BENCHMARKING
COMPETITIVE STRATEGIES
AND
BEST MANUFACTURING PRACTICES:
A STUDY INTO FOUR SECTORS OF THE TURKISH INDUSTY

by

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ABSTRACT

This thesis is a benchmarking study into domestic manufacturing industry, attempting to quantify how well companies operating in Turkish electronics, cement, automotive, and white goods suppliers industries match up to best practice, both in the practices they adopt and in the operational outcomes that result, and to quantify the impact of this match up on the overall business performance. In this respect, it is a study on competitiveness using the engineering approach. The data used in the study are gathered by conducting a benchmarking survey to a sample of 82 companies, in 1997 and 1998.

The sample companies are investigated by means of a Best Manufacturing Practice Model, similar to a business excellence model. Depending on how close they are to best practice, both in practices they implemented and the outcomes they achieved, two small groups are isolated from the sample and are classified as "leaders" and "laggers". These companies are later analyzed to identify their competitive priorities, manufacturing objectives, and action plans envisaged for the next two years.

By creating a comprehensive benchmark of the practices and performances of these companies, it provides a tool for other companies for assessing themselves to discover their relative strengths and weaknesses.

ÖZET

Bu tez, yerli imalat sektörü için yapılan bir kıyaslama çalışması olup, Türk elektronik, çimento, otomotiv ve beyaz eşya yan sanayi sektörlerinde faaliyet gösteren firmaların uygulamaları ve elde ettikleri operasyonel sonuçlar bakımından En İyi Uygulamalar'ı ne ölçüde yakaladıklarını belirlemeyi ve bunun toplam iş performansına etkisini ölçmeyi amaçlamaktadır. Bu bakımdan, tez, rekabetin ölçülmesinde mühendislik yaklaşımını kullanan bir çalışmadır. Kullanılan veriler, 1997 ve 1998 yıllarında 82 firmayı kapsayan bir kıyaslama çalışması sonucunda elde edilmiştir.

Çalışma kapsamına alınan firmalar, iş mükemmelliği modellerini andıran bir En İyi Uygulamalar Modeli temel alınarak incelenmiş, ve bu firmalardan iki küçük grup, hem uygulamaları hem de operasyonel sonuçları gözönüne alınarak diğer firmalardan ayrıştırılıp öncüller ve ardıllar olarak nitelendirilmişlerdir. Daha sonra, bu firmaların önümüzdeki iki yıl için öngördükleri rekabetçi öncelikleri, imalatta performans hedefleri, ve aksiyon planları belirlenmiştir.

İncelenen firmaların uygulamaları ve performansları üzerine kapsamlı bir kıyaslama tabanı oluşturmak suretiyle tez, diğer firmalara kendilerini değerlendirerek görece güçlü ve zayıf yönlerini bulmalarına yardımcı olacak bir araç sağlamaktadır.

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1. INTRODUCTION

Competitiveness, a widely-used term, has been attached various meanings in different contexts. One of the main difficulties in describing and measuring competitiveness is that, it has differing objectives depending on whether it is used with reference to firms, industrial sectors, regions, or nations. While for a nation the aim is to maintain and improve its citizens' living standards, for an enterprise the objective is to deal successfully with competition by making profits and increasing market share (Hatzichronoglou, 1996). Therefore, for a nation, competitiveness is defined as the capacity of a nation's goods and services to meet the test of international markets while maintaining or boosting the real incomes of its citizens. For an enterprise competitiveness is shaped around the customer and is defined as the ability of a firm to ensure customers prefer its products and services against alternatives on a sustainable basis. Even though competitiveness is discussed in various levels, it is a concept that applies primarily to enterprises (European Commission for Industry, 1996). Competitiveness has been usually measured in financial and economical terms. However, economic and financial data have a number of limitations in that they are at a high level of aggregation and often use proxies for managerial inputs and outputs. An alternative means of examining competitiveness is to study the drivers of competitiveness, the operational practices and outcomes of individual enterprises (Voss et al., 1995). Over the last years, many researchers attempted to measure competitiveness of enterprises, and nations by means of studying their operational practices and outcomes.

Among the various approaches used in the studies on competitiveness, the engineering approach (Hatzichronoglou, 1996) expresses the companies' capacity to compete as their ability to search for, identify, and assimilate best practices. In this approach, best practices are defined as the industry, country, or worldwide practices related to customer focus, quality, flexibility, cost, innovation, and responsiveness that yield superior performance. Best practices should be introduced to the company and set as targets by senior management. The objective is first to make these practices permanent in the company and then to surpass them. In essence, the engineering approach assumes that the competitive

ability of a country or region is the combination of competitive abilities of individual companies in that country or region. It is argued that, proliferation of best practices within the sector will improve the performance, and consequently the competitiveness of the sector as a whole. This approach suggests a best practice paradigm in competitiveness which has recently gained great attention in business community and supported by a number of researches that show strong linkages between adoption of best practice and business performance.

The thesis "Benchmarking Competitive Strategies and Best Manufacturing Practices: A Study into Four Sectors of the Turkish Industry" is a benchmarking study on competitiveness that uses the engineering approach as defined above. It is a comprehensive study into Turkish manufacturing industry, and is an attempt to quantify how well companies operating in the electronics, cement, automotive, and white goods suppliers sectors of the Turkish industry match up to best practice, both in the practices they implemented and in the operational outcomes that result, and to quantify the impact of this match up on overall business performance. It uses the "Best Manufacturing Practice Model" (BMP Model) designed to serve this objective. Moreover, it aims to identify the manufacturing's competitive strategies of these companies in terms of their competitive priorities, manufacturing objectives, and action plans envisaged for the next two years. In this respect, it is a study along the lines of studies performed earlier in various countries and different sectors of industry (eg., De Meyer, et al., 1992; Kim et al., 1996; Voss et al., 1993, 1994, 1995, 1996; Australian Manufacturing Council, 1994).

The thesis is based on the data collected by the "Competitive Strategies and Best Practices Benchmarking Questionnaire". In 1997, the questionnaire is applied to the 27 member companies of the Association of Turkish Electronics Industrialist (TESID), 25 member companies of the Association of Turkish Cement Producers (TCMB), and 10 member companies of the Association of Automotive Industrialists (OSD). The results of these surveys are displayed in the "Competitive Strategies and Best Practices" serial reports by Ulusoy et al. (1997a, 1997b, 1997c). In mid-1998, the questionnaire is applied to the 20

member companies of the Association of White Goods Suppliers (BEYSAD). These surveys are realized with the cooperation of the Association of Turkish Businessmen and Industrialists (TUSIAD) and Boğaziçi University (BU).

Benchmarking is a systematic process of searching for best practices, innovative ideas and highly effective operating procedures that lead to superior performance (Bogan et al., 1994). Learning from the best and adapting their approaches to fit one's own needs is the essence of benchmarking. It has become increasingly popular as a key means of improving organizational performance and has seen as a quality improvement concept. It helps a company to identify its strengths and weaknesses, and to implement programmes to close the identified gaps. A company can benchmark itself against a competitor, against a non-competitor, or against a model of business excellence such as European Foundation for Quality Management (EFQM) Model, the Malcolm-Baldridge Quality Award Model, or the Association of Turkish Businessmen and Industrialists - Quality Association (TUSIAD-KalDer) Quality Award Business Excellence Model. The BMP Model used in the thesis to measure the implementation of best manufacturing practices and the achievement of high operational outcomes, in part, resembles to a business excellence model. Therefore, by creating a comprehensive benchmark of the practices and outcomes of the surveyed companies, it provides a tool for others for assessing themselves to arrive at their strengths and weaknesses and to highlight what needs improvement. This type of benchmarking is called diagnostic benchmarking.

In Chapter 2, a literature survey about the key aspects of the thesis is presented. This chapter has three main sections. In the first section, the concepts of competition, competitiveness, competitive advantage, and competitive strategy are covered. In the second subsection, the practice of benchmarking and the importance of best practice adoption are presented from the viewpoint of competitiveness. In the third section, the role of manufacturing function in the company's pursuit of competitiveness is mentioned. This section is the most important part of the chapter, for it provides the baseline for the thesis study. It focuses on the manufacturing strategy formulation process and best practice

paradigm in competitiveness. The chapter is streamlined in a fashion to give the readers a holistic view on competition and ways to achieve competitiveness. It is a comprehensive literature survey enriched by definitions of and studies on the key aspects of the thesis.

Chapter 3 is about the methodology used in the study. It presents the purpose of the thesis, the studies used as frames of references for the work done, the development and the structure of the questionnaire by which the data are gathered, the questions selected for the purpose of the thesis and their data characteristics, the methodology used to measure the surveyed companies against best practice, and the methodology used to assess these companies' competitive strategies for manufacturing envisaged for the next two years.

