

# A GENERIC METHODOLOGY FOR STRATEGIC AUDITING OF A MANUFACTURING SYSTEM

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Operating without a definite strategy for competitiveness is becoming a common practice in small to medium enterprises, especially those with manufacturing functions. This has seen many potential businesses failing to survive the competition in today's dynamic business environment. In order to thrive in any chosen market, an organization needs to have a well-defined manufacturing strategy that is periodically audited and reviewed. An effective manufacturing strategy must clarify and define the links between overall competitive strategy and the development of the company's resources. Strategy formulation provides direction, purpose and coherence; ensures that manufacturing's interests are taken into account at corporate level; clarifies and emphasizes priorities and potential conflicts; and helps integrate functions. An understanding of the consumer's needs is critical and a clear awareness of order winning and order qualifying criteria is essential. Thus a manufacturing strategy sets the destination, and implementation defines how to get there. This paper outlines a generic methodology for formulating a manufacturing strategy which should be of value to private entrepreneurs especially in the manufacturing domain.

**Key words:** competitive performance objectives, manufacturing strategy, strategic auditing

## 1. INTRODUCTION

A manufacturing strategy is an indispensable tool for any business that is serious with survival and growth through out-performing its competitors in its chosen market. Since the market is a dynamic environment, it is important to keep track of the trends in the market and develop the manufacturing system accordingly, paying particular attention to the competitive performance objectives for different product groups. Thus it is vital to carry out regular manufacturing audits in order to compare the company's actual performance against the desired performance and take measures to bridge the gap if any. The aim of this study was to carry out a manufacturing strategic audit of a case study company: JandS Botswana (Pty) Ltd. The objectives included carrying out a detailed analysis of the manufacturing function of JandS Botswana as a case study analysis of all aspects of manufacturing strategy; evaluating how the company was fairing with respect to competitive strategies and competitive performance objectives; identify the gap size between the actual and the desired performance; identify possible ways of reducing the gap; and outlining the manufacturing strategic audit methodology and emphasize its potential impact on the company's competitive might. This study was restricted to the manufacturing function of the company, thus auxiliary products that are purely for distribution are not included in the case study.

## 2. THE PROCESS OF STRATEGY FORMULATION

Manufacturing strategic audit forms one of the important aspects/stages of the process of strategy formulation, and to understand it better, it should not be considered in isolation but in the context of the whole process. Many procedures exist for strategy formulation and most consultancy companies, for example, have their own methodologies for manufacturing strategy formulation. However, these procedures have a common philosophy known as the 'gap' methodology. The gap methodology means first developing a specific idea of what is required of the manufacturing function in order for it to compete effectively. Secondly, it means assessing the actual achieved performance of the manufacturing function. Thirdly, the gap between what is required and what is being achieved drives priorities for performance improvement. Fourthly, the performance priorities govern choice and implementation of long-term and short-term improvement plans [4]. The overall procedure is illustrated in figure 1.

### 2.1. Setting Manufacturing Objectives

The starting point for any functional strategy is to examine its role in improving overall competitiveness. The key question is "how do we want to compete and therefore what do we need from our manufacturing function to enable us to compete more effectively?" The answer depends on the view

of competitiveness taken by the other organizational functions, particularly Marketing and Product Development. Marketing should have a better idea than anyone else of what sells the company's products, how customers' needs are developing and what moves competitors are making. Likewise, Product Development should be able to chart how the features, attributes and technologies of the product are likely to develop over the planning period [7]. Overall these departments must come up with;

- A clear ranked set of competitive performance objectives for each product or product group.
- b) A view of the future which distinguishes between what capabilities the manufacturing function will definitely have to develop, what it definitely will not have to develop, and those which it might need to develop.

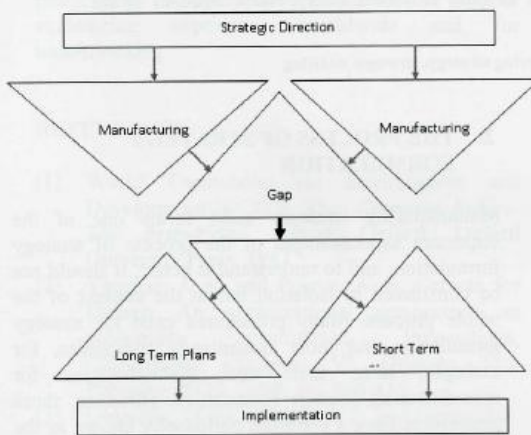


Fig 1: Strategy Formulation Process.

