
DEPARTMENT OF TRADE
AND INDUSTRY

# DEPARTMENT OF TRADE AND INDUSTRY
# POLICY SUPPORT PROGRAMME

## International Competitiveness And Value Chains in Selected Manufacturing Sectors Study
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# AUTOMOTIVE TEXTILE STUDY

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## PREFACE

The purpose of this report is to present the findings from a study of an automobile-textile (auto-textile) value chain in KwaZulu-Natal. The research was conducted under the auspices of the Industrial Restructuring Project (IRP) which was established in 1996 to conduct academic research into selected industrial sectors in KwaZulu-Natal. Since then, however, the focus of the project has shifted to consider restructuring issues at both the provincial and national levels. From the onset, the various stakeholders in the process (at that stage namely the research team, government, business and labour at the provincial level), made it clear that the IRP should be more than an esoteric academic process. There was a strong urge to avoid the development of a process that would produce interesting academic publications, but little else.

As a consequence of the sentiment that informed the formulation of the IRP, an "Action Participatory Research" process was strongly advocated. This research model attempts to include the various stakeholders in all the stages of the research process, and bridge the gap between these various phases: design, research activity, policy proposals and industrial restructuring.

Another crucial aspect to be considered about the IRP are the four inter-related outcomes that are intended to form the basis of further industrial restructuring activity in the province and beyond:
The generation of reliable data and analysis to inform or support industry and policy formulation processes;
The creation of academic support systems for industry by building capacity within provincial tertiary institutions (in this instance, the University of Natal in Durban);
Achieving higher levels of awareness with regard to industrial restructuring issues among government and business and labour constituencies in KwaZulu-Natal; and
To facilitate actual restructuring processes at the firm and sector levels.

The project is located within the School of Development Studies at the University of Natal, Durban. Furthermore, the IRP has formal institutional linkages with the Institute of Development Studies (Sussex University, Brighton). Thus far, three industrial sectors have been selected for focused research: Automobiles, Furniture and Textiles. Depending on the availability of resources, other sectors may still be chosen for research and restructuring.

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## INTRODUCTION AND BRIEF OVERVIEWS OF THE TEXTILE AND AUTOMOBILE SECTORS

In 1993, the DTI introduced the Motor Industry Development Plan (MIDP) and the Duty Credit Certificate (DCC) scheme for the motor and textiles industries respectively. The two measures were intended to achieve industrial rationalisation in each sector. Both measures were designed to induce not only improved export competitiveness, but also to effect critical improvements to manufacturing processes that will underpin effective export performance. The critical question to ask is how firms in these sectors have responded to the changing demands being placed on them because of the new operating environment in which they find themselves. A study of an auto-textile value chain is thus important for assessing the impact of these changes on a group of firms that operate both within and between the two sectors.

Firms in the auto-textile sector are in an ambiguous position – and hence one that is important to understand from an industrial policy perspective. They depend upon textile industry materials and production systems and yet, by virtue of having a market orientation that is directed towards the automobile sector, they need to meet the demands of, and adhere to the trends that are typical of the automobile sector.

Importantly, and in addition to this critical ambiguous position, IRP research over the last couple of years has suggested that the restructuring that has being occurring within automotive manufacturing value chains is limited by its shallow levels of embeddedness. This has resulted in a situation whereby the assemblers at the end of production value chains, can achieve impressive performance levels that are not necessarily replicated up their production value chain, thus undermining their competitiveness.

This study, which draws upon previous IRP research as well as detailed empirical research at the firm and value chain level, critically analyses the extent of these issues within an auto-textiles value chain. After two descriptive sections that highlight the research methodology employed for the study and the profile of the surveyed firms (Sections One and Two respectively), this research report focuses on the competitiveness of the auto-textiles firms as a whole (Section Three). In Section Four the competitiveness focus is taken further by critically analysing the value chain relationship between the assembler and one of the auto-textile firms included in the sample. This is done in order to highlight the critical importance of value chain relationships within the sub-sector (Section Four). A brief conclusion then completes the report.

A brief overview of the two sectors that are straddled by the auto-textile firms is, however, first provided.

### Brief Overview of the Textile Sector

Textile production contributes 0.7% to South Africa's GDP (see Table 1). Furthermore, the sector employed an estimated 70 000 workers in 1998. The most significant textile sub-sector in South Africa is the spinning, weaving and finishing of textiles. This covers a wide range of activities and accounts for 49% of total textile production (IDC-DTI, 1998).

**Table 1: Percentage share of total economy (1996)**

| | % share in the economy |
|---|---|
| Value Added | 0.69 |
| Exports | 1.32 |
| Imports | 2.42 |
| Employment | 1.14 |
| Capital Stock | 0.26 |

(Source: IDC-DTI, 1998)

The textile industry in South Africa is undergoing a difficult process of transformation. The industry is confronted with the challenge of upgrading capital equipment that was neglected during the long period of economic isolation. This is occurring at a time when the national currency is unstable and on a downward slide. To complicate matters further, the opening up of the local economy has increased the exposure of domestic textile markets to imported products from lower cost production areas.

**Brief Overview of the Auto-components Sector**

The automobile industry as a whole, accounts for 1.22% of jobs in the local economy. The sector also accounts for nearly 2% of the nation's value adding activities. Moreover, the sector accounts for 2.17% of the nation's imports. One of the most outstanding features of the sector is the high level of importation (9.68% of total imports). This is a manifestation of the sector's advanced levels of global connectivity and its dominance by multinational companies.

**Table 2: The contribution of the automobile industry in the economy.**

| | Percentage share |
|---|---|
| Total value added | 1.99 |
| Exports | 2.17 |
| Imports | 9.68 |
| Employment | 1.22 |
| Capital stock | 0.6 |

IDC-DTI (1998)

At a more disaggregated level, IRP studies suggest that the automobile components sub-sector comprised some 300 firms in 1996 (Barnes, 1997). Approximately 160 of these firms were members of the industry's association (NAACAM). The turnover levels for the auto-components sector in 1997/8 was over R7.5 billion and **employment levels in 1995 were over 47 000 (NAACAM, 1996).**

In summary the, the auto-textile firms straddle two very important sectors of the South African economy. These are also sectors however, that are under enormous competitiveness pressure due to the liberalisation of the South African economy.

## SECTION 1: RESEARCH METHODOLOGY

This research exercise is an assessment of relations along a value adding chain that included an automobile manufacturer as well as five domestic first tier suppliers in the auto-textile sub-sector. As a result, the research process was characterised by detailed studies of five first tier auto-textile suppliers and their major customer- the trimshop of an assembly plant.

