines	Filters	Metal Parts	Metal Parts	Steel
Stockturns	2.9	5.3	2.0	3 mths Finished goods; 6-9 mths raw materials	16		2.5-3 mths.
Current leadtimes (mths.)	4	2-3	6	2.5	0.5	0.77	
Past leadtimes (mths.)			7.0	1			
Frequency of deliveries to Bell (wks.)			1	4	pulled on demand	1	0.2
Frequency of visits to Bell (wks.)		<4 (in daily contact by phone/fax)	6	10	0.5	2	1
Frequency of visits from Bell (wks.)			>52	>52	4	6	>52
ISO 9000 Certification	Yes	No	Yes	No	No	No	No

From this discussion of supplier performance and inter-firm relations we can conclude the following:

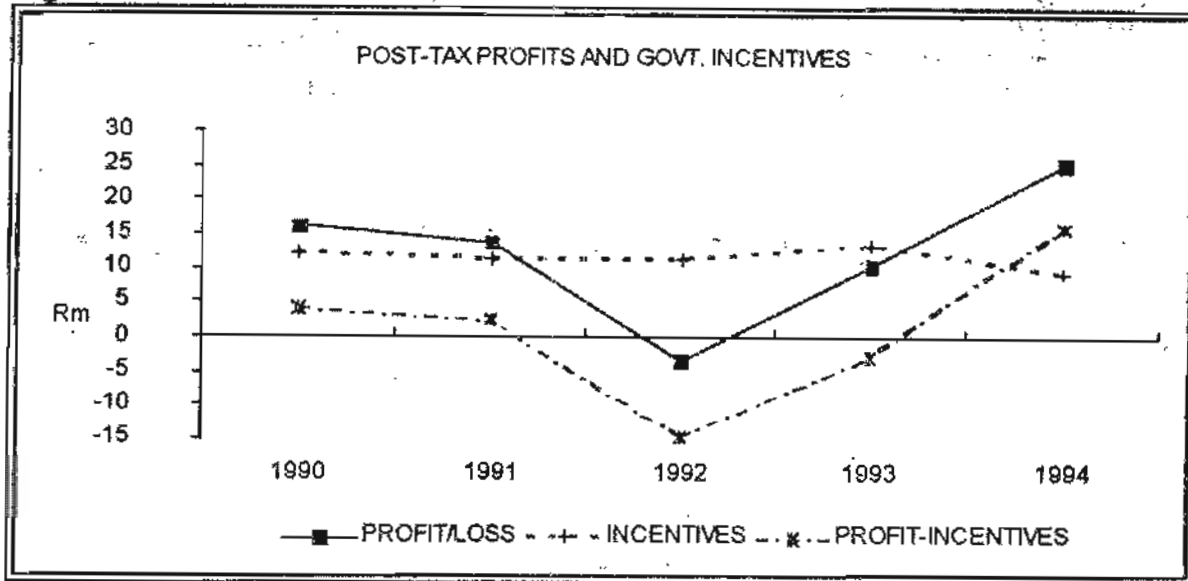
- Bell's attempts to increase its efficiency by decreasing its own value added are unlikely to enhance its overall performance given the poor capacities of its supplier base
- Bell is only at the initiating stage in a programme designed to upgrade supplier performance
- nevertheless it is, by comparison with other buyers, relatively far advanced in these efforts, and
- thus, as other studies have begun to suggest, South African manufacturing weakness is associated with poor SME performance and this acts to undermine the systemic efficiency of firms such as Bell who are competing on a global stage.

## 7 THE FUTURE?

As we have seen, Bell's growth from infancy to adolescence can be encapsulated in the recent change in its design philosophy - instead of designing for the South African market and then adding on features for more demanding external markets, Bell now designs for external markets and subtracts features for the domestic market. This reflects its large global share of particular sets of equipment for the cane and forestry industries, and a growth in global market share for its chosen vehicle for expansion, ADTs, from seven to 13 percent over the period 1991 to 1994.

This progress reflects three major factors. Two of these - a protected domestic market and a cash-cow (cane and forestry equipment) to finance diversification - have already been discussed in previous sections. But there is one further factor which has been particularly instrumental in Bell's growth from infancy, that is, government financial support. In the late 1980s, the South African government became anxious to promote manufactured exports, and thus instituted a financial incentive programme, the General Export Incentive Scheme (GEIS) from which Bell benefited considerably. In addition, there have been various financial packages designed to promote industrial decentralisation from which Bell benefited, given its location in Richards Bay. The net impact of these two types of financial incentives was very beneficial to Bell and enabled it to expand and diversify during periods of low underlying profitability. As can be seen from Figure 12, these incentives significantly supplemented Bell's earnings during the 1990-1994 period for which data are available. The total (undiscounted) value of these incentives was R57.14m, compared to post-tax profits of R62.06m and pre-tax profits of R67.87.