During this process of setting objectives by Marketing, Manufacturing and Product Development managers, the customer must be central. Customers define totally and absolutely what is important for manufacturing. Their needs must be translated, through the manufacturing strategy, directly to the shop floor. Customer's priorities should be manufacturing's priorities; their concerns, manufacturing's concerns. The success of this stage is determined largely by its success in establishing a firm image of the customers, their needs, and what is required from manufacturing to fulfill these needs [5].

## 2.2. Achieved Performance: The Manufacturing Audit

If the customer is the silent presence during the definition of manufacturing objectives, competitors play the same role when assessing manufacturing's achieved performance. Competitors provide a standard against which any manufacturing company should measure itself. All improvement in performance is, of course, worthwhile but it is that marginal step which takes a company beyond the performance level of its competitors which is the most valuable [3]. The purpose of the manufacturing audit is to answer three basic questions about the manufacturing function:

- What is our manufacturing performance for each major product group compared with our competitors?
- What are the trends in performance relative to our competitors? Are we getting better or worse compared to them?
- How does each part of the manufacturing function contribute to, or constrain, overall manufacturing performance?

A detailed audit that answers these questions is inevitably a time-consuming information-gathering task. Much of the information that is needed is scattered around different parts of the organization. Some is not in a particularly useful form; some is calculated in different ways in different parts of the organization and so needs to be made compatible. Worst of all, some may not exist and have to be estimated or physically measured. Certainly, conducting a manufacturing audit in an organization with a well developed and established manufacturing performance measurement system is a far more straightforward process than in one that does not.

## 2.3. Prioritizing: The Importance /Performance Gap

It is the gap between the "importance" rating of any particular competitive performance objective and its "performance" rating which gives the best guide to the priority it should be given. Putting each objective in an importance/performance matrix can aid this process. The "importance" scale indicates how customers see the relative importance of each competitive objective. The "performance" scale rates each competitive performance objective against the levels achieved by competitors. Any operation must therefore be improving its own performance in absolute terms at least as fast as its competitors just to maintain its position on the performance scale. Improvement therefore doesn't just mean doing better than before, it

means improving at a faster rate than competitors [2, 9]. Figure 2 below shows the importance performance matrix.

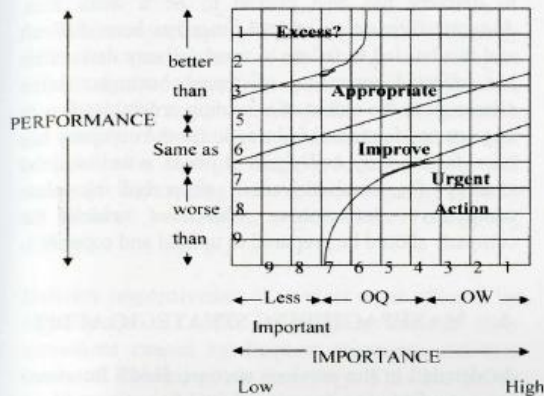


Fig 2: Importance-Performance Matrix

### 2.3.1 The “Appropriate” Zone

This zone is bounded on its lower edge by the ‘minimum performance boundary’, that is, the level of performance that the company would not wish the operation to fall below. Competitive performance objectives that fall in this area should be considered satisfactory, at least in the short to medium term.

### 2.3.2 The “Improve” Zone

Any competitive performance objective that lies below the lower bound of the ‘appropriate’ zone will be a candidate for improvement. Those lying either just below the bound or in the bottom left corner of the matrix (where performance is poor but it matters less) are likely to be viewed as non-urgent cases.