In Chapter 4, general information about the sample of the study is presented. The information presented includes the industrial sectors, nature of business, and foreign capital contribution in the sample companies together with their employment levels, sales, exports, and most important markets.

Chapter 5 serves as a background for the succeeding chapters. It has seven sections. In the first section, the proximity of the surveyed companies to best practice is mapped on a best practice scorecard. In the second section, companies are categorized into five groups according to their relative positions on the scorecard. They are identified as "leader", "lagger", "medium-performer", "promising", or "won't go the distance" companies. In the third section, a series of statistical analysis is carried out to demonstrate that the categories are in fact different than each other both in implementing best manufacturing practices and in achieving high operational outcomes. The business profile of the five categories in terms of industrial sector, company size, nature of business, and foreign contribution are analyzed in the fifth section. Since the sample is composed of companies from four different industrial sectors and of varying sizes, two analyses are conducted to see whether the industrial sector and company size affect the adoption of best practice, and if they do, how. These analyses are covered in the sixth and seventh sections.

Chapter 6 is the most comprehensive part of the thesis that covers three main sections. The first section examines the business performance of the "leaders" and the "laggers" to quantify the impact of best practice adoption on business performance. The importance of practices and outcomes in relation to company success is also reported. The second section reports on the extent to which best manufacturing practices in the areas of manufacturing strategy (including planning, focused strategies, and factory operations), leadership, people management, customer focus, quality, technology, and benchmarking are adopted by the "leaders" and by the "laggers". In the third section, the operational outcomes of these companies are reported in terms of self-comparison of companies with the best results achieved by the domestic and foreign competitors, perceived level of operational performance in terms of customer satisfaction, employee morale, process changeover time, technological competitiveness, and productivity; and evaluation of operational performance in terms of performance indicators including delivery full on time, ratio of production operators involved in quality-related mechanisms, and ratio of quality control inspectors to direct operators.

Chapter 7 examines the competitive strategies of the surveyed companies from the viewpoint of the "process model of manufacturing strategy" to highlight the strategic aspects of manufacturing management in the surveyed companies. It has three sections reporting on the most important competitive priorities, manufacturing objectives and action plans envisaged for the next two years by the "leader" and by the "lagger" companies, and the companies in the overall sample. By studying the competitive strategies of these companies, it is aimed to provide valuable information for companies that will help them to formulate their future strategies.

Chapter 8 is the conclusion part of the study. It presents a brief summary of the work done and the key findings of the thesis.

2. LITERATURE SURVEY

2.1. Competitiveness

Competitiveness, a widely-used term, has been attached various meanings in different situations, but has no agreed definition. Hatzichronoglou (1996) argued that one of the main difficulties in describing and measuring competitiveness is that, it has differing objectives depending on whether it is used with reference to firms, industrial sectors, target regions, or nations. As the author stated, while for a nation the aim is to maintain and improve its citizens' living standards, for an enterprise the objective is to deal successfully with competition by making profits and increasing market shares.

Even though competitiveness is discussed in various levels, it is a concept that applies primarily to enterprises (European Commission for Industry, 1996). A competitive enterprise is defined as the one that develops and achieves high profitability in the market as a result of the greater efficiency of its production system and its capacity for innovation.

From the viewpoint of enterprises, competitiveness is generally shaped around the customer, leading to the operational definition of competitiveness as the ability to ensure customers preferring company's products and services against alternatives on a sustainable basis. As stated in the study of Australian Manufacturing Council (1994), successful enterprises of today are those that are flexible, adaptive, innovative, and responsive, with a committed, highly skilled and involved workforce. They are focused on customer needs and have productive links with other organizations that provide competition, information and other essential services.

Hatzichronoglou (1996) argued that globalization has imparted competition a new perspective and altered its content. The author stated that in response to the changing nature of competition, most firms have adopted strategies that are increasingly global, with two main objectives in mind: to improve profitability by reducing costs, and to strengthen their technological capability. These objectives have directed companies to new organizational structures and new ways of doing business, such as focusing on core competencies, developing new organizational structures and content which will enable the company to react to changing conditions swiftly, perceiving and targeting markets as global markets, and forming networks with other companies.

Oral (1985) argued that the degree of success of an enterprise is equivalent to its competitiveness level and those, which cannot raise or maintain their level of competitiveness cannot fulfil their expectations and might even be eliminated from the market. So, the main objective of an enterprise is to maintain, or ideally to raise, its level of competitiveness in the face of ever increasing competition.

2.1.1. Competitive Potential of an Enterprise

Developing competitive strategies to attain competitiveness were being widely discussed in the literature for decades. Ohmae (1982) defined the competitive potential of a company in terms of its "strategic capacity" which determines the fundamental framework for developing corporate strategy. The strategic capacity of any company is a product of its business portfolio that has two main components:

(i) market attractiveness; and

(ii) company strength.

"Market attractiveness" refers to how much or how little growth there is within given markets, while "company strength" refers to how a particular business is operated.

Belohlav (1993) stated that in response to the changing nature of competition, the corporate strategy is being revised. The author identified the strategies pursued in the pre-1970s, 1970s, 1980s, and 1990s. In pre-1970s market attractiveness and company strength were perceived as being of relatively equal important components of corporate strategy. However, in the 1970s, corporate strategies tended to shift away from developing company strength and began to emphasize market attractiveness as the major component of corporate strategy. In those years, many corporations became groups of businesses or products that had little in common other than providing a means for financial growth. Company strength was defined as the market share relative to dominant companies within the market. The measurement of success came merely from financial data. In the 1980s, the perspective shifted away from market attractiveness towards company strength. Companies observed that profit is not enough, and profit as a goal, is insufficient even to sustain profit. As a result of his books Competitive Strategy (1980) and Competitive Advantage (1985), Porter's ideas became the standard for a different style of thinking competitive strategy. Although Porter (1980, 1985) also expressed competitive capacity of a firm as a function of its market attractiveness and its company strength, his basic views are quite different.

2.1.2. Competitive Advantage and Competitive Strategy

Porter (1980) defined "market attractiveness" as a function of five fundamental forces which can vary from industry to industry: bargaining power of buyers, bargaining power of suppliers, rivalry among existing firms, threat of new entrants, and threat of substitute products or services. Even though the relative importance of these forces is stable, it can change over time as an industry evolves either improving or eroding the attractiveness of the industry. "Company strength" is defined as a function of firm's competitive strategy. Porter (1980) argued that, although market attractiveness plays an important role in determining the firm's profitability, it is the firm's relative position within its industry that determines its level of competitiveness. Hence, a company aiming to raise its level of competitiveness must first choose the type of competitive advantage it seeks to attain and the scope within which it will attain it, and then develop its competitive strategy.

Porter (1985) identified two basic competitive advantage a firm can possess: cost advantage and differentiation; and three generic competitive strategies to be pursued: cost leadership, differentiation, and focus with two variants cost focus and differentiation focus (Figure 2.1.). To be successful, according to the author, companies need to select and focus on one of the three generic strategies and then rigorously pursue its application. Simply put, it was argued that anyone can prosper in a growing market, but only well-defined, clearly focused companies can do well in mature, more competitive markets.

		Competitive Advantage	
		Lower Cost	Differentiation
Competitive Scope	Broad Target	1. Cost Leadership	2. Differentiation
	Narrow Target	3a. Cost Focus	3b. Differentiation Focus

FIGURE 2.1. Generic competitive strategies and advantages (Porter, 1985)

In the "cost leadership" strategy, a company sets out to become a low cost producer in the industry by means of economies of scale, proprietary technology, preferential access to raw materials, etc. In the "differentiation" strategy, a company seeks to be unique in its industry along some dimensions that are widely valued by buyers. Differentiation can be based on the product itself, the delivery system by which it is sold, the marketing approach, etc. In the "focus" strategies, a company seeks either of the two types of competitive advantage in its target segments, but does not possess an overall competitive strategy. Having a "broad scope" means the company serves many industry segments, and may even operate in related industries as well. Having a "narrow scope" means the company selects and targets a segment or group of segments in the industry and fits its strategy to serving them to the exclusion of others.

2.1.3. Competitive Strategy Formulation

The selection and implementation of a competitive strategy requires an effective strategic management. Byars (1992) argued that the ultimate objective of strategic management is to take necessary actions timely and effectively, so as to maintain competitiveness in the long run. The author divided strategic management process into two main phases:

(i) strategy formulation; and

(ii) strategy implementation.

"Strategy formulation" is concerned with making decisions regarding to defining the organization's philosophy and mission; establishing long and short term objectives to achieve the mission; and, selecting the strategy to accomplish the objectives. Mission statement reflects what the organization stands for. Establishing long and short-term objectives requires a well understanding of the organization's external and internal environment; in other words, its threats and opportunities, and strengths and weaknesses. To achieve competitiveness as an objective, the organization should select one of the three generic competitive strategies (cost leadership, differentiation, and focus) that best fits its philosophy, mission, and objectives; and then should rigorously pursue its application. This is called "strategy implementation".