Figure 12:



However, the GEIS scheme is being withdrawn, both because of its high cost (0.5 percent of GDP in 1994), and because it is WTO-illegal, and the decentralisation scheme is under review. Hence Bell now has to stand on its own adolescent feet. But having established a market presence in each of the major sectors in each of the key markets (with the exception of ADTs in Europe)<sup>26</sup> it would appear that it has a robust chance of surviving the competitive onslaught, at least in the short run. Nevertheless it operates in an uncertain world, and four major threats loom on the horizon as it

<sup>26</sup> Hitherto Bell has only dabbled in the European ADT market. This is because this is the most sophisticated of markets, especially in the ADT sector where production was pioneered for European operating conditions. In general European users require better trim and finish, better ergonomics and more sophisticated safety standards. Operating in Europe would also require a marketing network - bear in mind that in the USA Bell began by marketing its cane and forestry equipment into a less competitive niche market. So far Bell has a marketing agreement with a UK firm (Heathfield) which has a marginal presence in ADTs via refit and rebuild activities, but this firm is virtually unknown in continental Europe.

attempts the transition from adolescence to adulthood.

The first and probably least likely of these is the threat of political instability. Bell operates in a national context in which the related problems of unemployment (in excess of 25 percent of the adult labour force) and crime have the potential to reduce business confidence. Moreover, the regional context in which it operates (northern KwaZulu) has a history of political violence. With the exception of the confrontational industrial relations of the 1980s and early 1990s, none of this has hitherto spilled over directly into Bell's internal operations, but they may do so in the future. In addition, Bell's ability to operate profitably in part results from a large home-market, and if this should be undermined as a consequence of a reduction in business confidence, this could undermine the solid foundation on which its global operations are currently built. Were these events to transpire in an extreme form, it is possible that Bell could relocate most of its operations to one of its two existing manufacturing subsidiaries - in Mauritius or in New Zealand - or more likely that it would begin manufacturing in one or more of its core markets in Europe or North America.

But, either way, the consequences for South African industry would be bleak.

Secondly, there is the possibility of a destabilising new entrant(s), especially in the hitherto largely protected domestic market. Korean firms most clearly fit this description and both Daewoo and Samsung have recently begun to assemble earthmoving equipment in Europe (following the threat of dumping action, given low-cost imports). They are also selling very aggressively in South Africa, initially in the excavator market which is currently marginal to Bell. But they remain a potential threat in the core ADT market, both locally and abroad.

The third potential threat arises from the dangers posed by an unstable and/or overvalued exchange rate. Prior to the decline of the Rand in early 1996, there is some evidence that the Rand was somewhat overvalued, and that GEIS or some other sort of incentive scheme was necessary to redress the inward orientation of South Africa's trade policy regime. However, by the end of 1996, this problem of overvaluation had been removed. But should this devaluation (or other government policies) lead to higher rates of inflation, then an overvalued exchange rate may once again become a problem in the future. In addition, the removal of Exchange Control may also lead to an appreciation of the exchange rate, as has happened in Chile and Argentina over the past decade. Were this, or extreme instability in the exchange rate, to transpire, then the decision to predominantly rely on production in South Africa, especially for ADTs, may be damaging to the long-term survival of Bell.

Related to this is the major long-term threat confronting Bell, namely its small size. Table 9 shows a selection of

examples evidencing growing concentration of production as well as a series of alliances between major producers in the ADT and the construction machinery markets. There are three factors underlying this tendency towards cross-national ownership and alliances. The first is the attempt by new entrants to enter the market and this mostly explains the various European-Japanese collaborations as the respective parties seek to penetrate new market segments. Second is the growth of R&D in this sector, running at more than \$400m annually in the case of Caterpillar; here, joint ventures help to spread these growing costs of innovation. And, third, is the ability which size and diversified product range provide in weathering the storms of cyclical demand in this sector. For example, in the UK ADT sector, sales fell from 869 in 1989 to 293 in 1992, leading the Managing Director of Volvo's UK operations to observe "Volume is critical. We need to keep up sales of machines to support our parts and service operation in two or three years time. It's a balancing act between short-term profits and long-term benefits." (Financial Times, 16/3/93). In the construction equipment industry, global sales fell from 200,000 in 1979, to 130,000 units in 1983, before rising again to 140,000 in 1991 (Financial Times, 3/01/92).

It was largely due to their small size that both David Brown and Moxy lost their independence. In the case of David Brown, Caterpillar decided that it wanted to have its own name on products which it was supporting, and since almost all of its sales were to Caterpillar on an OEM basis, David Brown had no option. In the case of Moxy, it had over-extended itself before the market fell sharply and, due to its small size, it was unable to sustain its working capital investments.