### 2.3.3 The “Urgent Action” Zone

More critical will be any competitive performance objective that lies in the ‘urgent action’ zone. These are aspects of performance which achievement is so far below importance to the customer that business is being lost directly as a result of operations performance. Urgent action must be taken to raise the performance of any competitive performance objective lying in this zone at least up to the ‘improve’ zone, while in the medium term, they need to be worked up beyond the lower bound of the ‘appropriate’ zone.

### 2.3.4 The “Excess” Zone

If any competitive performance objective lies in this area, its achieved performance is far better than would seem to be warranted. It is sensible to check to see if any resources used to achieve such a performance can be diverted into more needful areas, for example, anything which falls in the ‘urgent action’ area.

## 3. CASE STUDIES

JandS Botswana (Pty) Ltd (*JandS not the actual*) is a company whose core business is the manufacture of fencing materials in varieties of product groups. For many years until just recently, JandS has been the sole manufacturer of fencing material in Botswana, and being the only big player in the market, they have been operating virtually without any defined competitive strategy since they “owned the market”. With the rapid mushrooming of well-focused and serious competitors, issues have taken a tragic turn for the worse for JandS.

### 3.1. Manufacturing Processes

The company has three main production lines, which are Diamond Mesh production section, Gates department, and Posts and Stays department. The diamond mesh section consists of six automatic heavy-duty machines that process galvanized wire into mesh of different sizes according to customer specifications. The galvanized wire is made at the drawing plant at the company’s head office in South Africa. The wire normally comes in three standard thicknesses for the Botswana market, that is, 1.8mm, 2.0mm and 2.5mm. However the directors have deliberately instructed a reduction in the thickness of the wires to 1.6mm, 1.8mm and 2.3mm respectively so that more wire can be drawn from the same tonnage of raw material, but product specifications bear original thicknesses. Suspicious of the weight of the finished product, some customers went on to measure the wire thickness and discovered the deception. A big market share was lost through this deliberate neglect to use product characteristics as a competitive strategy for order qualifying. Also quality as a competitive performance objective is being compromised. Management is now trying to lower prices to cover up for low quality as a competitive strategy, but it is failing to have an impact because of lost good will and competition. Neglecting the quality of raw materials has also caused failure costs and the costs of producing defective products in terms of resources and time at

the processing machines. The machines are designed to easily pick up standard wire thickness, that is, 1.8mm, 2.0mm and 2.5mm and feed them onto the blades. Thinner wire causes a lot of jamming and difficulty in machine setup. A lot of production time is lost, which is costly, and a lot of scrap is produced. Machine down times are mostly due to process problems than breakdowns. This is a high cost area in terms of internal failure costs (down graded product costs and associated costs) and external failure costs (product rejection costs, replacement and compensation costs, and the cost of loss of business). There are also appraisal costs incurred by the supervisors as they take corrective actions resulting from monitoring and inspection activities. As a result of frequent machine downtimes due to jamming, it has proved difficult to have a quick response to orders and loyal customers just have to wait. Thus delivery responsiveness and dependability as competitive performance objectives are greatly compromised and competitors are taking advantage of that.

The gates section manufactures all types of gates, that is, homestead, pedestrian and security, and the production process has five stages, which are pipe cutting, pipe bending, gate welding, gate weaving and gate painting. The pipes (tubing), which form the main raw material, are made at the plant at the head office in South Africa. The composition of the metal for making the pipes and the wall thickness of the pipe are very important parameters that should not be compromised. Unfortunately, because of the need to cut down costs, these parameters are being compromised and the raw material supplied for the Botswana market is mostly of thinner wall thickness than market requirement, and too brittle that it can hardly be bent without cracking. Consequently, scrap levels are very high in this section due to cracking of pipes, and customers return some products quite often. Replacement costs are therefore incurred, and costs of scrapping. Quality costs are also incurred on welding as the thin pipe wall gets burnt through quite easily, and making welding difficult. So quality and costs of productivity are very much compromised as competitive performance objectives.

In the posts and stays section, like in the gates section discussed above, the main raw material is tubing (pipes) and the problem of off cuts due to pipe lengths that do not match standard product sizes and compromised wall thickness has led to high production costs. This has a negative bearing on the product price as an order-winning objective. Product quality is also low due to reduced pipe wall thickness. So the business is actually operating haphazardly with no strategy for competitiveness.