In order to effect the research process, a variety of research methods were relied upon. The research process was essentially designed to reveal rich data related to firm level performance and relations along the value adding chain. The following research procedures were relied upon to inform the process:

- Questionnaires: Each of the six firms that participated in the study received questionnaires that drew out information relating to: the profile of the firm, their economic performance, various indicators to assess internal firm performance, and relations with suppliers and customers. Of the six competitiveness questionnaires that were left at firms, five were returned.
- Management and labour interviews: Interviews were arranged with various personnel at the participating firms. Interviews with management typically covered the following areas: market conditions, strategic planning and orientation, pipeline management, production management, quality maintenance, human resource development and research and development. Depending on each plant's particular labour regime, interviews with labour representatives usually included union representatives, supervisors and/or foremen and members of shop-floor committees (where they existed).
- Plant level measurements: All the participants allowed the IRP to access their plants for one to two days so that manufacturing performance levels could be assessed. This undertaking was characterised by the collection of data related to inventories, throughput times, the organisation of production, quality performance and capital utilisation.
- Customer survey: The five auto-textile firms' ability to respond to market pressures was also assessed by means of a customer survey. The survey measured plant level responses to changes in the market. The integrity of this undertaking was further strengthened by a parallel survey of their major customer's views regarding the performance its auto-textile supply base. This component of the research methodology is critical because the analysis in this report is based on the market driver approach. The characteristics of the market driver approach and why it is useful as an analytical tool shall be explained in greater detail in section 3 of the report.

The six firms that participated in the study each received a 15 to 20 page report that detailed the critical findings for each plant level study. The findings were also presented in one to two hour report-back sessions at each participating firm.

## SECTION 2: PROFILE OF THE SAMPLED FIRMS

For the purpose of effecting this pipeline study, six firms were observed and analysed. One of the firms that was observed in this instance was an automobile assembly plant. The research process was not concerned with the manufacturing performance of the plant as a whole, however. Instead, the research was confined to an observation of the plant's internal trim and seat making section (see table 3).

### 2.1 Profile of the Assembly Plant's Trimshop.

The plant in question is one of the more significant automobile assemblers in the country. Its seat making section (i.e. the trimshop) was observed to fit uncomfortably within the confines of an automobile assembly plant. The manufacturing process in this section of its plant tended to resemble "Cut, Make and Trim" processes that are typical of the apparel sector. The composition of labour in the trimshop had a slight majority of women workers (i.e. 51%). Women accounted for 15% of the plant's combined employment figure of just over 1000.

**Table 3: The profile of the trimshop of the sampled motor assembly plant.**

| **Part** | Daily Use | Total Inventory |
|---|---|---|
| Door Panels | 600 of each component | 2 days |
| Head linings | 29 | 1 day |
| Seats | 1750 frames<br>1750 pads<br>1170 covers | 2 days |

### 2.2 Profile of the sampled component Firms.

#### *2.2.1 Markets:*

The five auto-textile firms that participated in the study were component suppliers to the assembler's trimshop. The firms were essentially supplying the trimshop with components that are largely textile based. Although some of the firms (i.e. firms 1, 2 and 3) were also supplying markets other than the automobile OEM market, the automobile industry tended to be the primary customer for all the firms that were observed. The 5 firms were all first-tier OEM suppliers. However, Firm 3 also had limited exposure to the domestic independent automobile aftermarket.

#### *2.2.2 Products and Manufacturing Processes*

As indicated in table 4, the products manufactured by the sampled firms include items such as laminated fabrics, carpets and seals. A key characteristic that sets these textile products apart from conventional textile manufacturers is the heavy reliance upon processes such as laminating or coating. This was typically done with PVC and other plastic based materials. In some instances rubber based materials were also used.

**Table 4: Profile of the auto-textile firms that participated in the study.**

| Firms | Location | Markets | Employment | T/Ov. (Rm.) | Products |
|---|---|---|---|---|---|
| 1 | KZN | Local OEM & footwear | 11 | 1.5 (est.) | Plastic coated (i.e. laminated) fabrics |
| 2 | KZN | Local OEM & CMTs | 290 | 90 | Weaving, knitting and laminating of textile fabrics |
| 3 | KZN | Local OEM & Construction | 344 | 58 | Cutting and laminating of foam based products |
| 4 | KZN | Local OEM | 117 | 39.1 | Carpets and internal trim |
| 5 | KZN | Local OEM | 117 | 29.3 | Sun visors, form technology, rubber seals plastic extrusions and injection moldings |

*2.2.3 Geographic Location*

All of the sampled auto-textile firms were located within the metropolitan area of Durban. This was a legacy of a number of factors that included:

- The pressure in OEM trim supply to operate on a just-in-time basis,
- The need to be close to suppliers, and
- The need to be close to customers.

*2.2.4 Ownership structures*

The political economy of the global automobile industry tends to discriminate against local producers who are not linked to the major global companies that dominate the sector (Barnes, Kaplinsky, 1999; Humphrey et al, 1998). This is largely a symptom of the high levels of global integration within this sector. Automobile assemblers around the world have been at the forefront of developments such as global strategic planning and sourcing practices. Furthermore, the automobile industry has also been experiencing a shift towards higher levels of focus with regard to core competencies. This has led to the increased incidence of sub-assembly activities at the first tier level of the OEM supply chain. Furthermore, an ability to consistently adhere to the sector's exacting product and quality specifications, is an important attribute that firms require in order to operate in this market.

At the very least, the net impact of such characteristics has been to push domestic auto-component firms towards technology sharing agreements with foreign multi-nationals. However, as these trends intensify, joint ventures with overseas firms or being a subsidiary to one becomes even more significant.

**Table 5: Ownership structure for the 5 SA suppliers**

| | Turnover (million Rands) | Ownership Structure |
|---|---|---|
| Firm 1 | 1.5 | Owner managed SA company |
| Firm 2 | 90 | Joint venture with overseas company |
| Firm 3 | 58 | Subsidiary SA company |
| Firm 4 | 39.1 | Subsidiary SA company in joint venture with overseas company |
| Firm 5 | 29.3 | Subsidiary SA company |

Given such trends it is not surprising that the sample captured only one owner managed firm. The rest of the firms were either joint ventures with overseas companies or subsidiaries of larger South African companies (see table 5).

*2.2.5 Employment Levels*

As indicated in table 5, employment levels in the sample ranged from a low of 11 to 344. The firm that had the lowest employment level had a fairly undifferentiated production process, while the other firms in the sample had more complex production systems. Firm 1's production system is limited to the lamination of fabric with PVC and other plastic based materials. The largest employer in the sample (Firm 3) was also involved in lamination processes. However, its product base was diverse and its production system included other processes such as moulding, finishing, and sub-assembly. The sample's average employment size was 176, and the median was 117.

### *2.2.6 Turnover Levels*

In line with the employment variance, the sampled firms had turnover levels that ranged from R11 million to R90 million (see table 4). Once again, Firm 1 registered the lowest levels of turnover. Firm 2 had the highest turnover levels. This firm had most capital intensive production system of the sample. Production processes in Firm 2 ranged from spinning fibre into yarn; the knitting and weaving of yarn into fabric; and laminating and finishing processes. Average turnover levels for the sample was R43.58 million, whilst the sample median was R39.1 million.

## SECTION 3: AN ANALYSIS OF THE COMPETITIVENESS OF SOUTH AFRICA'S AUTO-TEXTILE COMPONENTS INDUSTRY

Understanding how a firm (or a group of firms) performs economically is not sufficient to provide a conclusive indication of its general levels of competitiveness. Whilst economic indicators most definitely do highlight the financial strengths and weaknesses of the firm, they give little indication of the firm's capacity to meet its markets' present and future demands. This is particularly true when its markets are being fundamentally altered on an ongoing basis, as is the case in the South African manufacturing environment.