Table 9

Some Recent Examples of Globalisation of Ownership and Joint Ventures in ADT and Construction Equipment Industries

	Residence of Parent Company and 1994 Turnover (\$)	Nature of Links in ADT Sector	Links in other Sectors of Construction Equipment
Volvo VME	Sweden \$1.6bn	1985 50:50 joint venture with Clark Equipment of the USA. In 1995 purchased Clark's equity for \$573m	Joint venture with Hitachi for rigid dumptrucks
Caterpillar	USA \$13.9bn	In 1996, Caterpillar purchased equity of David Brown which had previously manufactured its ADTs on an OEM basis	Acquired Dana Spicer (UK) which previously manufactured transmission units for backhoe loaders
Komatsu	Japan \$918m	Equity share of Moxy (Norway) which manufactures its ADTs on an OEM basis	Joint venture between John Deere and Hitachi for excavators. Purchased Hanomag (Germany) from Varity (US)
Terex	USA \$786m	Manufactures ADTs in the UK through UK subsidiary, Terex	Took over Clark fork-lift trucks Makes ADTs on OEM basis for O&K of Germany

Finally, as we saw in earlier sections, one of the keys to Bell's success, especially in the South African market, was that it often tailored equipment to individual user's needs, partly in a virtuous attempt to speed time-to-market innovation. This has led to an explosion of parts variety, creating difficulties for manufacturing which Bell is currently grappling with.

For this reason, Bell is restructuring its design procedures to in order to homogenise and modularise its designs. But, this past virtue of customisation holds the danger that in future years the Bell after-sales team will have to have stores to cover the needs of this diverse product range - bear in mind, for example, that in its South African operations it aims for 85 percent first-pick availability in

order to prevent customers from downtime of equipment. To some extent this problem can be met by redesigning components into new sub-systems which can be retrofitted, but the scope for this is limited.

The higher the growth rate which Bell is able to sustain, the less burdensome this problem will become in the future, as long as it is successful in making the required transition to "the American System of Manufacture" (see earlier).

## 8 THE WIDER IMPLICATIONS OF THE BELL EXPERIENCE

As we observed in the Introduction, Bell stands out from the rump of South African manufacturing industry. Its record of innovation has been both excellent and sustained. It produces a technologically complex capital good, to international standards of design and quality, and both exports these products and assembles them abroad. In its historically core sectors it holds a commanding market presence, and has grown rapidly in the sector which it has targeted for global expansion. Clearly, there are lessons to be learnt from this exceptional experience, both for other companies and for government attempting to provide an enabling environment for the South African industrial sector.

So, what explains this successful growth to adolescence, and how is Bell to sustain its global expansion and growth to adulthood in the future?

In the Introduction we also flagged the wider context in which South African industrial restructuring is occurring, and in particular the debate over the appropriate role which government might play in aiding this process. Two polar views were identified - one prescribing that government should withdraw entirely from trying to affect resource allocation and leave this entirely to market forces; the other, that government should play a highly active and interventionist role, directing resources in the pursuit of dynamic comparative advantage. Not surprisingly, Bell's experience shows that neither extreme is appropriate. On the one hand, the firm's success is unambiguously a reflection of the particular nature of the Bell family. Over a period of four decades and in a succession of generations, it sustained a

combination of invention, innovation and marketing. These pure "animal spirits" (as Keynes dubbed successful entrepreneurship) are largely unpredictable and cannot be created by government fiat. Few entrepreneurs possess them in abundance, for if they did, there would be no winners to market competition.

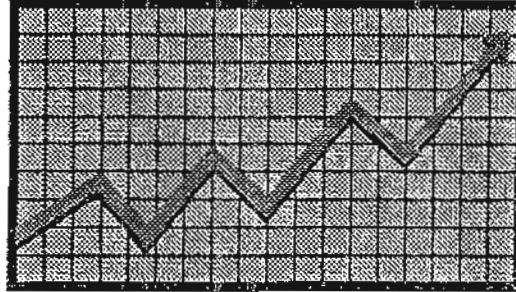
But entrepreneurship alone is not an adequate explanation of the firm's success, for there were a number of factors external to Bell's operations which facilitated this growth. These naturally lead our attention from a crude market oriented approach ("it is not nations which compete, but individual firms") to a more complex model in which the efforts of entrepreneurs are rooted in historical circumstances and national factor endowments and are complemented by effective government support. So what are these extraneous factors in which Bell's entrepreneurship has flourished, and to what extent do they reflect government interventions? And, if these government actions have been significant, what implications does this hold for the wider development of South African industry? Before addressing the policy implications which are raised, it is first necessary to briefly locate Bell's evolution in the context of two exogenous factors over which government has no control - South Africa's natural resource base, and the fortuitous timing of Bell's recent expansion.

Although it was never a conscious strategic objective in Bell's development, the company clearly gained from the links it had to South Africa's abundant mineral sector, particularly in the first two decades of its existence (1954-1975). Its early products were initially targeted at the agricultural sector (cane, and then forestry). Subsequently, diversification into rigid haulers was spurred by links to the coal-mining sector, as well as by the general engineering business contracting

for Richards Bay harbour (which, itself, was built to accommodate the needs of the mineral sector). And even in the 1990s, much of the demand for FELs and ADTs arises from the need to shift materials in the mining and resource sectors. In this sense Bell can be seen as a partial expression of what has been termed the "mineral energy complex", that is, that cluster of industries which has arisen from South Africa's comparative advantage of cheap energy and abundant natural resources (Fine and Rustomjee, 1996).