### 3.2. Quality of Service

The processing and execution of orders from receipt to delivery has also proved to be a weak area. Accurate forecasting of lead times has been difficult and this has led to failure to meet delivery dates. This has affected prospects of repeat business. Some clients go to the extent of canceling orders, leading to huge costs of external failure. So far the company has been fairing very badly and it needs a well-defined strategy for competitiveness supported by clear competitive performance objectives which the company should be prepared to uphold and support.

## 4. MANUFACTURING STRATEGIC AUDIT

As detailed in the previous section, JandS Botswana is a manufacturing company that is operating with no clearly defined competitive strategy. As a result of increasing competition in the market, the company is failing to have a cutting edge due to the absence of a strategy. They have a reactive rather than a proactive approach to situations as they arise, that is, one time they seem to compete in terms of product characteristics, at another time in terms of price, and yet at another in terms of customer service, depending on which direction complaints come from. Competitive performance objectives are not upheld, but rather deliberately compromised as long as the product can be pushed to the customer and revenue is collected. This approach has been very costly both directly and indirectly. Company policy is that strategy formulation is done by the directors who, unfortunately have not looked at contribution of manufacturing, product development and marketing to the overall business success from the strategic point of view.

As discussed in section 3, the manufacturing's main product groups are diamond mesh, gates, posts and stays. The raw materials for all these products are made within the organization and this is where the quality of the raw material is deliberately tempered with. Strategically, the company loses it from the source because product quality and characteristics are compromised. Competitors purchase their raw materials from suppliers like Isco that are accredited to international quality standards, and they make quality products that lead the market on product characteristics. These also do compete well on price because customers are willing to pay more for quality products than less for non-durable products. JandS's customer service is poor because for irregular buyers, the policy is not to accept any returns (since they

would have taken chances in the first place with compromised products). However competitors do well in this aspect because they have confidence in their products and returns are very rare.

Since the company loses its competitive strategy from the source, there is no way it can compete effectively on competitive performance objectives, because of the compromised quality of raw material, the quality of the products made is low and the cost of production is high. High production costs will demand a high selling price for a low quality product to at least break-even, which makes competing difficult.

Delivery responsiveness is in most cases affected by high levels of work in progress due to slow movement caused by frequent stoppages and low levels of finished goods inventory. This has led to false promises of delivery dates that could not be met. Thus the customers could not view the company as dependable.

The company is doing fairly well on product flexibility since product varieties in the same product group are closely related and hence easy to make changes if need arises. After failing to get certain products from better suppliers, customers would be assured of getting them at JandS.

Generally, JandS is fairing badly in all aspects of strategic competitiveness when compared to competitors and to how the organization would ideally wish to perform. Any organization would wish to be the best in all aspects of competitiveness, that is, order-winning and order-qualifying objectives, with a clearly defined competitive strategy. The gap that exists between the desired ideal and the current position is so wide that urgent action needs to be taken to improve the competitive performance objectives which are mostly in the Improve and Urgent Action zones of the Performance/Importance matrix, as shown in Figure 3 below.

**5. BRIDGING THE GAP**

The gap that exists between what is required and the audited state of affairs at JandS (Pty) Ltd is the one that drives priorities for performance improvement in both the short-term and long-term horizons. Suggested below are some of the improvement plans that the organization may need to adopt in order to bridge the gap. These are of course suggested in the context of the nature of the business, the size of the

company, level of mechanization, and resource constraints.