Numerous international experts (Kaplinsky, 1994; Womack et al, 1990; Brown, 1996; Humphrey et al, 1998) have therefore highlighted the significance of considering key internal performance variables as a mechanism for generating a detailed and thorough understanding of firm-level competitiveness. These key variables are highlighted in table 6.

Table 6: Market drivers and manufacturing performance and practice (Adapted from: Kaplinsky and Morris, 1998).

| Market drivers | Performance measures | Organisational practices |
|---|---|---|
| 1. Cost | Inventory use (raw materials, work in progress, finished goods) | Single unit flow, quality at source, cellular production, multi-skilling, production pulling (KANBAN) |
| 2. Quality | Customer return rate, internal defect and scrap rate | Statistical process control, quality circles, team working |
| 3. Lead times | Time from customer order to delivery, delivery frequency of suppliers | Business process engineering, cellular structures in order processing and dispatch, supply chain management |
| 4. Flexibility | Delivery frequency to customers, machine changeover times, batch sizes, lot sizes, inventory levels, throughput time through factory, production flow | Value chain relationships, JIT, single minute exchange of dies, multi tasking and multi skilling, cellular production in manufacturing |
| 5. Capacity to change | Suggestion schemes, labour turnover and absenteeism (proxies for employee commitment), employee development/training | Continuous improvement (Kaizen), worker development and commitment |
| 6. New product development | R&D expenditure, development of new products | Concurrent engineering, R&D |

The analysis of competitiveness presented in this section relies upon the six market drivers presented in table 6 as a prism through which to disentangle the plant level data. By doing so, it is hoped that a detailed appreciation of the sub-sector's internal dynamics will emerge. It is essential to draw such a picture because it provides a sound basis for determining the long-term viability of this important sub-sector.

For the purpose of effecting such an analysis, this section has been organised into three constituent parts. The first part will be dedicated to a discussion of market dynamics. This discussion will assess the demands that assemblers place upon their auto-textile suppliers, and how suppliers respond to those challenges. The second part of the discussion will be dedicated to an analysis of the sub-sector's internal efficiency competencies. This section will depend heavily on the market driver approach presented in table 6. Finally, the discussion will be concluded with a summary of key observations.

## 3.1 Market Demands and Firm level Responses

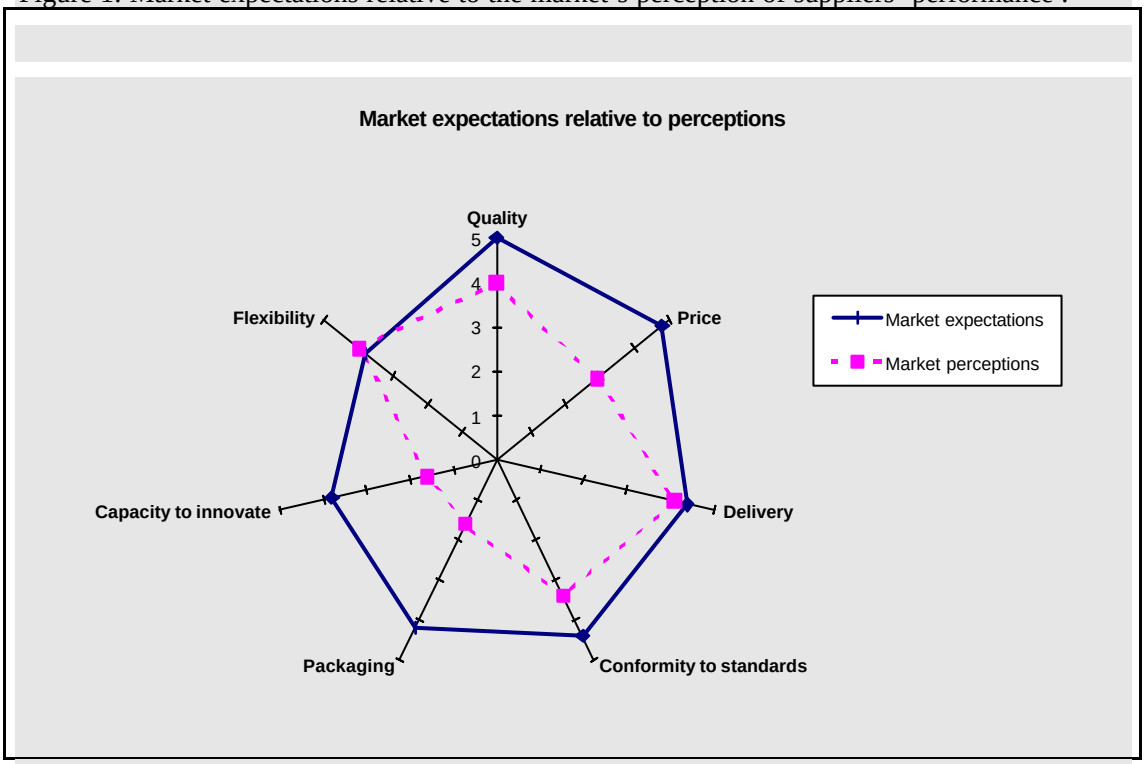
### *3.1.1 Market Demands*

The auto-textile sector's Original Equipment Manufacturer (OEM) market indicated that price and quality were their key concerns when sourcing from suppliers. This is not surprising as vehicles fall into that category of product that requires high levels of safety and quality maintenance. Insufficient levels of attention to these factors can result in both fatalities and costly legal action.

Pricing, on the other hand, is also critical as consumers demand more out their vehicle for less money. In the domestic South African market, low levels of consumer spending compound the pressure on prices. This has resulted in decreasing levels of new car sales. Furthermore, there is the added pressure of having to contend with increasing numbers of imported fully imported built-up cars.

Given such dynamics, it was not unexpected to see both price and quality considerations getting the highest possible rating (i.e. five), which indicates very high levels of sectoral emphasis on these factors (figure 1).

Figure 1: Market expectations relative to the market's perception of suppliers' performance[1].




The market has also attached substantial levels of significance to the following factors by giving them scores of above four:

- Conformity to standards,
- Delivery reliability, and

[1] In the rating system that informs the customer surveys, a score of one represents an area of least significance to the respondent, whilst a rating of five is attached to areas that command the highest levels of significance. This rating system is a useful comparative tool because it presents the customer and the supplier's responses in the same graph. In this manner, perceptions regarding performance gaps can be revealed.

- Packaging.

These three demands from the market flow primarily from pressures that have come about as a result of the organisation of manufacturing at the assembly end of the value-adding chain. Assemblers tend to typically organise their production processes along just-in-time principles. This has necessitated a number of innovations and arrangements to enhance the overall efficiency of the system. Primarily, assemblers around the world are increasingly shifting their focus towards what they isolate as their core competency- i.e. vehicle assembly. That has in turn led to a higher incidence of sub-assembly activity at the first tier level of the supply base.

Given such developments and their accompanying arrangements, it has become critical for first tier OEM suppliers to be able to provide a vehicle assembly line with the following:

- Accurately configured components (or sub-assembled complexes), that are
- Packaged in the most user-friendly manner, and
- Are delivered to the point of assembly on time.