As in the article of Hörte et al. (1987) reported, the choice of competitive strategy should be a result of careful analysis of the competitive environment (customers, suppliers, competitors, etc.) and the strengths and weaknesses of the company itself. The frameworks provided by Day et al. (1988) and Oral (1986, 1987, and 1993) serve good examples in that sense.

The framework of Day et al. (1988) for assessing competitive advantage relative to competitors is driven by two different but interrelated perspective: the competitor, and the customer. In the "competitor-centered methods", competitive advantage is driven by the company's ability to minimize the steps throughout the value-chain in the shortest time, at the least cost. "Customer-centered methods" address the company's ability to achieve a superior position among the choice alternatives of potential customers, generally involve product differentiation on critical product features. By using the framework, a company can assess its points of superiority from both the customer and the competitor points of view.

In the industrial competitiveness model of Oral (1986, 1987, and 1993), the level of competitiveness of a firm is expressed as a function of two major factors: industrial mastery, and cost superiority. The model suggests that, a high "industry mastery" score relative to competitor implies that a firm performs better in selecting and utilizing its product-mix, capacity, technology, machinery and equipment, plant location, personnel, etc. It is a measure of combined performance of the top-level management and line management in all functional areas. A high "cost superiority" score relative to competitor implies that a firm is in a better position with respect to actual unit purchasing costs and input usage rates when all inputs are considered. By using the industrial competitiveness model, a firm can determine its relative competitive position either in a given market of interest against all competitors (market-oriented analysis), or against a particular competitor in all markets of interest (competitor-oriented analysis), or against all competitors in all markets of interest (global analysis). The model can be used in a wide variety of areas, such as marketing and competitive strategy formulation.

2.1.4. Evolving New Paradigms for Competitiveness

It is widely accepted that the business environment has experienced an accelerated rate of change during the last decades. Noori et al. (1995) argued that some of the underlying features creating the change in the marketplace are identified as rapid advances in

technology and science, escalation of new product introductions, market fragmentation and intense global competition. Customers are more discriminating and competition is much more sophisticated. Adoption of new strategies becomes a necessity to meet the challenges of the change, for the change has called into question the sustainability of competitive advantage.

Kavrakoğlu (1998) gave a good summary on the evolutionary nature of the sources of competitive success (Figure 2.2.). The author stated that, at the times where technological advancements were not widespread, the basic competitive advantage has been production superiority (in terms of volume of production). After the proliferation of technological advancements, cost superiority became the new source of competitive advantage in the 1970s. In the beginning of the 1980s, demand for quality products was increased resulting in a new source of competitive success: quality superiority. In the 1990s, following the quality revolution, companies seek competitiveness on the basis of speed superiority (in terms of speed of design and new product launches). And in the 2000s, service superiority is identified as a candidate source of competitive advantage. However, the emerging new sources of competitive success do not replace the old ones, but are added to the list.

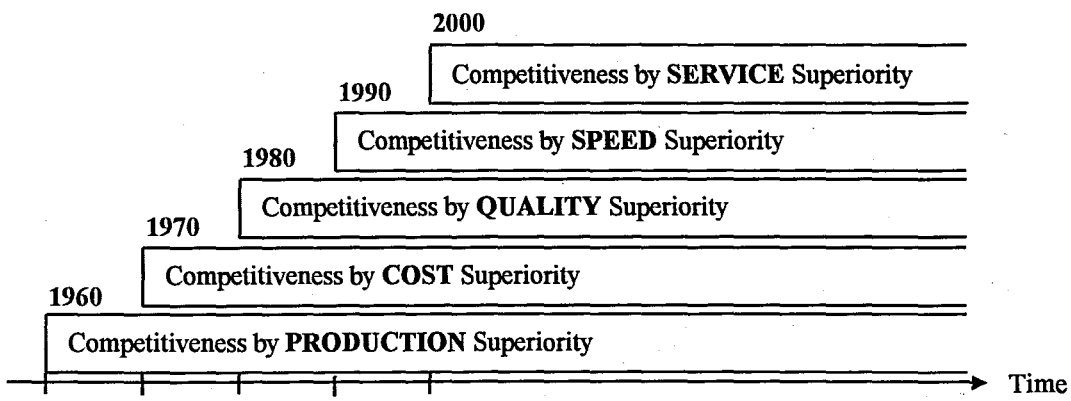

FIGURE 2.2. The evolving sources of competitive success (Kavrakoğlu, 1998)

Peeffer (1995) argued that, today, the traditional sources of competitive success such as product and process technologies protected by patents or other proprietary knowledge, protected or regulated markets, access to financial resources, and economies of scale can still provide competitive leverage, but to a lesser degree now than in the past, leaving organizational culture and capabilities derived from how people are managed, as comparatively more vital. The author added that the need for continuous innovation and rapid response to market and technological changes requires a workforce that delivers superior performance.

Belohlav (1993) observed that, in the 1990s, many companies have begun to emphasize quality as their source of competitive advantage. The author argued that much of the interest on quality has been attributed to the pioneering efforts of individuals such as W. Edwards Deming and Joseph Juran. Quality has come to mean much more than product, service or process quality, but a philosophy underlying the decisions and actions that composes a company's competitive strategy. Quality is linked to competitive strategy in several of ways. The link between quality and strategy can be seen easily in the differentiation strategy defined by Porter (1985). Differentiation is concerned with providing those factors that buyers consider to be important, and quality is, after all, related to producing a better product or service for the customer.

Hum and Sim (1996) suggested that in the constant evolution of competitive paradigms, "time-based competition" has emerged as the competitive paradigm of 1990s. Stalk (1988) argued that a company that builds a time-based strategy is a more powerful competitor than one with a cost-based strategy. "Cost-based strategies" require managers to do whatever is necessary to drive costs down, such as moving production to or sourcing from a low-wage country, building new facilities or consolidating old plants to gain economies of scale. These tactics reduce costs but at the expense of responsiveness. In contrast, "time-based strategies" are based on flexible manufacturing, rapid response systems, expanding variety and increasing innovation. Companies with time-based strategies build their factories close to the customers they serve, and have organizational structures

enabling fast responses rather than low cost and control. As Tersine et al. (1995) stated measures for reduction in design times, cycle times, setup times, throughput times, and delivery times are appearing with great regularity in performance reports.

Stalk et al. (1992) argued that companies that compete effectively on time by speeding new products to market, manufacturing just in time, or responding promptly to customer complaints, tend to outperform the competition along five dimensions: *speed* (ability to respond quickly to customer or market demands and to incorporate new ideas and technologies quickly into products), *consistency* (ability to produce a product that unfailingly satisfies customers' expectations), *acuity* (ability to see the competitive environment clearly and to anticipate and respond to customers' evolving needs and wants), *agility* (ability to adapt simultaneously to many different business environments), *innovatiness* (ability to generate new ideas and to combine existing element to create new sources of value).

However, Stalk et al. (1992) suggested that all these qualities are mere reflections of a more fundamental characteristic, which is a new conception of corporate strategy called "capabilities-based competition". To become a capabilities-based competitor, a company should understand that the building blocks of corporate strategy are not products and markets but business processes, and that competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to the customer.

Sheu et al. (1997) stated that international competition is forcing companies to achieve "world-class manufacturing" in order to compete in global markets. Short manufacturing lead-time is recognized as the central underlying factor for successfully accomplishing world-class manufacturing goals of on-time delivery, quality, flexibility and productivity. The length of manufacturing lead-time is frequently used as a measure of a firm's competitiveness. Therefore, in their efforts to gain competitive advantage, it is extremely

important for companies to reduce their manufacturing lead-time. One of the many programmes that effectively reduce manufacturing lead-time is "component standardization" which improves material availability and reduces system complexity. Companies have discovered that the use of common parts could greatly facilitate the new product design and production process in a fashion that provides a competitive advantage.

Feather (1998) argued that with a major shift toward a service-oriented economy, many companies today, both in service and manufacturing, are competing to provide the best customer service. Service is fast becoming a major point of differentiation. Veitch (1998), by means of an extensive literature survey, proved that the 1990s have seen the development of customer service as a strategy for competitive advantage in industrial organizations. Many researches, today, correlates customer satisfaction with improved performance. Customer relationships are recognized to be the key to long term profitability. Leveraging customer service is paramount to superior performance, for customers now tell suppliers what they want, when they want it, and what they will pay for it. Gunn (1992) stated that global competitive pressures are forcing today's manufacturing companies to become more customer focused in terms of offering quality products and services, and faster order to delivery.

According to Jeffrey et al. (1996), productivity attained by economies of scale served as the dominant competitive paradigm of 1970s. However, today, it became vital for firms to find ways of reducing product development lead-time in order to win new customers and keep old ones. In today's market, the ability to introduce new products faster, more frequently, and of higher quality is a distinct competitive advantage.