Bell also gained in recent years from the fortuitous juxtaposition of domestic and global market conditions. The early 1990s were years of significant global demand growth in Bell's core markets (timber and construction). This provided it with the volumes and the margins to fund diversification into the ADT market which is the focus of its drive to "adulthood". It also provided the experience in international markets on which the expansion of ADT production (for which there is only a limited domestic market) can be built. As can be seen from earlier discussion, this provided Bell with the crucial lesson in the US that it could not expect to be a serious supplier unless it marketed its products through an established brand-name, and it was for this reason that it closed its independent distributor network and is marketing its products through the John Deere network. Furthermore, had Bell attempted to penetrate the global ADT market during a period of global recession, it would almost certainly have been forced out by the price-cutting of competitors with significantly greater corporate muscle than Bell possesses. But, now in 1996, just as there appear to be signs of a downturn in the global timber market, Bell is likely to benefit from the infrastructural

development in the domestic economy arising from the Reconstruction and Development Plan (RDP) of the new government. The RDP will involve extensive infrastructural investments, providing an outlet for both ADTs and front-end loaders.



However, in itself the combination of Bell's endogenous entrepreneurial excellence and these

two exogenous factors (the bounty of nature and fortuitous timing) do not fully explain its successful growth. Other factors - largely in the domain of government policy - have played an important role in the past and will be necessary in the future if Bell, and other firms in its position, are to sustain their growth in the future.

## 9 The Role of Industrial Policy

### 9.1 Infant Industry Policy

The theory of infant industries is based on the view that firms (and industries) need the space to grow into adulthood (Bell et al., 1984). This is for three reasons. First, in many sectors there are significant economies of scale so that late-comers to an industry need the opportunity to build-up production in a protected market so that they can travel down the cost curve. Secondly, firms learn-by-doing, that is, the greater the experience of production, the more efficient they become. This is often referred to as the "Boston Experience Curve", based upon the evolution of efficiency growth in the electronics industry recorded by the Boston Consulting Group in the 1970s. And, thirdly, firms do not only learn-by-doing, but they also learn-by-trying, that is, the growth of technological capabilities requires conscious effort and this takes time.

For all these reasons, it is argued that nascent industries need protection from the icy winds of international competition in their domestic markets. They also require government support as they enter export markets, since this, too, is a learning experience and is also subject to scale economies. However, the major argument against infant industry policies is that by protecting firms against competition, it promotes inefficient production. Moreover, it is argued, despite the best intentions of those promoting infant industry policies, protection and subsidies breed a coalition of interests which makes it politically very difficult to wean infants into adulthood and so-called "temporary" protection becomes solidified over time (Kreuger, 1974).

Bell's experience throws light on this policy debate, not so much because it reflects conscious government policies to promote infant industries, but because of the unconscious evolution of the required policy environment. In Bell's case, protection was provided in part through heavy tariffs, which kept imports out of the market. But, as in many import-substituting economies, this may well have led to foreign investment which would, too, have made it difficult for Bell to thrive. But, here Bell was aided inadvertently by international sanctions against Apartheid South Africa in the 1970s and especially in the 1980s. This led major competitors such as Volvo and Caterpillar to hold back from the South African market, including through the restriction of exports. This enabled Bell to grow and develop its product range. Then, in the late 1980s the government introduced a generous export scheme - the GEIS facility which subsidised its drive into external markets. Further subsidies were provided through a decentralisation fund which "compensated" Bell for producing in Richards Bay, even though it was located there because of its proximity to the family base (see Figure 12 above).

These various factors - tariffs, international sanctions, GEIS incentives and the decentralisation scheme - provided the shield for Bell's growth. But what protected it from inefficiency? Here Bell has benefited from the temporary nature of these various benefits. Tariffs have been scaled down since South Africa has rejoined the international community; sanctions have been removed since Apartheid was overthrown; the GEIS scheme is being removed since it is WTO-illegal,<sup>27</sup> and the decentralisation fund is

<sup>27</sup> The GEIS scheme - consuming 0.5 percent of GDP - was also prohibitively costly. The new administration has committed these resources to a bundle of supply-sided measures to promote a broader process of industrial restructuring in the future (DTI, 1995).

being re-thought by the new administration. All of these factors have confronted Bell with a moving policy frontier which promoted its growth to adolescence.

But, even though Bell has benefited from this largely unconscious exercise of infant industry policy, its growth to adulthood in the future will require other types of government support which are promoting of sustained growth in output and efficiency. The following elements of industrial policy will be relevant to future expansion.

## **9.2 Support in External Markets.**

As observed, penetrating external markets can be very costly, particularly when this involves enterprising new markets. Here, too, Bell has begun to benefit from appropriate government support. The new post-Apartheid administration in the Department of Trade and Industry has observed that South Africa's trade with western countries largely involves the export of commodities, whereas much of its eastward oriented exports are more technology-based. For this reason, and because it wanted to diversify South Africa's trade base, the DTI organised a large trade mission to visit India in late 1995. One of the Bell brothers participated in this mission and recognised that India presented a growing market opportunity, not just for ADTs but also for Bell's three-wheeled cane and forestry equipment. A decision has therefore been made to make a big push into Asia, based initially on the growth of sales in South Asia. However, it was clear that selling in India required a productive presence there, so Bell has decided to establish a third overseas production facility (in addition to those in Mauritius and New Zealand) in India. This will either be a joint venture with an Indian firm, or with a large Japanese trading house.