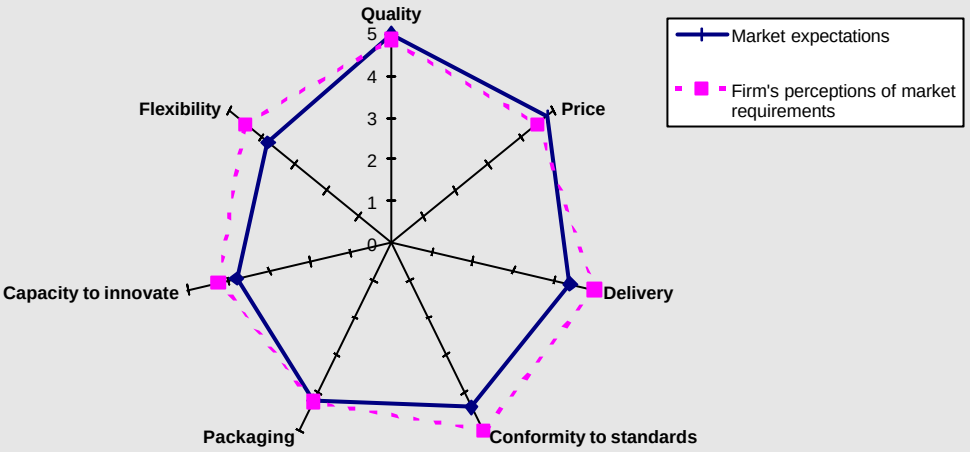
Finally, the auto-textile sub-sector's customers placed the lowest levels of significance on flexibility and the capacity to innovate. However, it is essential to note that although these two factors were rated lowly relative to the other factors, they were still given ratings that were fairly close to a score of four by the market.

### *3.1.2 The Auto-textile sub-sector's understanding of market demands*

As far as the sector's ability to read its market is concerned, there would seem to be significant levels of convergence between the demands of the market and the views of such demands on the part of the supply base (figure 2). The two sides of the value chain are in total agreement with regard to the levels of emphasis that need to be attached to both quality and packaging. However, suppliers tended to overestimate market expectations in relation to delivery reliability, conformity to standards, flexibility and innovation capacity requirements.

On the issue of price, market expectations were recorded to be slightly higher than what supplying firms perceived them to be, with quality indicators matching one another.

**Figure 2: How firms rate market expectations relative to actual market expectations.**

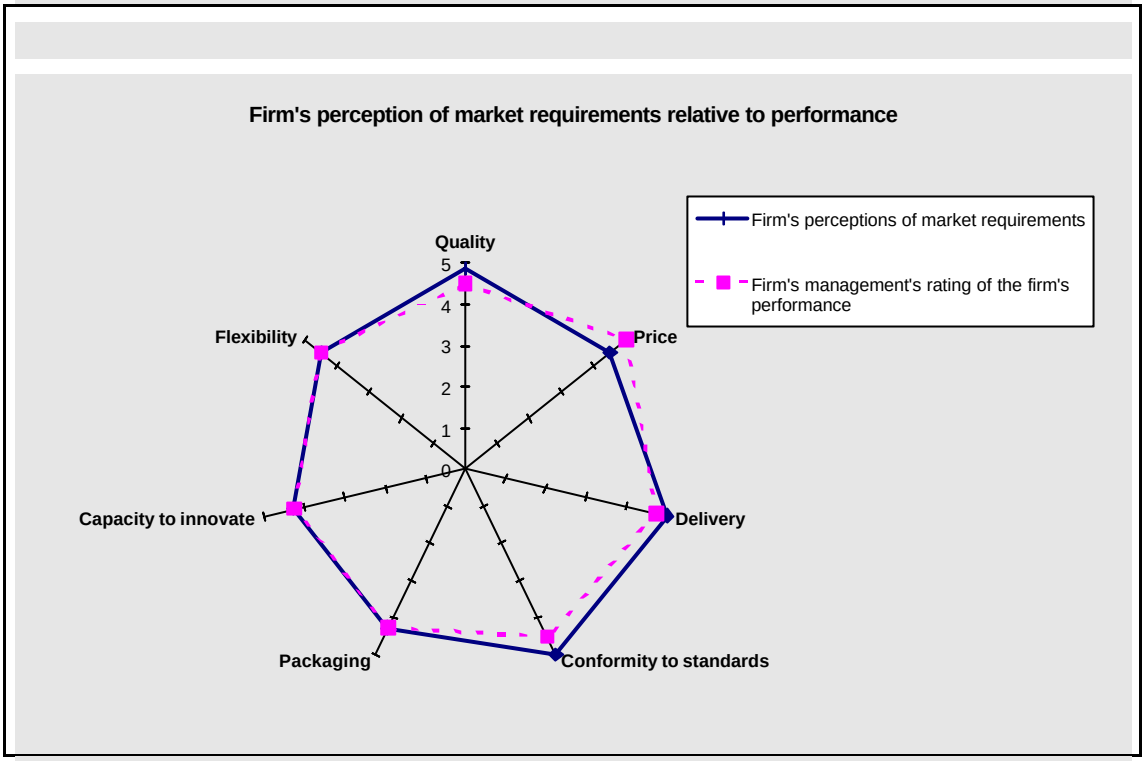



The ratings that the supply base gave for its performance relative to market expectations were equally informative (figure 3). Firstly, suppliers rated their ability to meet price demands slightly above the market's expectation. In the case of packaging, capacity to innovate and flexibility, the supply-base felt that its performance was on par with market expectations.

The two instances where suppliers felt that their performance rates below market expectations related to their quality and their ability to conform to standards.

However, in order to fully appreciate the significance of these ratings, it is essential to contrast the ratings that the supply base gave for its own performance against how their customer base assessed their performance.