2.2. Benchmarking and Best Practices for Competitiveness

Competitive advantage is a constantly moving target. As Slatter (1996) suggested, developing a competitive advantage is necessary for achieving superior performance, but as market and technology change, the need to develop new competitive strategies continues. A capability that was a source of competitive advantage five years ago may only be sufficient for competitive parity today. Likewise, as Hum and Sim (1996) argued, for any company in any industry, the key to success is avoiding getting stuck with a single simple notion of its source of advantage. The most successful companies are those who know how to keep moving and always stay on the cutting edge. These companies are learning organizations. Today, learning is essential to stay competitive.

"Benchmarking" is simply learning from others' experiences. As Bogan et al. (1994) suggested no individual, team or operating unit, no matter how creative, can parent all innovations and good ideas. By systematically studying the best business practices, operating tactics and winning strategies of others, an individual, team or organization can accelerate its own progress and improvement. The authors gave a formal definition of benchmarking as "the systematic process of searching for best practices, innovative ideas and highly effective operating procedures that lead to superior performance". The authors argued that learning from the best and adapting their approaches to fit one's own needs is the essence of benchmarking.

Benchmarking has become increasingly popular as a key means of improving organizational performance and has seen as a quality improvement concept. As reported by Bradley et al. (1998), by the year 1992, 65 per cent of the Fortune 1000 in the USA and 67 per cent of the Times 1000 in the UK claimed to be applying benchmarking.

Bogan et al. (1994) stated that the rise of benchmarking as a quality improvement concept is reinforced with its inclusion in Malcolm Baldridge National Quality Award established in 1987. In 1988, the award included no direct references to benchmarking. In total, 17.5 per cent of the points were influenced by inquiries about a company's use of competitive comparisons to drive performance improvement. In 1993, the total influence of direct and indirect benchmarking references had grown to 55 per cent of total eligible points. In 1994, it grew into an open-ended requirement to engage benchmarking in the course of developing and maintaining an environment for quality excellence. From the Baldridge viewpoint, a company cannot achieve world-class stature and quality excellence without fully embracing benchmarking as a fundamental management discipline.

In the report "Competitiveness of European Industry" released by the European Commission for Industry (1996), it is claimed that Europe has to monitor its performance against the world's best in a continuous fashion, and identify the reasons why industries and economies elsewhere in the world perform better. This claim implies the need to adopt a new strategy, "benchmarking", in the way to achieve competitiveness by means of searching for and adapting best practices.

According to a report issued by the Supply Chain Council (1997), effective companies are those which deliver customers' service expectations to a level of satisfaction that will ensure them a position of "first choice" supplier of its customers, and at the same time, maintain high levels of production and profitability, thereby maintaining satisfactory returns to the shareholders. Two concepts are noticeable in these companies: "best practices" and "benchmarking". Best practice is considered to be about doing things in the most effective manner, usually focusing on a specific activity or operation such as inventory management, customer service, etc. Best practice is identified by searching for companies, which excel in similar product-market situations, and then analysing the reasons for that success in terms of processes and functions conducted within the business. Benchmarking is a method of continuous improvement involving an ongoing and systematic evaluation and incorporation of external products, services and processes recognized as representing best practice.

Among the various approaches used in the studies of competitiveness, the "engineering approach" (Hatzichronoglou, 1996) expresses the companies' capacity to compete as their ability to search for, identify and assimilate best practices. In this approach, best practices are defined as the industry, country or worldwide practices related to customer focus, quality, flexibility, cost, innovation and responsiveness that yield superior performance. Best practices should be introduced to the company and set as targets by senior management. The objective is first to make these practices permanent in the company and then to surpass them. In essence, the engineering approach assumes that the competitive ability of a country or region is the combination of competitive abilities of individual companies in that country or region. It is argued that, proliferation of best practices within the sector will improve the performance and consequently the competitiveness of the sector as a whole.

2.2.1. Types of Benchmarking

In the literature there are various classification of benchmarking practices. Bogan et al. (1994) identified three types of benchmarking: process benchmarking, performance benchmarking, and strategic benchmarking. "Process benchmarking" focuses on discrete work processes of many companies that perform similar work functions in order to identify the most effective operating practices. "Performance benchmarking" enables a firm to assess its competitive position through direct product and service comparisons such as unit costs, quality, speed, and reliability. "Strategic benchmarking" examines how companies compete, and is seldomly industry-focused. The objective is to identify the winning strategies that have enabled high-performing companies to be successful in their marketplace. The authors favour "benchmarking for best practices", an on-going and systematic search for best practices that produce superior performance when adapted and implemented, against others.

Miller et al. (1992) defined four types of benchmarking: product benchmarking, functional or process benchmarking, best practices benchmarking, and strategic benchmarking. "Product benchmarking", the oldest and most widely used one, is simply the

practice of tearing down another firm's product to evaluate the current and future strengths and weaknesses of alternative designs. Reverse engineering is the commonly used technique. "Process benchmarking" aims to examine the processes of other firms deemed to be performing better. Unlike the former, it requires the permission of the firms to be benchmarked. "Best practices benchmarking" focuses on management practices that lead to superior performance. "Strategic benchmarking" focuses on gathering strategic data to discover the secrets of success of high-performing firms. The authors considered strategic benchmarking to be the most effective among all four.

Zairi (1994) provides another classification of benchmarking: internal benchmarking, competitive benchmarking, functional benchmarking, and generic benchmarking. "Internal benchmarking" is the type that applies primarily to large organizations having various business units. It is based on the comparison of internal operations of sister companies. "Competitor benchmarking" requires an investigation of competitors' products or processes to capture their practices. "Functional benchmarking" compares similar functions or processes of a firm with those of others that are deemed to be industry leaders. "Generic benchmarking", usually applied in learning organizations, compares similar business processes of firms regardless of their industries.

Zairi (1994) also identified two different approaches adopted in benchmarking studies: cost-driven benchmarking, and process-driven benchmarking. "Cost-driven benchmarking" compares cost-related performance indicators of a firm with those of the competitors. The outcome of this practice is cost reduction, usually coupled with incremental improvements. "Process-driven benchmarking" is a process, which uses the philosophy of continuous improvement. Its focus is not necessarily on the competitor or on performance outcomes, but understanding the practices and processes. It helps organizations achieve and sustain superior performance through strengthening of their processes and practices.

Korpela et al. (1996) reported that benchmarking has an evolutionary process, which resembles art-transitioning-to-science model (Figure 2.3.). It has now reached the fourth level in the process, which is "strategic benchmarking". The upcoming fifth generation of benchmarking envisages a global scope where international trade, cultural, and business process distinctions among companies are linked and their impacts on improving business processes are understood.

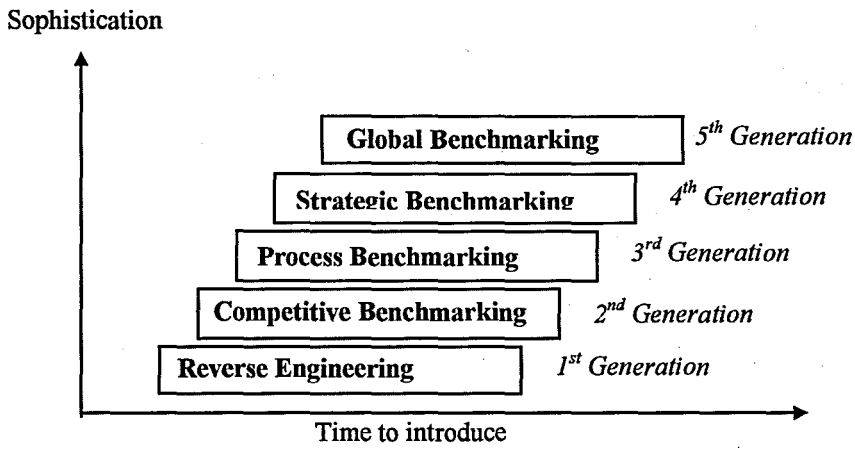

FIGURE 2.3. Benchmarking as a developing science (Korpela et al., 1996)

2.2.2. The Practice of Benchmarking

A company can benchmark itself either against a competitor or against a non-competitor. However, Tucker et al. (1987) argued that "benchmarking against competition" poses certain problems. To begin with, obtaining information about competitors is difficult. Besides, while competitive benchmarking help a firm to reach its competitor's performance, it is unlikely to reveal practices for surpassing them. Contradictory, "a non-competitor" benchmarking can highlight the best industry practices and promote their adoption.