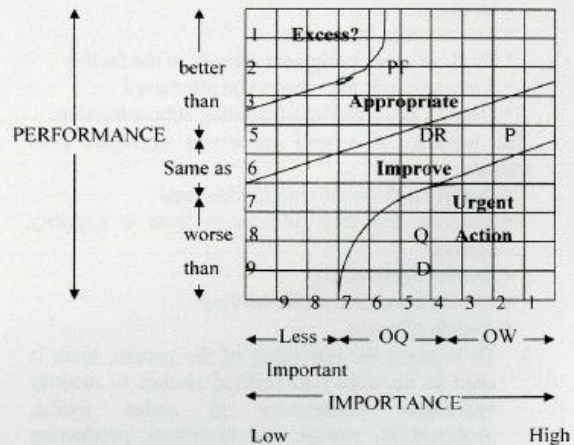


Fig 3: Importance-Performance Matrix (JandS versus Competitors). Legend: PF–Product Flexibility; DR–Delivery Responsiveness; P – Productivity; Q–Quality; D–Dependability

**5.1. Short -Term Plans**

1. The organization needs to address the issue of quality very seriously and urgently.
  - The practice of deliberately compromising quality at the tubing and wire drawing plant in the guise of serving costs will not take the business anywhere and needs to stop if ever the company is to survive competition in its chosen market.
  - The organization needs to arrange training and regular quality awareness programmes for factory workers especially those on critical process stages.
  - There is also need to adopt a strict inspection policy that ensures minimal product non-conformance, and that such products are not dispatched to customers.

Once the quality problem is solved, other issues will, to a great extent, fall into place. For example, dependability level will be high because scrap levels will be low, so productivity will be predictable.

2. There is need to draw an aggregate production plan or any other such tool to guide the activities of the production department. An aggregate production plan will rely heavily on annual month by month forecast of demand and existing

productive resources. It involves deciding on how resources will be used to meet the forecast or actual demand cost effectively within the constraints of the facility. Thus it helps to decide on the use of:

- The existing labor force
- Machines and equipment already in the facility
- Raw materials that need to be purchased
- Outside labor services including subcontracting.

The benefits of a well conceived aggregate plan include:

- Orderly and smooth production runs
  - Machine and labor utilization close to capacity always
  - Avoids overloading
  - Avoids excessive under-loading
  - Avoids idleness.
3. To increase the efficiency of the system, there is need to do work and method studies to identify operations bottlenecks in order intake, procurement, storage and inventory, production and distribution. Operations bottlenecks are elements inside the organization that are part of operations procedures (normal daily work) but that do not help to achieve the desired strategic goals. Although they may seem to be at a micro level, they are able to severely impede or sometimes stop the growth of the company.
  4. The company needs to train machine operators to be able to attend to minor machine problems to increase machine availability.
  5. Workers need to be motivated through good working conditions, competitive wages and fringe benefits.

### 5.2. Long – Term Plans

1. Since the company has no quality department and it is so critical, the author strongly advises that such a department be established to ensure the building of quality into the system and products, and the inspection of the same. In the long term, implementing a quality management system should be critical. This will benefit the company in gaining customer confidence in their products and also getting access to other markets that may need accreditation as a requirement.
2. With an aggregate production plan working in the short term, the company will also need to have a long term production plan coupled with a strategic Capacity plan. This is planning of the capacity of the production system in the long term (3-5 years) as a result of the envisioned demand. A strategic capacity plan can help the company to:
  - Map the demand for their products
  - Identify weak partners in the network

- Choose the best layout for the production system
  - Check whether the system is able to keep up with the demand for the next 3-5 years.
3. The company is currently using a breakdown maintenance style which has affected its delivery responsiveness and dependability with customers. A systematic preventive maintenance programme is recommended to support the current system. Machines need to be fully serviced periodically especially as they wear out.
  4. The company may also consider creating an operations department or appoint an operations person to do work studies and optimization projects to optimize the productivity of the system.
  5. There is need to define and adopt a strategy for competitiveness which should be communicated throughout the company. It is vital for the manufacturing personnel to know whether it is the price, product or customer service that gives them the competitive advantage.

### 6. CONCLUSION

The strategic auditing performed on JandS Botswana (Pty) Ltd revealed that the organisation is currently operating without a defined strategy for competitiveness, and is performing badly with respect to the desired levels of competitive performance objectives. The gap that exists within the company is very wide and urgent action needs to be taken to close it if the organization is to survive the competition in its chosen market. The suggested methodology can help a great deal in implementing a performance improvement programme within the context of their constraints. Thus the generic methodology for strategic auditing of a manufacturing system described in this paper can be applied to any business for purposes of system maintenance and focus.

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