**Figure 3: Suppliers' ratings of their own performance relative how they perceive market demands.**

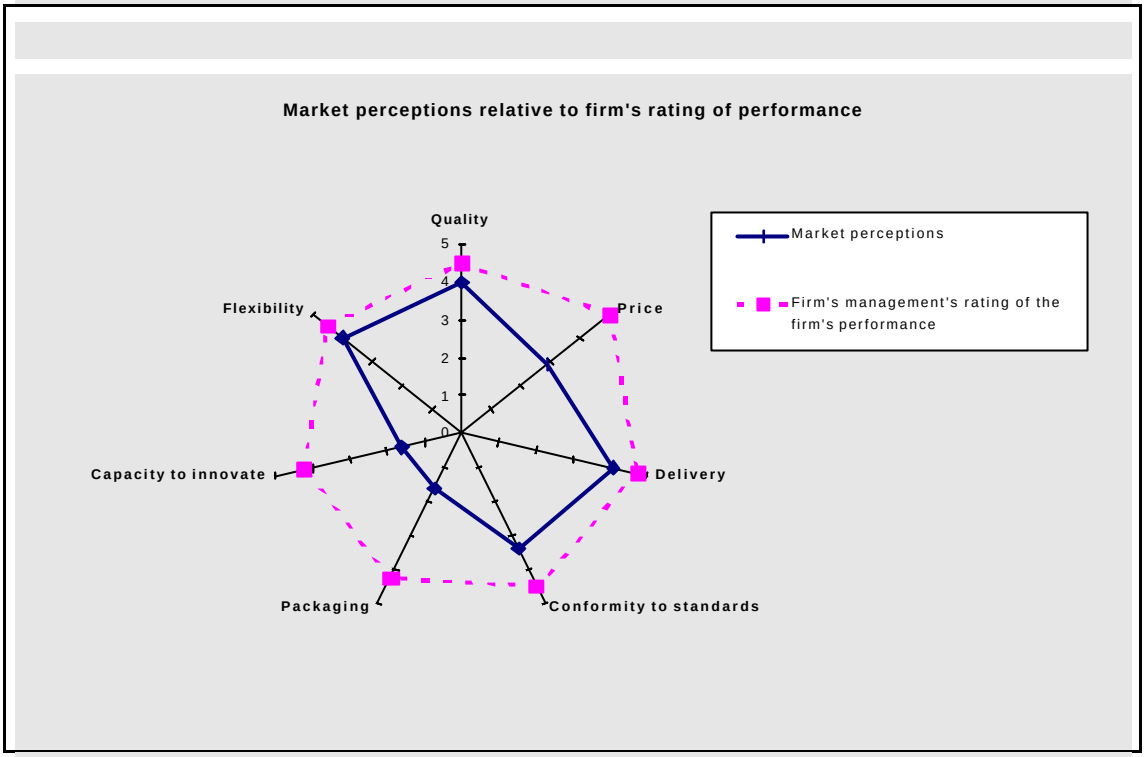



*3.1.3. Market perceptions regarding the performance of suppliers relative to how suppliers rate themselves.*

When the ratings that suppliers attach to their manufacturing competency is contrasted against what the market perceptions were on the same issue, a dramatically different scenario emerges. Although there was a significant level of convergence regarding the supply base's perceptions of market expectations and the responses that came from customers (figure 4), perceptions regarding performance reveal a wide gulf between customer expectations and supplier competency levels.

Therefore despite the supply base's belief that its performance regarding price, packaging and conformity to standards is of a commendable standard, its market rated the auto-textile sub-sector lowly in all three instances. Furthermore, the market also felt that auto-textile firms fail to meet performance demands for flexibility, quality, delivery reliability, and conformity to standards. However, the divergence of opinion was not as significant for these last four factors.

Figure 4: Market perceptions of the performance of suppliers relative to how suppliers rate themselves.




## 3.2 Firm Level Competitiveness Issues

Given the performance gap that revealed in figure 4, it is clear that the market segment that the auto-textile sub-sector services is not entirely satisfied with the performance of firms in the industry. This will have a substantially negative impact on the general economic well being of the sub-sector in the longer term. The reasons for this poor performance can be located at many levels: the policy formulation and implementation level, within the locality, the sector or broader global dynamics. A critical component to the overall competitiveness equation is the operational competency level within the firms themselves. If firms are not competitive in terms of their operational dynamics economic performance will suffer. This is therefore a key issue and one that forms the core of the discussion below. This will be determined by filtering firm level performance data through the market driver approach system of analysis as presented in table 6.

### *3.2.1 Cost Control*

The measurement of inventory levels is a useful proxy indicator of a firm's manufacturing cost control. Inventory in the form of raw materials, work in progress and finished goods, is often a major contributor to the final cost of a product. Therefore, firms that control this aspect of their costing structure will often reap the benefits thereof through increased cost competitiveness in the final market.

**Table 7: Inventory Levels in the auto-textile value chain in comparison to the South African automotive average (measured in days)**

| | Raw Materials. | WIP | Finished Goods | Total Inventory |
|---|---|---|---|---|
| Sampled Assembler | 1 | 1 | 0 | 2 |
| Auto-textile firms | 18.21 | 4.84 | 2.3 | 25.35 |
| RSA average (Barnes, 1998) | 28.69 | 12.1 | 16.82 | 57.61 |

An analysis of the auto textile industry's inventory indicators reveals that the sampled firms had on average total inventory figures of about 25 days. When this figure is disaggregated, it becomes clear that the sub-sector is particularly good at controlling of finished goods inventories. This is partly a result of demands from assemblers to be supplied on a JIT basis and the strategic decision by all the sampled firms to locate close to their primary customer.

The sub-sector also performs well in terms of WIP levels. WIP levels in the sample averaged about 5 days. However, levels of raw material inventories were found to be consistently much higher than for the other components of inventory. Previous IRP research (Barnes, 1997 & 1998) has highlighted that this is an area that firms will usually struggle to control optimally. This is often a result of inflexible overseas suppliers, or local suppliers who are too large and powerful to care about the concerns of less powerful customers. But, it is also important to note that South African firms are usually incompetent at maintaining intimate and co-operative relations along value adding chains. The fact that there is a significant performance gap between the assembler and the supply base could be a manifestation of that legacy. Table 7 reveals that the sampled assembly plant carried a total of only 2 days worth of inventory against an average of 25 days held at the first tier supply base.

However, relative to the average for South African auto-component manufacturers, auto-textile firms are performing at a much higher level of efficiency. Auto-textile firms generated seven days less total inventory than other components firms in the country.

### *3.2.2 Quality*

There are two principal measurements of quality: customer return rates and internal quality performance. Of theses, the rate of customer returns is perhaps the most important quality measure because it focuses in on the quality satisfaction levels of a firm's customer. The higher the customer return rate, the less likely it is that a firm has built quality maintenance into its production system. Thus defects are only picked up at the end of the value-adding process, or by the customer. By referring to figure 4, we can establish that the firms in the sample are hardly satisfying customer expectation levels for quality.

**Table 8: Quality performance:**

| | Internal Rejects | Customer Returns |
|---|---|---|
| Assembler | 1.6% | - |
| Auto-textile firms | 0.3% | 503 (parts per million-PPM) |
| Other RSA component firms (Barnes, 1998) | 3.61% | 9455.6 (PPM) |

Customer returns are very important. The assembler was found to have virtually no customer returns, compared to a level of 503 PPM in the auto-textile supply base.

As far as internal rejects are concerned, the assembly plant recorded a rate of 1.6%. The auto-textile firms performed over five times better with an internal defect rate of 0.3%. These should be approached with a measure of suspicion. IRP research has established that the measurement of quality within South Africa's automobile component and textile firms can at best be described

as being essentially flawed[2].

However, compared to other South African auto-component firms, auto-textile firms tended to perform at a far higher level of competence. Customer returns for other component firms were 9455.6 PPM, with internal reject rates at the 3.6% level (Barnes, 1998).

### *3.2.3 External Flexibility*

All the sampled firms were supplying their major customer (an assembler) on a JIT basis. In order to facilitate this, all the firms in the sample took strategic decisions that led to their location at a close proximity to their major customer.

**Table 9: Delivery frequencies by major suppliers to the sampled firms:**

| | Daily | 2-3 days/Weekly | Less Frequently than weekly. |
|---|---|---|---|
| Auto-textile firms | 20% | 30% | 50% |

However, in relation to their major suppliers, the situation is more complex. Firstly, all the firms in the sample relied upon imported inputs. This dependency on foreign suppliers locks firms into supply chains that stretch to overseas companies with whom local firms have less than intimate relations. Inflexible shipping times, long distances and cumbersome communications procedures impede the flexibility of overseas suppliers. Furthermore, once an order has been placed inside a ship, it is virtually impossible to alter it in any way.