A firm aiming to perform a benchmarking study can benchmark itself against a single firm or a group of firms. Bradley et al. (1998) argued that "cooperative benchmarking" which is the formation of networks or groups of firms to benchmark one or more key

business processes, is becoming increasingly popular in practice and is beginning to be discussed in professional and academic benchmarking literature. In this approach, several firms voluntarily share information about selected areas of their operations in order to identify and learn from the best practices. Such groups can be comprised of firms from within one industry or across industries, and can include either competitor or non-competitor organizations. Potential benefits of group benchmarking include the ability to share benchmarking costs and an enhanced ability to include information from a greater diversity of firm sizes. The authors established a clear set of rules and guidelines for the way in which the group project is to be conducted to enhance the efficiency of cooperative benchmarking process.

Voss et al. (1998) stated that many companies, besides benchmarking, have began to use "self-assessment methods" to improve their organizational performance. Self-assessment is the process of evaluating a company against a model of business excellence, to highlight what needs improvement. Self-assessment against a model of total quality management - such as EFQM, Malcolm Baldridge, and Deming - is one type of self-assessment, which has recently gained popularity. This type of practice is called "diagnostic benchmarking" in which a company's data are compared with those of others to arrive at the company's strengths and weaknesses.

The goals for a benchmarking process, as reported in the article of Korpela et al. (1996), are: to identify key performance measures for each function of a company's operations; to measure the internal performance levels of the company as well as those of the competitors; to compare performance levels in order to identify areas of competitive advantage and disadvantage; and to implement programs for closing the identified gaps. In summary, benchmarking helps understanding the business, its process and performance, and identifies gaps between the 'best practice' and the current operating environment. In doing so, it focuses on understanding how the "best practice companies" achieve superior performance, as well as on understanding their objectives.

There are a number of studies on how successful benchmarking can be practiced. Among these, the approach of Bogan et al. (1994) can be highlighted both for its simplicity and effectiveness. The author argued that successful benchmarking processes bear a Four-A brand: Analyze-Adopt-Adapt-Advance which also supports the continuous improvement philosophy: Plan-Do-Check-Act (P-D-C-A) cycle (Figure 2.4.).

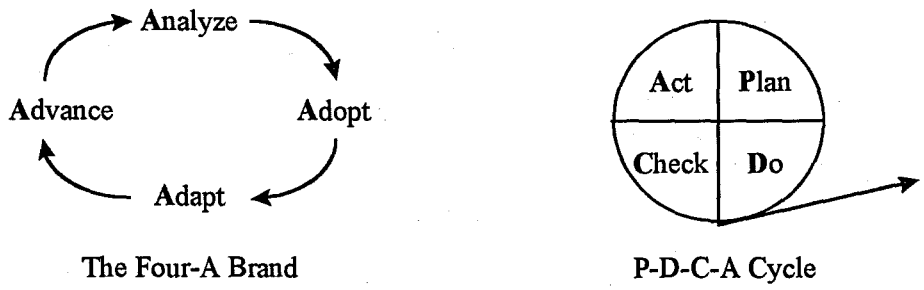

FIGURE 2.4. The Four-A brand and the P-D-C-A cycle (Bogan et al., 1994)

Sweeney (1994) recommended a methodology for the use of benchmarking to improve "manufacturing competitiveness". The methodology is based on a benchmarking model used by Cranfield Benchmarking Consortium (Figure 2.5.).

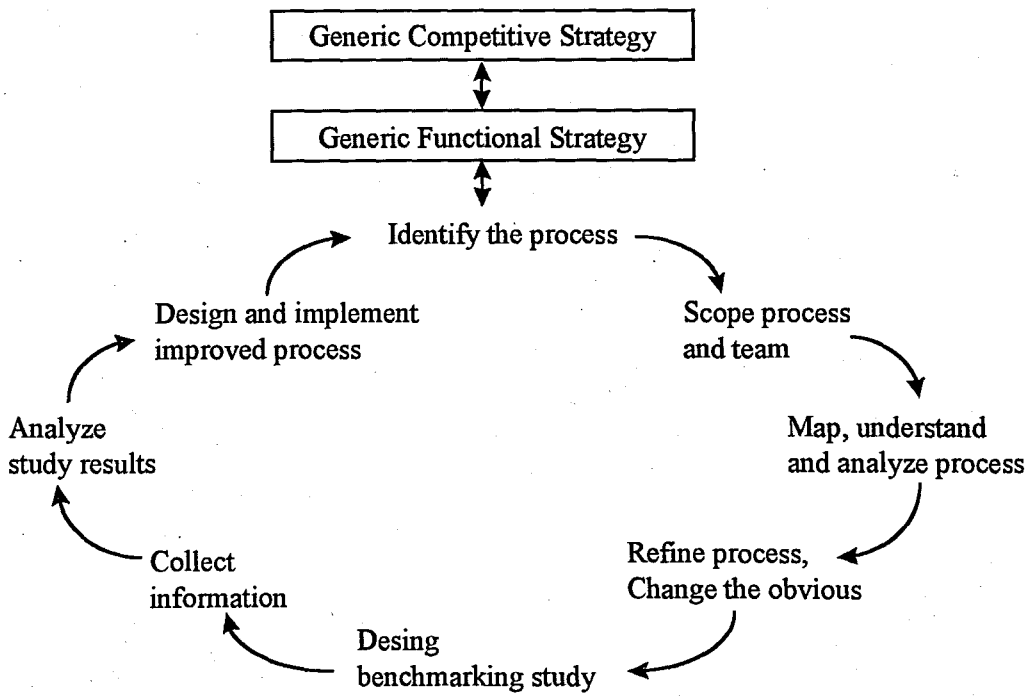

FIGURE 2.5. Benchmarking for strategic functional management (Sweeney, 1994)

The primary purpose of the model is to illustrate the relationship between the benchmarking activity and competitive and functional strategies of the business. According to this model, the selection of which process to benchmark is based on a thorough understanding of the competitive strategy of the firm and understanding of both the current and prospective role of the company in the supply chain (functional strategy). The choice of the key performance indicators to be used for benchmarking is based on how well they measure customer satisfaction or how well the information generated by their use will facilitate the achievement of customer satisfaction. The author argued that a benchmarking study using this model helps companies to employ appropriate measures of performance to develop superior performance.

2.3. Developing Manufacturing Strategy for Competitiveness

From the viewpoint of a manufacturing company, the manufacturing function plays a fundamental role in its pursuit of competitiveness. This is because; the ability of a manufacturing company to compete is primarily a derivative of its manufacturing capabilities. It is therefore critical to develop an appropriate "manufacturing strategy" that will enable the manufacturing function to contribute to the company's long-term competitiveness and business performance. As reported in the article of Swamidass et al. (1987), manufacturing strategy can be seen as the effective use of manufacturing strengths as a competitive weapon for the achievement of business goals. Also reported in the article of Hörte et al. (1987) is the primary function of a manufacturing strategy is to guide the business in putting together the set of manufacturing capabilities that will enable it to pursue its chosen competitive strategy over the long term. Hence, the objective of manufacturing strategy is to support the company's business strategy in its pursuit of competitiveness.

Sweeney (1994) emphasized the need to align company's manufacturing strategy with its competitive strategy. The author argued that since the goal of a manufacturing firm is to establish and maintain a competitive advantage that will enable it to generate the profits

needed to finance its growth, its main objective must be to increase its manufacturing competitiveness. A competitive advantage can be gained by improving either "product performance" or "manufacturing performance". The latter is more difficult to accomplish but more crucial. It requires the management of a manufacturing firm to have a clear vision of the preferred generic competitive strategy (cost leadership, differentiation, and focus) for the company. To implement the chosen strategy, the management must also have a clear vision of the type of manufacturing strategy (caretaker, marketeer, reorganizer, and innovator) needed to deliver the quality of the service expected by the customer and desired by the company (Figure 2.6.).

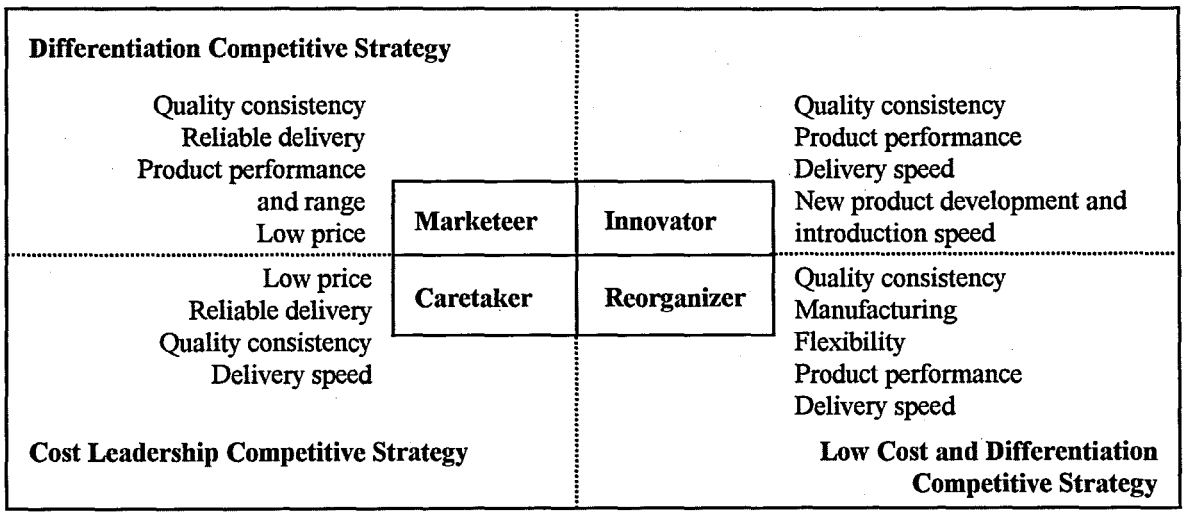

FIGURE 2.6. Generic competitive and manufacturing strategies (Sweeney, 1994)