This reflects an example of the type of government support which is able to assist Bell in the growth and diversification of its export market. In this case, the appropriate action by government was to initiate new trade contacts and to open trading doors. But it may be that in other environments, additional forms of export support may be required such as providing support with respect to obtaining market intelligence and ensuring that South African exporters achieve adequate quality levels to maintain the country's reputation as a reliable exporter.

## **9.3 Anti-dumping legislation**

New disruptive entrants into the South African market from Korea are clearly dumping their products, particularly excavators (which are currently only of peripheral concern to Bell). The same actions by these firms in Europe led to punitive tariffs, and (because of the large size of the European market) this forced the Korean firms to establish manufacturing subsidiaries in Belgium and the UK. Similar protective action is probably warranted in South Africa if Bell's home base (as well as that of Barlow Rand - see below) is not to be eroded. It is unlikely that this will lead many large firms to produce in South Africa, since the market for this type of equipment is small. But anti-dumping actions, by protecting the margins of domestic producers from unfair competition, will allow firms such as Bell to continue to grow, with the pressures for efficiency being provided by low-tariff imports and by Bell's domestic competitor, Barlow Rand.

## **9.4 The Functioning of South Africa's Capital Markets**

On the basis of Bell's past experience, there are reasons to doubt whether the South African domestic capital market operates in a manner best designed to foster industrial success. This undermines

the prospects of medium-sized firms such as Bell in three different ways. First, as we have seen, South African real interest rates are at historically high levels, hindering the capacity to invest in new equipment and to fund the working capital requirements of high growth, including in export markets.<sup>28</sup> It is for this reason, therefore, that high-growth economies such as Korea combine high real-interest rates (to promote savings) with subsidised credit to export-oriented and growth-oriented firms (Wade, 1990).

Secondly, the highly concentrated pattern of industrial ownership in South Africa (see earlier discussion) has meant unequal access to funds and differential interest charges to different parties. By its nature this type of imperfection is difficult to document but our own discussions with the senior strategist of one of the major conglomerates confirms its existence (see also Joffe, et. al., 1995). Bell, being a medium-sized firm with no links to any of the major banks or conglomerates was therefore forced to pay high market rates of interest. But it is not only large South African firms which benefit from favourable access to capital. In 1992, Volvo VME, the largest producer of ADTs, had a debt-equity gearing ratio of 300 percent, supported by the financial resources of its parent and by favourable capital market conditions. At a similar stage of Bell's development, in 1996, its gearing was limited to only 65 percent.

Third, like the British and American stock markets, equity-linked finance in South Africa orients enterprises towards short-term profitability. As we have seen, Bell's requirement for funds to promote expansion in the early 1990s, forced it into the hands of banks which pressurized Bell

to float on the stock exchange to provide the banks with capital gains on their equity-linked funds. And, as many British firms have found, going public often constrains firms from long-term growth, since pension fund shareholders who own the bulk of equity often require high annual dividends. Moreover, pension fund and other public stockholders are happy to see takeovers since this provides them with windfall capital gains.<sup>29</sup> Most damagingly from the national perspective (and also from Bell's point of view of course), this feature of this South African capital market led Bell to hold back from future growth in 1996-1997 in order to avoid losing its independent status. Bear in mind, also, that Bell faces a real danger of being too small to protect itself from cyclical market conditions, and unless it grows significantly rapidly, it may be in danger of losing its independent status and become an appendage of transnational firms, as has happened to both Moxy (formerly Norwegian, now owned by Komatsu of Japan) and David Brown (formerly British, now owned by Caterpillar of the US) in the ADT sector (Table 3 Above). Recent changes in government industrial policy have provided a series of lower-interest rate loans which firms such as Bell can tap to support export development and innovation, and these may go some way towards redressing these imperfections in capital markets.

### 9.5 Supply Chain Development, particularly for SMEs

Supply chain development is critical for the sustained competitiveness of firms such as Bell, particularly if they wish to move to industry benchmarks of low value added which allows firms to concentrate on their core competence. There is much

<sup>28</sup> On the other hand, high real interest rates promote the effective use of working capital and can often be the spur to better inventory management and hence the reform of production organisation.

<sup>29</sup> For this reasons, successful entrepreneurial firms in the UK such as Virgin and The Body Shop have attempted to delist and return to private status.

which Bell can do itself in upgrading its supplier base, as occurs in many other countries, including in developing countries with poor supplier capacities such as India (Kaplinsky, 1995b; Humphrey and Kaplinsky, 1996). But as even many industrialised countries have found, the upgrading of suppliers, especially SMEs, cannot be left to user-firms alone. The UK has had a series of schemes to promote the improvement of manufacturing organisation, despite its ideological hostility to industrial policy; so, too, have many other countries, involving both national and local government (Robbins, 1995). Such programmes designed to upgrade manufacturing performance will not only benefit Bell through the upgrading of its supply chain, but also in the improvement of its own, internal manufacturing operations. As we saw in earlier sections, this is a key weakness in Bell's current operations.