The second source of complexity relates to ownership patterns and the corporate culture that certain of the auto-textile firms are locked into. Three of the sampled firms had to source some of their raw material inputs from sister firms within their holding companies. These suppliers were all located away from the province. As such even if a closer alternative could be found, a change of supplier would still be difficult to effect. But more importantly, corporate politics also tend to cloud relations along such supply chains.

As indicated in table 9, it is quite apparent that the sampled firms had a smaller proportion of deliveries coming in on a daily basis while a bigger proportion tended to come in at a frequency that exceeded a week. Considered in isolation, these figures do not mean much. However, when the delivery frequency of inputs is compared to that of the outputs, an interesting scenario is revealed.

### *3.2.4 Internal Flexibility:*

When table 9 is contrasted to table 10, the first thing that becomes apparent is that although most major supplies to auto-textile firms arrive less frequently than weekly, such an arrangement does not exist for primary outputs to key customers. Furthermore, Table 10 reflects a trend that is opposite to the one in table 9. Therefore, the supply regime delivers less frequently on a daily basis and more frequently on a more-than-weekly basis. The customer delivery regime however, demands higher delivery frequency on a daily basis and less frequency on a weekly basis.

**Table 10: Customer delivery frequencies in the sample:**

| | Daily | 2-3/Days | Weekly |
|---|---|---|---|
| Auto-textile firms | 56% | 33% | 11% |

[2] Interestingly, IRP research suggests that as firms improve their internal quality control, rejects increase. This is because the rejects begin to be measure on a “right first time” basis at each station

The conclusion that can be fashioned out of this anomaly is that:

- The sub-sector is failing to make flexibility demands upon second tier suppliers. Therefore, they find themselves having to cater for a customer that demands flexibility while getting inputs from inflexible suppliers.
- The kanban[3] system that exists between the assembler and the first tier suppliers is also not being extended further into the value adding chain.
- First tier suppliers depend on high stock levels to meet flexibility demands.

Under such circumstances, it is very possible that the JIT system that the assemblers have put in place have not deeply embedded along the value adding chain. This may suggest that what appears as a JIT customer supply regime, is actually only an "apparent JIT system"[4].

**Table 11: Internal Inventories**

| | WIP (days) | Raw Materials (days) |
|---|---|---|
| Auto-textile firms | 4.8 | 18.2 |
| Assembler | 1 | 1 |

A combination of WIP and raw material inventories is also a good proxy measure of a firm's internal flexibility. An inflexible production system is likely to create gluts and bottlenecks and result in poor housekeeping. These factors have an inflationary effect on both raw material inventories and WIP levels.

As already highlighted, the assembler is performing very efficiently in this regard with combined WIP and raw material inventories of only two days. The auto-textile first tier suppliers however, hold on to 23 days in raw material and WIP inventories (table 11).

*3.2.5. Capacity to change*

The auto-textile sub-sector is stuck between two rapidly changing industries. As far as the textile industry is concerned, the bulk of this change has been located within the domestic sphere of activity. These changes are essentially a catch-up excise after the industrial neglect that befell the sector during the sanctions era. The other half of the equation is the automotive industry, which tends to be characterised by rapid change, primarily because motor cars as a manufactured commodity are both fashion and technology driven. Furthermore, it is not only the products that change in the automobile industry. Indeed it was the automobile industry that pioneered both the Fordist assembly line system and the more recent JIT system with its host of accompanying procedural innovations. Recently, the whole political economy of the global automobile industry has been thrust into a process of rapid change. At the assembly level, there has been a steady stream of mergers by the major players. At the first tier supplier level, the shift towards global sourcing and increasing demands for sub-assemblies is also resulting in a consolidation of ownership at this level.

Human resources are one of the key determinants of a firm's ability to change. Basically, people influence organisations as much as organisations influence people. Furthermore, if a production system is not fully automated, there will always be a need for people to interact with the production system. Such people often develop valuable insights into the mechanics and dynamics around their workstations. Therefore, labour can be a critical resource in a firm's efforts to manage change. In such circumstances, the quality and satisfaction levels of labour become critical.

[3] Kanban is a Japanese word for an inventory control system that depends upon a signalling system to control the flow of work in progress.

[4] Apparent JIT system can be described as value chain supply system that does not necessarily eliminate high levels of inventory from the value chain, but merely relocates them else within the supply chain.

**Table 12: Proxy indicators of the auto-textile sub-sector's capacity to change.**

| Research & development as a percentage of turnover | Human resource development as a percentage of turnover | Absenteeism |
|---|---|---|
| 2.3% | 0.4% | 4.2% |

Firms in the sample had labour turnover rates that were low to the point of insignificance. However, that is probably due to the depressed state of the labour market, rather than internal firm dynamics. Absenteeism rates for the auto-textile firms averaged about 4.2% (table 12). Compared to other auto-component firms (i.e. 4.98%: Barnes, 1998), this performance is still better than the norm. But in this instance, there seems to be a level of convergence between the auto-textile sector and the rest of the auto-components industry.

The quality of labour in South Africa is generally weak. With such a legacy, one would expect firms to spend substantial proportions of their budget and management effort on human resource development (HRD). However, after a number of visits to each of the firms in the auto-textile sample, some very important observations were made:

1. Management representatives were often unable reveal how much their firms spent on HRD without having to first consult company records. This is revealing, because the same respondents were often able to reveal profit trends, output and market share trends without having to refer to company records. In some instances, a budget did not exist.
2. Every respondent was running some sort of labour productivity-enhancing programme. These were often foreign in origin (often with Japanese names: e.g. Kaisen, Gochi, 7 Mudas, 5-S etc). However, with the exception of one firm in the sample, there was little evidence to suggest that labour in these firms was internalising and implementing these concepts.
3. The organisational structure of every firm in the sample that had an HRD division tended to relegate this division and its functions to the backburner. HRD divisions in the sampled firms thus tended to be balkanised entities that are so alienated from the centre of activity that they come to resemble what we shall term "corporate ghettos".
4. Management tended to confuse human resource development (i.e. the enhancement of labour's capacity) with industrial relations. This was also reflected in the manner in which human resource divisions operated (whereby there is a capacity bias in favour of the following activities: recruitment, disciplinary issues, wage determination and relationships with trade unions).

*3.2.6. New Product Development*

The political economy in the automobile sector tends to discourage research and development (R&D) activity within certain types of firms. Basically, a combination of the need to maintain uniform safety and quality standards across the globe, and single sourcing procedures have resulted the emergence of technology and innovation monopolies in the automobile sector. The net impact of this regime is that if firms are not large, first tier OEM suppliers who are based in Europe, Japan or America; then assemblers are unlikely to demand R&D capacity from them. This therefore precludes auto-component firms based in developing countries such as South Africa.

However, there are areas of opportunity that peripheral suppliers (like the sampled firms) can take advantage of. The auto-textile sub-sector is one such area of industrial activity. Textile products are often not easy to ship around the world. They can light and bulky as well as easy to damage, which means that shipping costs could get unbearably high. Furthermore, textile products in vehicles are used primarily for sealing and finishing purposes. Since fashion tastes are not uniform from market to

market, finishings cannot be expected to be uniform either. Climatic conditions can also change from market to market, which means that a car's sealing requirements may also have to be altered accordingly. Both of these factors conspire against the centralisation of R&D capacity.