According to Sweeney (1994), a company adapted a "caretaker manufacturing strategy" aims to produce quality products, and to achieve increased efficiency and lower costs. A company with a "marketeer strategy" is seeking to expand the range of products it produces to fulfil the needs of its customers. To overcome the problem of increasing complexity, these companies must change the manufacturing system infrastructure, for instance by introducing a materials requirements planning system or a total quality management system. The "reorganizer strategy" is designed to reduce the major constraints to manufacturing flexibility. The implementation of this strategy may necessitate changes to methods traditionally used to manage individual elements of the total supply chain. It is most

suitable for a company aiming to increase its competitiveness by means of speeding the delivery of its make to order products to its customers. The "innovator manufacturing" strategy is usually adopted by companies that are competing in mature markets against competitors that have been using quality, price and speed of service as their competitive weapons for some time. Time-based competition is perceived by these companies to be a new means of gaining competitive advantage. The success of this strategy is dependent on the frequency and the quality of product innovations.

2.3.1. Manufacturing Strategy Formulation

Manufacturing strategy as a concept and an area of study and practice has been growing for the last 30 years. Voss (1995), through an extensive literature review, identified three different approaches related to the choice and content in manufacturing strategy:

(i) competing through capability;

(ii) strategic choices in the manufacturing strategy; and

(iii) best practice adoption.

The first approach argues that the firm should compete through its manufacturing capabilities, and should align its capabilities with the key success factors, its corporate and marketing strategies and the demands of the marketplace. The second approach is a contingency-based approach, which is based on the need to attain internal and external consistency among all choices in manufacturing. The third one is the most recent of the three approaches and becoming prominent in manufacturing strategy. This approach focuses on the continuous development of best practice in all areas within a company, and claims that failure to match industry best practice can remove the competitive edge from manufacturing.

Voss (1995) also compared and evaluated these three different manufacturing strategy approaches and looked for the linkages between them. The author concluded that all of these approaches have their strengths and weaknesses and each partially overlaps the other (Figure 2.7.). A company cannot ignore any of these completely, for it would risk losing its competitive strength in manufacturing: it is possible to propose a continuous loop which is consistent with the continuous philosophy: Plan-Do-Check-Act (P-D-A-C) cycle. The logic behind the need to follow the continuous loop is that, firstly, any company needs to develop a strategy for competing through manufacturing to guide its actions. This strategy leads to the need to make key strategic choices. This, in turn, requires the development of world class performance in the areas chosen and by necessity the development of best in class practices. This is not an evolutionary cycle but a continuous iterative process.

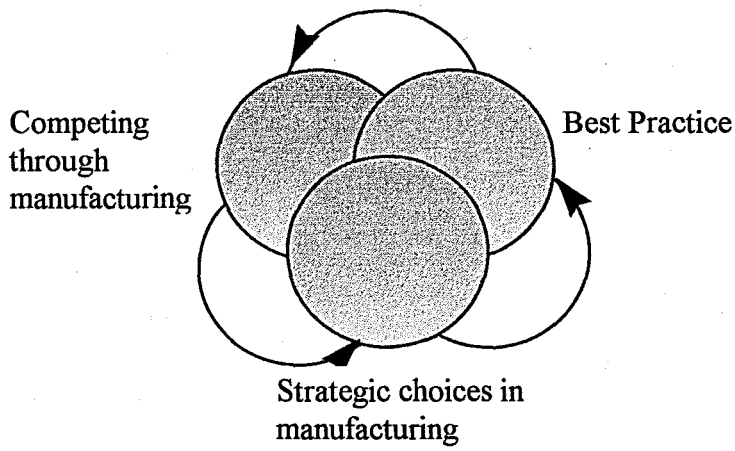

FIGURE 2.7. Manufacturing strategy formulation (Voss, 1995)

2.3.2. Competing Through Manufacturing

Developing strategy for competing through manufacturing requires the selection of manufacturing capabilities, for it heavily impacts a firm's business performance. There are two approaches widely discussed in the literature related to this subject:

(i) the trade-off (focus) approach; and

(ii) the cumulative approach.

The "trade-off approach" posits that firms cannot compete effectively on the basis of multiple capabilities because of the inherent trade-offs among the capabilities. The "cumulative approach", on the contrary, suggests that competing on multiple capabilities results in better performance. The capabilities represent a holistic set of tasks in the areas of cost, quality, dependability, and flexibility, which should be performed by the manufacturing function to support the business performance. Many researchers aimed to test these approaches by carrying out empirical studies on the manufacturing strategies employed by high and low performing companies. The studies of De Meyer et al. (1990) and Noble (1997) serve good examples in that sense.

De Meyer et al. (1990) aimed to explain whether there is a way to avoid trading off one capability for another to built lasting improvements in manufacturing performance. By using data obtained from 1988 Global Manufacturing Futures Survey, the authors compared the manufacturing practices of 167 West European companies by means of examining the relationship between their action plans undertaken and the performance indicators used, from both the perspective of the trade-off and the cumulative approach. These analyses revealed that the excellent manufacturers seem to follow a distinct sequence of improvement programs which aim at building one capability upon, and not instead of, another. The authors suggested that the approach which avoids trade-offs and ensures cumulative builtup of manufacturing capabilities in the long run is the one which, in broad terms, focuses on quality first, then quality and dependability, then quality, dependability and flexibility, and finally on all three plus cost efficiency (Figure 2.8.).

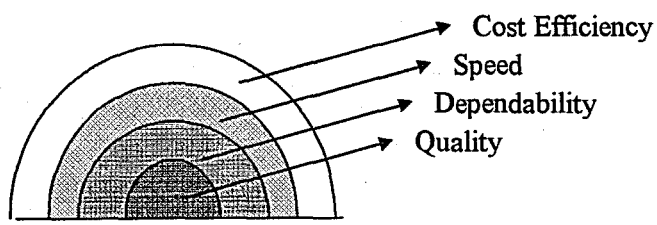

FIGURE 2.8. Cumulative built-up of manufacturing capabilities (De Meyer et al., 1990)

De Meyer et al. (1990) claimed that capabilities built in this way become formidable competitive weapons and they cannot be easily or quickly matched by competitors. Embarking on this course requires a commitment to expand the role of manufacturing in the competitive strategy of the company. Otherwise, the arguments for going directly after one capability at the expense of another's will prevail.

Noble (1997) examined manufacturing capabilities of 561 firms worldwide, comparing the manufacturing strategies of high-productivity firms with those of low-productivity firms from the perspective of cumulative model. The results suggest that high-productivity firms are more likely to address multiple manufacturing capabilities simultaneously, which supports the rationale behind the cumulative model.

2.3.3. Strategic Choices in Manufacturing

Kim et al. (1996) identified two basic frames to manufacturing strategy formulation:
(i) the conventional framework of manufacturing strategy; and
(ii) the process model of manufacturing strategy.

Wheelwright (1984) presents the "conventional framework of manufacturing strategy" as a two-stage process for the development and implementation of manufacturing strategy. First, on the basis of intended manufacturing business strategy such as cost leadership, differentiation or focus (Porter, 1985), manufacturing's competitive priorities should be determined in terms of relative emphasis given to price, quality, flexibility, and delivery.

As reported in the article of Hörte et al. (1987), the competitive priorities necessary to compete successfully should reflect the business strategy, and also provide criteria or mission - in other words, performance measures related to cost, quality, delivery, and

flexibility - against which manufacturing should be evaluated. Second, various structural decisions (decisions on capacity, facility, technology, and vertical integration) and infrastructural decisions (decisions on workforce, quality, planning and control, and organization) should be linked such that there is consistent support for chosen competitive priorities (Figure 2.9).