### **9.6 The Need for Sectoral Policies**

The protection offered by sanctions did not only benefit Bell. We have so far ignored the operations of Bell's principal competitor, Barlow Rand. Barlows manufactures some Caterpillar equipment under licence in South Africa, and, in 1992 it acquired Finanzauto, Caterpillar's principal distributor in Spain, whose needs it partially meets from its South African manufacturing base.<sup>30</sup> Clearly, the two firms together constitute a potentially formidable national sectoral specialisation. Since they have common needs, in export promotion (particularly in new markets), in technological infrastructure, in links to the resource sector (where increasing use

is being made of special steels, most of which have to be imported) and in human resources, there is clearly scope for the development of a strategic sectoral support initiative, but one which does not slip into the familiar cartelisation which has dogged much of South Africa's industrial performance so far (Joffe et al., 1995). The promotion of policies to support sectoral specialisation lies at the heart of the new administration's industrial policy, based upon identifying appropriate industrial clusters. The haulage sector in which both Bell and Barlow Rand operate must surely qualify as an appropriate cluster for policy support.

### **9.7 Strengthening the Human Resources Fabric**

As we have observed, the key competitive resource for the future lies in human resources. This is one area in which South African producers are acutely disfavoured. In the past Bell has systematically disadvantaged itself even further, by its hostile approach to industrial relations and by its failure to invest adequately in the training of its labour force. If it is to make the transition to a more effective manufacturing organisation, this is certain to lead to the need for a more flexible and multi-skilled labour force. It is also certain that this will require greater participation by the direct labour force in continuous improvement programmes (such as the QSP) and in a new approach towards Total Quality Control.

Here, much of the necessary action lies in Bell's own control. But some also necessarily involves government, both at the national and local levels. For example, the new Labour Relations Act (LRA), modelled on the successful experience of countries such as Japan and Germany, is designed in part to foster a more cooperative pattern of industrial relations and participation. The LRA makes provision for Workplace Forums in

<sup>30</sup> In those market segments where Barlow Rand and Bell compete in domestic markets, Bell performs well. It has the largest market-share in ADTs (with a share of 70 percent), lies third in excavators (Caterpillar accounts for 40 percent and is market leader), and is second in FELs (where Caterpillar narrowly outpaces Bell).

workplaces of over 100 employees and can be activated by organisations which represent more than half of the plant's workforce. The intention of the act is both to separate productivity innovations from wage negotiations and to replace confrontational bargaining with "joint problem solving and participation", especially on issues related to working conditions and productivity. This represents an important departure from past patterns of industrial relations in South Africa and provides the potential for meeting some of the major problems confronted by firms such as Bell - for example, ensuring a more effective continuous improvement programme (see above), diminishing the fear of middle management over organisational changes and making sure that the workforce is kept adequately informed of the external pressures which risk undermining Bell's growth from adolescence to adulthood.

Yet, much of South African management (including in Bell) is hostile to this policy initiative, viewing it as a mere reflection of trade union power in the new government, rather than as a tool for improving efficiency. Thus, government will need to act sensitively, to help firms such as Bell restructure their historic approaches towards training and industrial relations. International experience shows, too, that support for human resource development also necessarily has implications for local government as well, particularly in developing closer links between education and training institutes and local industry.

### 9.8 Implications for Trade Unions

The changes which Bell is required to undertake, particularly in its work-organisation and human resource management, are substantial if it is to manufacture effectively and this, as we have seen above, poses major challenges to management in its industrial relations and training initiatives. But it is equally challenging for its workforce, including

for the trade unions (of which the metalworkers union, NUMSA, is by far and away the largest). Some of the shop-stewards interviewed at Bell have clearly recognised that their long-term future lies in a successful company, and have begun to change their attitudes, for example toward quality procedures. But in general the union remains hostile to management, a position which is common throughout South African industry.

In Australia, the trade unions have played an important role in restructuring worker attitudes, as indeed this has also recently been the case in South Africa (Joffe, et. al., 1995). But, the pace of this change is not adequate and, moreover, the trade union movement in South Africa has lost many key officials to government, so the struggle to manage this change successfully will not be easy.