It thus surprising to find that the respondents were rarely able to calculate their R&D budgets were. Some of the time an R&D budget was not available at all. Most of the time, firms presented their laboratory budget as an R&D budget. Not only did that betray a limited understanding of R&D issues, but it was also observed that most of the laboratories were mainly conducting quality assurance activities.

Table 12 reflects that average R&D rates for the sub-sector are 2.3% of turnover. Given the qualitative observations that have been mentioned, it is advised that this figure be treated with a measure of scepticism. But, that is not to suggest that the firms were not conducting R&D activity. In fact it was observed that there was a lot of activity directed towards developing new printing designs for fabrics or alternative materials. Furthermore, there ware also evidence of the implementation of process innovations. Therefore, the glaring anomaly in this instance is not that companies did not conduct R&D activity but rather that they were failing to measure it properly.

**SECTION 4: A CLOSER LOOK: THE CASE OF FIRM 3.**

The changing basis of competition carries significant implications with regard to the organisation of the manufacturing process within firms. If the basic organisation of manufacturing is not altered, firms will experience major difficulties with respect to meeting the demands of their customer base.

In the case of the trimshop, those demands are essentially concerned with factors such as price,

quality, delivery reliability, and conformity to standards and packaging. This is a set of demands that requires a firm's manufacturing process to be lean, efficient and flexible. However, for those gains to be properly generated and sustained, it is essential that the whole "eco-system" within which a firm operates should be equally motivated to implement the necessary changes

In this section therefore, we shall be focusing our attention upon the assembling firm and one of the first tier auto-textile suppliers which best demonstrates the characteristics that are typically associated with this sub-sector, i.e. the shallow embeddedness of efficiency and flexibility within the value adding chain.

**4.1. The Trimshop**

4.1.1. Quality Maintenance at the Trimshop:

The trimshop's quality implementation philosophy is geared towards the achievement of "zero defect rates". Given the level of defects in the trimshop (table 13), it is fair to pronounce that this division of the firm is on course towards meeting management objectives.

**Table 13: Average trimshop quality standards:**

| | |
|---|---|
| Re-works | 1.8% |
| Scrapped products | 1.6% |

The trimshop depends on a number of strategic interventions to ensure that the maintenance of quality is embedded into the manufacturing process:

- Total Quality Control (TQC), which entails building quality maintenance into the production process, has been implemented in the trimshop. This process entails the multi-skilling of labour to ensure that workers are equipped to deal with greater responsibilities on the shopfloor. In order to complement this process, a functional green area has been set-up for the trimshop. Teams of workers gather for about 20 minutes at least once a week to discuss production issues. Furthermore, there are adequate Statistical Process Control (SPC) displays within the green area that relate to various factors of production. The benefits of these interventions can be appreciated by noting that there are no quality inspectors in the trimshop and by referring to Table 14:

**Table 14: Impact of the trimshop's TQC procedures:**

| | |
|---|---|
| KAIZEN teams | 25 |
| Quality circle | 32 |
| No. Of worker suggestions (1996) | 376 |
| Value of cost savings from suggestions (1996) | R 20 170 000 |

*4.1.2. Inventories:*

**Table 15: Inventory levels in the trimshop (6 May 1997):**

| Part | Daily Use | FG | RM. | WIP |
|---|---|---|---|---|
| Door Panels | 600 of each component | Delivery to vehicle assembly | 1 day | 1 day |
| Head linings | 29 | Same | 0 | 1 day |

| | | | | |
|---|---|---|---|---|
| Seats | 1750 frames<br>1750 pads<br>1170 covers | Same | 1 day | 1 day |

As indicated from table 15, the trimshop has gone some way towards instituting lean production techniques within its manufacturing facilities. The trimshop was for example, found to be operating with low levels of RM., FG and WIP inventories.

*4.1.3. Plant Layout:*

**Table 16: Actual distances covered by parts through the trimshop (P-160):**

| | Actual distance covered by seats | Actual distance covered door panels |
|---|---|---|
| RM. to production begin | 34m | 23m |
| Production begin to Assembly | 190m | 129m |
| TOTALS | 224m | 152m |

Instead of grouping like machines together, the configuration of the trimshop's manufacturing space appears to be dependent on the principle of organising factory layout according to the products that are being produced. As a result, the configuration of the trimshop can be said to compose of three mini-factories catering for seats, door panels and head linings respectively. The benefit of this configuration is a reduction of WIP and housekeeping problems, shorter throughput times (table 17), and shorter throughput distances as well.

**Table 17: Through-put times in the trimshop:**

| Part | Average through-put time |
|---|---|
| Seats | 3.2 hrs. |
| Door panels | 1.34 hrs. |
| Head linings | 0.25 hrs. |
| Machine change over times | 0.0 hrs (trimshop uses dedicated machinery) |

## 4.2 Firm 3

Firm 3 is primarily involved in the cutting, laminating and moulding of foam and textile based products. These can be used as seals, lining or insulators in the footwear, construction and automobile industries. However, the automobile sector is by far Firm 3's most significant market. Up to 59% of turnover is generated through this sector.

This section is restricted to the analysis of Firm 3's activities within the confines of the automotive sector. In order to establish how Firm 3 fares in relation to the demands of its primary market, the research team measured the market-related perceptions of both Firm 3 and its automobile industry customer base.

**Table 15: Value-chain perceptions about market expectations.**

| | **Market expectations** | **Market perceptions of how KZN firms perform** | **Firm 3' perceptions of market requirements** | **Management rating of Firm 3' performance** |
|---|---|---|---|---|
| Quality | 5 | 4 | 5 | 5 |

| | | | | |
|---|---|---|---|---|
| Price | 5 | 2 | 5 | 5 |
| Delivery reliability | 4 | 4 | 5 | 5 |
| Conformity to standards | 4 | 3 | 5 | 5 |
| Packaging | 4 | - | 4 | 5 |
| Capacity to innovate | 3 | - | 4 | 4 |
| Flexibility | 3 | 4 | 4 | 5 |

In terms of customer expectations (table 15), Firm 3 operates within a market that places a high premium on factors such as:

- Quality,
- Price,
- Delivery Reliability,
- Conformity to Standards, and
- Packaging.

Based on management perceptions, Firm 3 has largely been able to gauge the requirements of this market (except on the score of delivery reliability and conformity to standards, whereby the firm has marginally over-estimated the requirements of the market).

*4.2.1 Supply Chain Management:*

**Table 16: Firm 3's perceptions regarding the performance of key suppliers.**

| | Firm 3's expectations from suppliers | Firm 3's perception of how their suppliers perform |
|---|---|---|
| Quality | 5 | 5 |
| Price | 4 | 4 |
| Delivery Reliability | 5 | 4 |
| Conformity to Std. | 5 | 5 |
| Packaging | 3 | 4 |
| Flexibility | 4 | 3 |
| Capacity to Innovate | 4 | 3 |
| Financial Stability | 4 | 4 |
| Credit Facility | 4 | 4 |

According to table 16, Firm 3 is not completely satisfied with the performance of its suppliers in terms of:

- Delivery reliability,
- Flexibility, and
- Their ability to innovate.

Furthermore, none of Firm 3's suppliers deliver more frequently than weekly. Therefore, based on this score alone, the firm is forced to hold on to raw material stocks of up to a week.