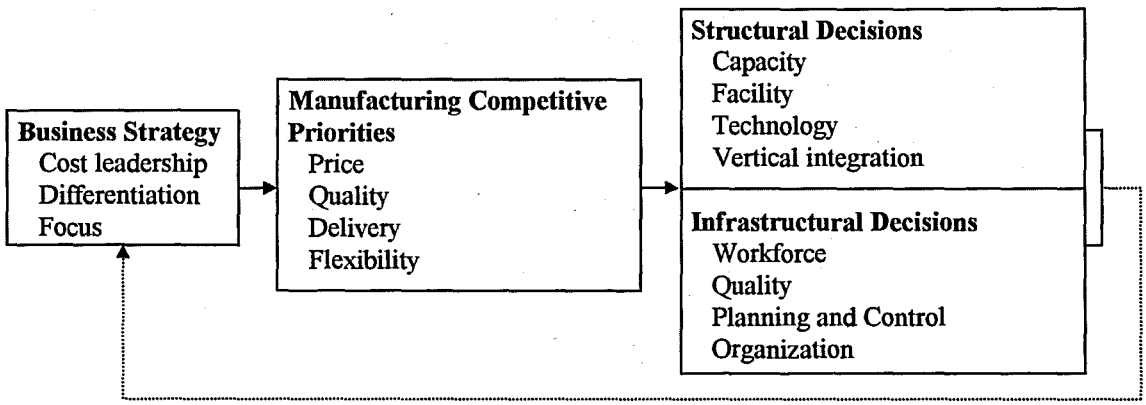

FIGURE 2.9. A conventional framework of manufacturing strategy (Hayes et al.,1994)

Kim et al. (1996) argued that the "conventional framework of manufacturing strategy" lacks a cohesive foundation that can guide its realization on the factory floor. The author proposed a "process model of manufacturing strategy" to close the gap between its development and implementation (Figure 2.10).

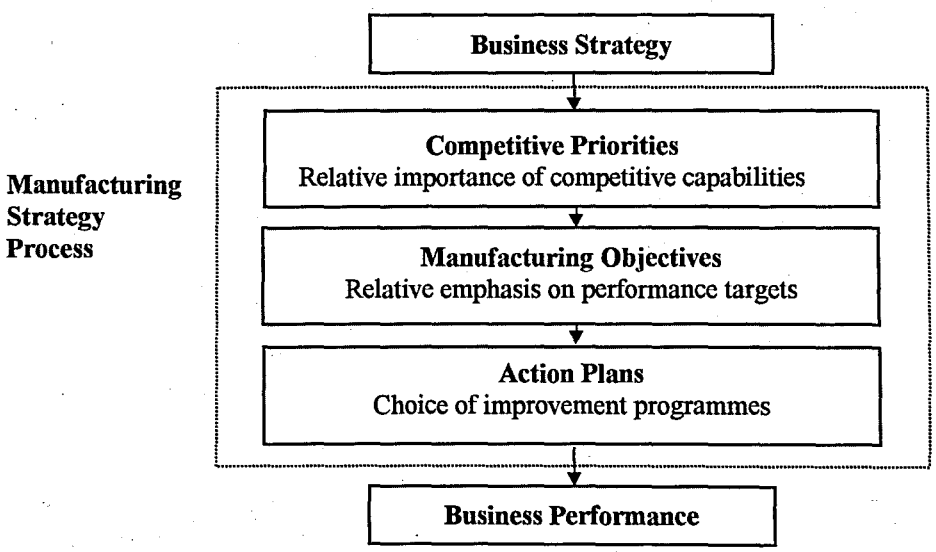

FIGURE 2.10. The process model of manufacturing strategy (Kim et al., 1996)

According to this mode (Figure 2.10), manufacturing strategy formulation process requires making three strategic choices: selection and implementation of competitive priorities, manufacturing objectives, and action plans. "Competitive priorities" indicate what the manufacturing function should achieve with regard to cost, quality, flexibility and delivery, in order to support the company's business strategy. Once the manufacturing function sets its competitive priorities, measurable performance targets should be established. These targets refer to "manufacturing objectives" which are identified to support the envisaged competitive priorities. To achieve the established set of manufacturing objectives, in turn, the management should develop improvement programs; in other words, "action plans"; to implement in the future. The ultimate outcome of this process is expected to be a positive contribution to the overall business performance.

The most relevant study related to questioning the components of manufacturing strategy is the "Global Manufacturing Futures Project". Since 1981, the Project has been systematically gathering data on the performance, status, and future plans of global manufacturers (United States, Western Europe, Japan, and Pacific Rim) in a variety of industries to study the strategic aspects of manufacturing management. The Project uses a strategic benchmarking questionnaire designed to assess manufacturing firms' business strategies, competitive priorities, manufacturing objectives, action plans and programmes, and performance improvement. De Meyer et al. (1992) published their book "Benchmarking Global Manufacturing" to interpret the data from more than 1,000 manufacturing business units collected over 10 years by this Project.

In the literature, there are a number of researches examining the linkages between the components of manufacturing strategy. The purpose is to check whether there is a consistency among competitive priorities, manufacturing objectives, and action plans and programmes of manufacturing firms. The studies of Hörte et al. (1987), De Meyer et al. (1987), Gelders et al. (1994), Hausmann et al. (1994) and Kim et al. (1996) - in which real data were used and a series of statistical analysis techniques such as factor and regression analysis were performed - serve good examples related to the subject.

The article of Hörte et al. (1987) is about a research aiming to examine manufacturing strategies employed by 125 Swedish business units in 1986-87. The data used was obtained from the Swedish Manufacturing Futures Survey. Their questionnaire was composed of four sections: strategic directions, competitive priorities, concerns, and action plans and programmes. Examples of "strategic directions" include high level of innovation, increasing market share in existing markets, entering new markets with existing products, and forward and backward integration. The list of "competitive priorities" consists of items such as low prices, after sale services, fast deliveries, and rapid volume changes, etc. "Concerns" involve areas that are of concern to manufacturing managers, with respect to ability to fulfil competitive priorities with thirty-four alternative issues related to planning, work-force, communication and information, processes, etc. "Programmes" refer to the selection of "action plans" to be specified over the next two years. The findings of the research revealed that the programmes are fairly consistent with the concerns which are, in turn, consistent with the competitive priorities.

De Meyer et al. (1987) aimed to explain the differences in manufacturing strategies employed by different companies. The research was based on the data provided by 163 companies in 1985 European Manufacturing Futures Project Survey. The questionnaire used in the research consists of a list of thirty-five "action plans". The companies were asked to indicate on a continuous five-point scale the extent to which they are working or having plans to work in the next two years on each of the action plans. After analyzing the data, the authors identified some dimensions along which major differences in manufacturing strategies of different companies can be explained. The usefulness of their study is that no assumption about the link between competitive priorities and action plans need to be made. The identification of differences in action plans of different companies serve as a framework to identify the focal points of attention of the management even if they might not have been conscious of them or made them explicit.

The research of Gelders et al. (1994) was based on a survey of 30 manufacturing companies located in Belgium. The survey, carried out during the summer 1991, was

constructed around three basic topics: company strategy, manufacturing performance measurement, and manufacturing improvement projects. "Company strategy" refers to the set of potential strategic dimensions selected by the companies related to price, quality, availability, and product characteristics. The identification of "manufacturing performance measurement system" is based on the identification of performance indicators used to report about manufacturing activities to top management (such as quality, delivery time and reliability, inventory levels, manufacturing costs, etc.) and of those used on the shop floor (such as inventory turnovers, rework and scrap, downtime, setup time, etc.). "Improvement programmes" are the plans that are indicated as most important by the companies. Examples include just in time, manufacturing resource planning, total quality management, activity based costing, etc. After analyzing the linkage between these constructs, it was revealed that although these concepts are popular, there is still a lack of consistency between company strategy, performance measurement systems and improvement actions.

Hausmann et al. (1994) performed a similar study, which proves strong linkages between marketing strategy, manufacturing strategy, and manufacturing tactics. "Marketing strategy" attributes are price, quality (reliability, durability, not features), availability, variety, features, and after-sales service. "Manufacturing strategy" attributes are cost, quality (conformance to specifications), dependability, flexibility, and innovation. "Manufacturing tactics" consist of ten items such as statistical process control, just in time, and concurrent engineering. The study was based on the data provided by 178 managers and executives, in the years 1991 and 1992.

Kim et al. (1996) claimed that manufacturing strategy formulation follows a top-down process. That is, managers determine the competitive priorities of the manufacturing function on the basis of their strategy and, with that knowledge, establish a set of objectives, and then make the investment decisions among various action programmes. To test his claim, the author performed a series of statistical analyses with the data of 182 companies from 1990 Global Manufacturing Futures Survey. The findings of the analyses revealed that there is a considerable fit between competitive priorities, manufacturing objectives and

action plans. The author argued that studies trying to find answers to such questions like "do firms that make decisions in the pattern as found in this study perform better that those do not?" would also be appreciated.