### 9.9 The Role of Local Government

In many respects the appropriate level of government support for industry may not be at the centre, but in the region in which the enterprise is located. In Bell's case, this is particularly evident in relation to supply-chain and human resource development and in the availability of what is called "real producer services" such as quality and inventory management skills and design and marketing capabilities. As we have seen, Bell's ability to maintain its global competitive edge is undermined by its weak supplier base, particularly since it has made the decision to reduce its internal value added. But few of its suppliers are located in its region, so that supply-chain development will become that much more difficult to achieve unless local suppliers can be developed. This benefits of supply-chain proximity are especially evident in Japan (Hoffman and Kaplinsky, 1988), but are also apparent in India (Humphrey and Kaplinsky, 1996) and in the European auto industry. The Italian experience is also one in which local governments have

assisted networks of firms (including interlinked networks of suppliers and customers) in gaining access to necessary services (Pyke and Sengenberger, 1992). Again, this is an important area of policy debate in South Africa, since the post-Apartheid constitutional agreement has not clearly specified the appropriate responsibilities of central and local government. Moreover, for local government to play a more constructive role would require a change from the sorts of administrative role which it played under the inherited constitutional dispensation.

### **9.10 Science and Technology Policy**

Historically South Africa has never had a national technology policy. Policy support was largely confined to strategic and military sectors. But the need to reorient South African industrial capabilities to meet the challenges posed by trade policy reform, and especially the need to encourage manufactured exports, has led the new government to develop a comprehensive national science and technology policy. The DTI's focus on supply-sided measures thus explicitly commits itself to a national science and technology policy and this has led to the preparation of a Green and a White Paper on this policy agenda. In addition, the DTI's own supply-sided measures programme include a number of Manufacturing Technology Centres (MTCs) to support the acquisition of technological capabilities in SMEs.

Bell is probably typical of much of South African industry in that it has had no links with the Science Councils, its links to and use of the products of the tertiary education sector have been weak, it has not participated in any of the sector specific government support programmes such as the Support Programme for Industrial Innovation (SPII), and its past links with the science and technology

infrastructure have not been strong and have largely been confined to the externalisation of stress analysis on its designs.<sup>31</sup> This reflects both its path of evolution (an expanding family firm) and the lack of outreach and relevance of most of these previous technology support programmes, which have invariably been directed and implemented in the heartland of South African industry (the Reef, some distance from Richards Bay where Bell is located, as well as from the growing industrial base in the Natal coastal province).

For Bell to make this transition to adulthood will therefore undoubtedly require the greater scientisation of its design and development programme. For this to be successful, it will therefore have to liaise far more closely with the science and technology system than has hitherto been the case. And for this to be successful will require not only concerted action by corporate management, but also the design of appropriate policies for technology support which are both attractive and available to the firm and, in all likelihood, include a large measure of sectoral focus (see above). Almost certainly it will also require of the science and technology system a far greater degree of decentralisation and sensitivity to industry's needs than has hitherto been the case.

31 In recent years, however, in recent years Bell has gained skilled design personnel and management from the former military-industrial sector

**10 CONCLUSIONS**

**I**n this paper we have charted the growth from infancy to adulthood of a medium-sized firm operating in demanding global markets. We have shown how, on the base of excellent family-entrepreneurship and a long-term commitment to innovation, it benefited from a range of external factors which have enabled it to become not only a dominant producer in the domestic market, but also an active participant in external markets. In this sense Bell represents a role-model for South African industry as it struggles to make the transition from a closed to an open economy.

To some extent, Bell's success arose from conjunctural factors which are unlikely to be repeated in the future. But other conjunctural opportunities will inevitably arise, and if South African firms are to take advantage of these opportunities they will not only have to be nimble and innovative, but will also require an appropriate policy environment. Based upon Bell's specific experience, we have identified some of these relevant policies. Most of these apply to other firms and to other sectors. But in other cases, different policy instruments will have to be fashioned. The detail of these policies is less important in this firm-specific analysis, than the observation that successful industrial restructuring will require close complementarity between market conditions, entrepreneurship, innovation and a supportive policy environment.