*4.2.2 Plant Lay Out*

Manufacturing at Firm 3 is organised in a manner, which cannot accommodate the firm's needs and attempts to increase flexibility. The factory floor has been configured in a way that tends to group like machines together. Therefore, laminating machines stand separately from the scissors cutters, and the scissors cutters are grouped apart from the dye cutters - etc. This organising principle, which has its roots in the fading Fordist system of manufacturing, forces the flow of material to follow machinery. As the number of products increase and different products start hopping from one

machine to another in different ways, keeping track of WIP becomes a nightmare. Management at Firm 3 revealed that over a 10-year period, the product range at the plant increased from below 10 to over 200 different products.

**Table 17: Actual vs. Necessary distance covered by parts in Firm 3.**

| | Actual Distance covered by Part A. | Necessary Distance: Part A. | Actual Distance covered by Part B. | Necessary Distance: Part B. |
|---|---|---|---|---|
| Incoming RM. to RM. Shelving | 50m | 50m | 50m | 50m |
| RM. Stores to Production Begin | 40m | 30m | 27m | 20m |
| Production Begin to End | 26m | 23m | 97m | 35m |
| Production End to FG Storage | 25m | 5m | 34m | 15m |
| FG Storage to Dispatch | 1.5m | 1.5m | 1.5m | 1.5m |
| TOTALS | 122.5m | 109.5 | 183.5m | 121.5 |

Table 17 is useful in further illustrating the challenges that can be presented by an inflexible plant layout. The actual distance covered by Part A (whose production process is as follows: lamination to scissors, cutters to dye, and cutters to packaging), is 122.5m. This part's production process follows a typical path for most parts that go through the factory. However, when a component, which requires a different production process is produced, the distance traveled by that component increases. Furthermore, its flow through the factory becomes more complex as the WIP jumps around the shopfloor. Table 17 illustrates this point through the example of the Part B (whose production process goes from scissors cutters (splitting)-dye cutters (trimming)-vacuum moulding-smoulder trimming-packaging). This part covers an actual distance of 183.5m through the factory.

Having to carry WIP from one workstation to another may not be physically demanding given that foam is a light material. However, the practice creates high levels of WIP and can present serious problems in the quest to deal with quality defects at their source. An inflexible plant layout will also reduce the benefits of cultivating a flexible work force.

*4.2.3. Inventory Levels*

Firm 3's problems in value chain management have had an adverse effect on certain aspects of its manufacturing performance. This is apparent in the instance of RM. inventory levels.

**Table 18: Inventory levels for Part A**

| | |
|---|---|
| Daily Production | 300 units |
| Customer Requirements | 300 units |
| RM. Inventory | 2944 units |
| RM. Inventory in working days | 9.8 days |
| FG Inventory | 450 units |
| FG Buffer | 150 units |
| FG Buffer in working days | 1/2 a day |

Firm 3 has, for example, consistently held about 10 days worth of RM. inventories since 1994. In the instance of the sampled part (Part A), 300 units were being produced per day, yet material for 2944 units was being held as RM. stock (representing close to 10 days worth of inventory).

Firm 3's inability to keep lower RM. stocks is connected to the plant's challenges regarding the improvement of relations with suppliers. As it has been pointed out elsewhere in this report, Firm 3 is dissatisfied with the performance of its suppliers with regard to delivery reliability and flexibility. The restrictions placed by the lack of EDI (or some other system that would allow a supplier to stay abreast of the firm's material consumption) are thus strikingly apparent in this regard. Another option could be the implementation of a kanban system to control material flow from suppliers. A signalling system is already in operation with regard to the firm's customers, so Firm 3 should seek to extend it beyond their plant.

Firm 3 also had numerous problems with regard to tracking its WIP. As it has already been suggested, this is partly due to an inadequate inventory tracking system and an inflexible plant layout.

Firm 3's plant also caters for customers who make once-off purchases for unique products - thus complicating production planning. The complications arise due the plant's inflexible layout and difficulties stemming from trying to keep track of products on the shop floor in the absence SPC.

In order to measure Firm 3's WIP performance within the context of the automotive industry, another sampled part (Part B) was used as a measure:

**Table 19: WIP levels for Part B (12 June 1997).**

| | |
|---|---|
| Daily Production | 250 |
| Parts Still in Sheets | 430 |
| Blanks | 532 |
| Untrimmed Parts | 28 |
| TOTAL WIP | 990 |
| WIP in working days | 3.96 Days |

On 12 June 1997, Firm 3 had close to four days in WIP on the shopfloor. High levels of WIP have the impact of trapping resources in an unproductive state. This is due to the fact that when WIP levels are high, material gestation periods between value adding activities tend to be longer. High WIP inventories also lead to house keeping difficulties, and make the correction of defects at source difficult.

### *4.2.4 Conclusion*

The purpose of this section was to demonstrate that efficient and flexible production systems are not being adequately embedded within the auto textile value adding chain. As a result, there is a wide performance gap between the assembler in the sample and the first tier supply base. The net result of this scenario is that the auto-textile value adding chain appears to operate along apparent JIT, as opposed to a true JIT system whereby efficiency and flexibility are a feature of manufacturing processes throughout the value adding chain.

## CONCLUSION

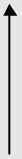
This report focused-in on a branch of the automobile industry that extents into the textile sector. The firms in this sector were found to be between two rapidly changing business environments. Apart from that, the firms had to deal with conflicting corporate cultures. For instance, while quality and safety features are increasingly becoming more important within the textile sector, the automobile industry tends makes exacting demands about them.

Basically, the OEM market is very demanding across the world. Yet our research indicated that the assembler was dissatisfied with the performance of the trimshop's suppliers with regard to the following factors:

- Quality,
- Pricing,
- Delivery reliability,
- Packaging,
- Capacity to innovate
- Flexibility, and
- Conformity to standards.

**Assembly Plant**

Low inventories
Flexible plant layout
Total Quality Control



| **First Tier Auto-textile Supply Base** |
|---|
| Meets Demands for flexibility at a high cost. |
| High RM. inventory |
| High WIP inventory |
| Low FG inventory |
| Multi-tasking |
| Low levels of Multi-skilling |

Furthermore, the research process confirmed that there are significant levels of inefficiency that are embedded within the value adding chain. Although the trimshop's manufacturing operation is clearly performing at impressive competitive levels, the auto-textile firms that feed into this production unit were found to do so at sub-optimal efficiency levels.

Although these firms were found to be sufficiently capable of meeting customer demands for flexibility and JIT supplies, the following shortcomings were noted:

- First tier suppliers were often dependent on high raw material inventories to satisfy customer demands for flexibility; as such the trimshop could be said to be operating along the lines of an apparent JIT system. Thus the trimshop's inventories are in many cases being held elsewhere in the value adding chain.
- These firms tended to have factory layouts that are organised according to the inflexible Fordist format. As a consequence of this configuration, WIP levels rise and housekeeping problems increase. These problems often become intensified when customer demands for flexibility arise and/or when products proliferate.
- Although HRD programmes were being widely implemented by the supplying firms, attempts to achieve higher levels of labour participation in production management were being hampered by insufficient levels of embeddedness. Quality control, production planning, continuous improvement, etc. tended to be primarily carried out by management.

However, compared to other firms in the automobile components sector, firms in the auto-textile sub-sector were found to be performing consistently better.