## BIBLIOGRAPHY

- Andreasen Lars, Benjamin Coriat, Friso den Hertog and Raphael Kaplinsky (eds.) (1995), Europe's Next Step: Organisational Innovation, Competition and Employment, London: Frank Cass.
- Barlett, Christopher. A. and Sumantra Ghoshal (1994), "Changing the Role of Top Management: Beyond Strategy to Purpose", Harvard Business Review, November-December, pp. 79-88.
- Bell, M, Ross-Larsen and L Westphal (1984), Assessing the Performance of Infant Industry, World Bank Staff Working Paper No.666, Washington, D.C.
- Best Michael (1990), The New Competition, Oxford, Polity Press.
- Cusumano Michael A (1985), The Japanese Automobile Industry: Technology and Management at Nissan and Toyota, Cambridge, Mass., Harvard University Press.
- Department of Trade and Industry (1995), Support Measures for the Enhancement of the International Competitiveness of South Africa's Industrial Sector: Submission by Government to the Trade and Industry Chamber of Nedlac, Pretoria: DTI.
- Fine, Ben and Zavareh Rustomjee, The Political Economy of South Africa: From Minerals-Energy Complex to Industrialisation? (1996, London: Hurst, and Johannesburg: Witwatersrand University Press).
- Freeman, Christopher, John Clark and Luc Soete, Unemployment and Technical Innovation: A Study of Long Waves and Economic Development, (London, Frances Pinter 1982).
- Hobday, Michael (1994), "Complex System vs. Mass Production Industries: The Need for a Research Field", mimeo, Brighton: Science Policy Research Unit.
- Hoffman Kurt and Raphael Kaplinsky (1988), Driving Force: The Global Restructuring of Technology, Labor and Investment in the Automobile and Components Industries, Boulder, Colorado, Westview Press.
- Humphrey, John and Raphael Kaplinsky (1996, forthcoming), "The Restructuring of Industry in India: A Case Study", mimeo, Brighton. Institute of Development Studies.
- Joffe Avril, David Kaplan, Raphael Kaplinsky and David Lewis (1995), Improving Manufacturing Performance: The Report of the ISP, Cape Town, University of Cape Town Press.
- Kaplinsky, Raphael (1994), Easternisation: The Spread of Japanese Management Techniques to Developing Countries, London: Frank Cass.
- Kaplinsky, Raphael (1995), "Technique and System: The Spread of Japanese Management Techniques to LDCs", World Development, Vol. 23 No. 1, 1995 pp. 57-72.
- Kreuger Anne O. (1974), "The political economy of rent seeking society", American Economic Review, Vol. 64, pp. 291-303.
- Lamming, Richard (1993), Beyond Partnership: Strategies for Innovation and Lean Supply, London: Prentice Hall.
- Manning, Claudia (1996, forthcoming), "", D. Phil Dissertation, Brighton: University of Sussex.
- Porter Michael (1990), The Competitive Advantage of Nations, London, Macmillan.
- Reich Robert B. (1991), The Work of Nations: Preparing Ourselves for 21st-Century Capitalism, N. York, Simon and Schuster.
- Robbins, Glen (1995), "Policy Options for Upgrading the Performance of Laggard Small and Medium Enterprises: Implications for South Africa", M. Phil. Dissertation, Brighton: University of Sussex.
- Rosenberg Nathan (1994), Exploring the Black Box: Technology, Economics and History, Cambridge: Cambridge University Press.
- Sako, Mari (1992), Prices, Quality and Trust: Inter-firm Relations in Britain and Japan, Cambridge Studies in Management 18, Cambridge: Cambridge University Press.
- Wade Robert (1990), Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization, Princeton, Princeton University Press.
- Womack, James, Daniel Jones and Daniel Roos (1990), The Machine That Changed the World, Rawson Associates, New York.

INDUSTRIAL STRATEGY PROJECT  
RESEARCH REPORTS

THE FOLLOWING RESEARCH REPORTS ARE AVAILABLE:

PUBLISHED BY UCT PRESS:

- Joffe, A; Kaplan, D; Kaplinsky R; Lewis, D., *Improving Manufacturing Performance in South Africa.*  
Altman, M., *The Clothing Sector.*  
Baumann, T., *The Household Electrical Durables Sector.*  
Bethlehem, L., *The Pulp and Paper Sector.*  
Black, A., *The Motor Vehicle Assembly and Component Sector.*  
Crompton, R., *The Commodity Plastics Sector.*  
Goode, R., *The Electrical Distribution Equipment and the Professional Electronics Sectors.*  
Marce, J., *The Textile Sector.*  
Nguasheng, M., *The Building Material Supplies Sector.*  
Van Huren, C., *Counting the social costs. Electricity and externalities in SA- (R45-00)*

THESE REPORTS ARE AVAILABLE FROM : BOOK PROMOTIONS

TEL : CAPE TOWN 021-720332 ; FAX: 021-720383

JOHANNESBURG 011-8827331 ; FAX: 011-8827332

*The costs of each report is R69-95 plus vat unless otherwise stated.*

WORKING PAPERS:

- No.1: Hanival, S., *South African Fruit Processing Industry : Is the Climate Ripe?*  
No.2: October, L., *A Study of the Cape Clothing Industry.*  
No.3 : Prinsloo, E., *The Clothing Industry in Durban*  
No.4: Schur, M., *Printing and Publishing in the Witwatersrand*  
No.5 : McDonald, F., *Restructuring the South African Steel Industry: A study of Newcastle.*  
No.6: Kaplinsky, R & Mhlongo, E., *South African Industrial Policy and the learning firm: A study of Bell Equipment Ltd.*  
No.7: Black, A., *Learning, technical change and the trade regime in the South African automotive component sector. \**  
No.8: Joffe, A., *Restructuring for Survival: a case study of a small electrical appliance Company. \**  
No.9: Rosenthal, T., *A tale of two Companies: a case study of restructuring in the glass packaging industry in South Africa. \**

THESE REPORTS ARE AVAILABLE FROM :

THE DEVELOPMENT POLICY RESEARCH UNIT

UNIVERSITY OF CAPE TOWN

PH: 021-242340 EXT. 7162/3 OR 4807162/3

FAX: 021-232501

THE COST OF THE WORKING PAPERS ARE :

NO'S 1-5 R20-00 EACH; NO'S 6-9 R30-00 EACH

\* WORKING PAPERS 7,8 &9 CAN BE ORDERED NOW BUT WILL ONLY BE AVAILABLE IN DECEMBER