2.3.4. Best Practice Paradigm in Manufacturing Strategy

Recently, "best practice paradigm in manufacturing strategy" is strongly supported by a number of researches that show strong linkages between adoption of best practices and business performance. These researches are leading many companies to seek best practices as the basis of their manufacturing strategies. The most relevant studies are the study of Australian Manufacturing Council called "Leading the Way: A Study of Best Manufacturing Studies in Australia and New Zealand" (1994), and the studies of Voss et al. supported by IBM United Kingdom Limited and London Business School, such as "Made in Britain" (1993), "Made in Europe: A Four Nations Best Practice Study" (1994), and "Made in Europe 2: An Anglo-German Design Study" (1996). Similar studies were also performed in Turkey called "Competitive Strategies and Best Practices" for automotive, electronics and cement industrial sectors (1997a, 1997b, 1997c). All of these studies use a practice-performance model to extract subgroups out of the respondents. In doing so, the studies try to assess to which extent the best practices adopted by the companies and the impact of this adoption on business performance.

The practice - performance model used in the studies of IBM United Kingdom Limited and London Business School is exhibited in Figure 2.11. In this model, "practices" refers to the established processes that a company has to put in place to improve the way it runs its business. They range from organizational aspects such as teamwork and empowerment to use of techniques such as lean production. "Performance" refers to the measurable results of a company's processes in each of the six areas depicted in the model including their business impact. Process measures include work-in-progress, production cycle time; business impact measures include market share and customer satisfaction, etc.

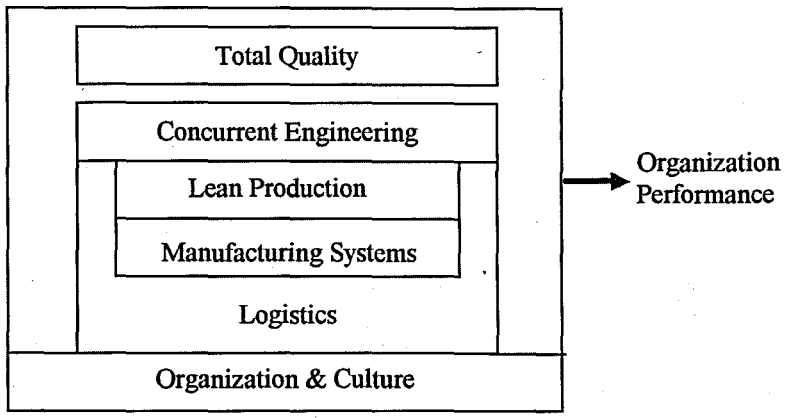

FIGURE 2.11. The practice - performance model (Voss et al., 1995)

By using the above model, a performance - practice index was constructed to divide the surveyed companies into six subgroups: world class; contenders; promising; won't go the distance; makeweights; and punchbags (Figure 2.12).

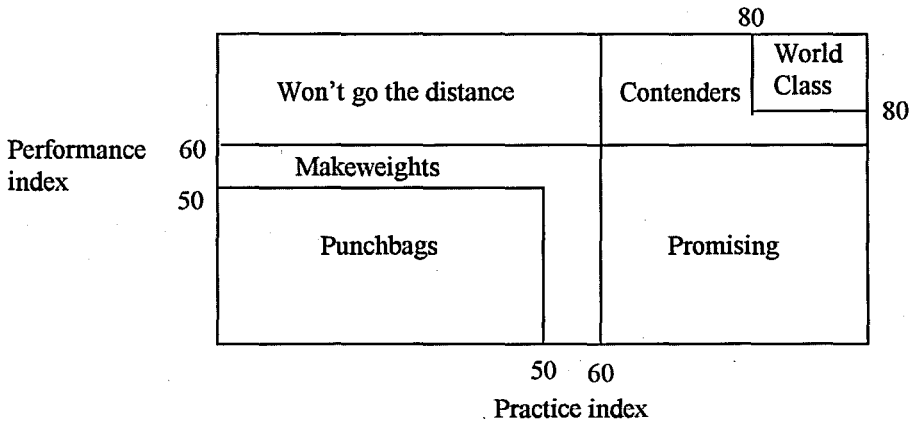

FIGURE 2.12. Practice - performance categorization (Voss et al., 1995)

Voss et al. (1995) described these classes as follows: "World class" companies are those that have adopted a range of best practices, with resulting high operational performance. "Contenders" are those that have the potential to compete internationally and are poised to move into the world class category. "Promising" companies are those that have put in place a strong set of practices, but are not yet seeing all of the benefits in terms of performance. "Won't go the distance" ones are those that have performed well but may

not go the distance because they have achieved this without having established enduring practices. "Makeweights" companies are the ones that lack both the practices and performance needed to compete in an international stage; and require radical changes in management and practices to succeed. "Punchbags" are the lowest scoring.

In the "Made in Europe: A Four Nations Best Practice Study" (1994), it was found that only 14 of 650 surveyed manufacturing sites reach full world class standards. Voss et al. (1995) argued that the biggest threat to European manufacturing is the inertia at both the company and industry level. Overcoming inertia may require many stimuli like expose to overseas competition, benchmarking to look at best practice elsewhere and top management attention. The authors added that excellence is not the preserve of any country or group; world class companies are found in most sectors; at every size of company and with domestic and foreign parents.

In the study of Australian Manufacturing Council, AMC, (1994) - a similar approach was utilized. The study is based on a model called "The Best Manufacturing Practice Model". "Best Practice" is defined as the co-operative way in which firms and their employees undertake business activities in all key process: leadership, planning, customers, suppliers, community relations, production and supply of products and services, and the use of benchmarking. These practices, when effectively linked together, can be expected to lead sustainable world-class outcomes in quality, customer service, flexibility, timeliness, innovation, cost and competitiveness. To measure how far a site has progressed towards best practice, the study utilized two indices: strategy/practice index, and operational performance index. The calculation of the "strategy/practice index" is based on the answers given to the questions related to the manufacturing strategy and best practice adoption. The calculation of "operational performance index" is based on the answers given to the questions related to the operational outcomes in quality, customer service, flexibility, timeliness, innovation, cost and competitiveness. By using the two indices together, it is aimed to extract two subgroups out of the set of respondents: the leaders, and the laggers (Figure 2.13).

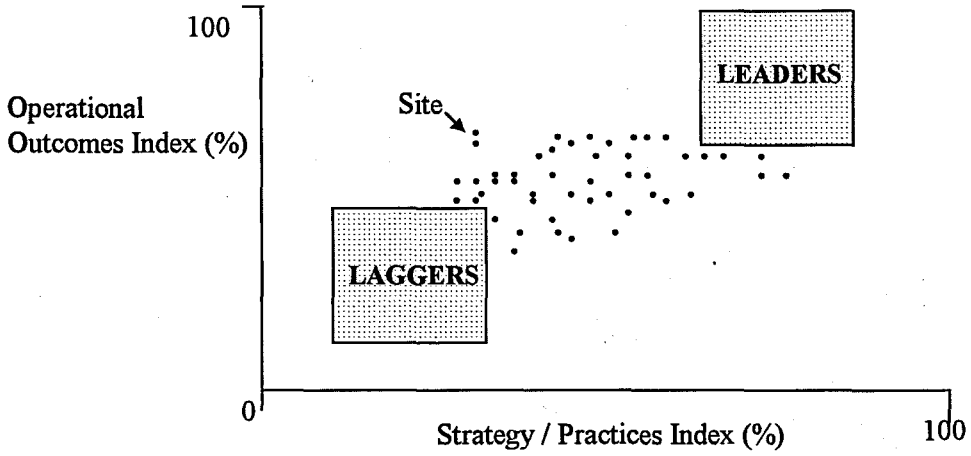

FIGURE 2.13. Best manufacturing practice scorecard (AMC, 1994)

In the best manufacturing practice scorecard, "laggers" are defined as the bottom 20 per cent sites with neither practices nor outcomes in place. The top 20 per cent sites are defined as "leaders" with practices in place and being converted into outcomes. The study was based on the data provided by 962 Australian sites and 37 New Zealand sites. The results of the study confirmed that the sites that were making improvements in all best practice elements (manufacturing strategy, leadership, quality, technology, people practices, customer focus and the use of benchmarking) were experiencing superior operational performance together with superior sales and export growth, and positive cash flow. That is, adoption of international best practice had a positive impact on the business performance.

In the studies "Competitive Strategies and Best Practices" for Turkish automotive, electronics and cement industrial sectors, Ulusoy et al. (1997a, 1997b, 1997c) used a similar approach as used in the study of Australian Manufacturing Council (1994) for analyzing the extent to which best practice were adopted in these industries. The leaders and laggers of the sectors were identified based on their practice-performance scores. It was found that although some of the best practices analyzed were adopted both by the leaders and the laggers and become industry standards, adoption of others significantly differentiate the leaders from the laggers. In these studies, companies were recommended to adopt these best practices to enhance their level of competitiveness.

3. THE METHODOLOGY

The thesis "Benchmarking Competitive Strategies and Best Manufacturing Practices: A Study into Four Sectors of the Turkish Industry" is a benchmarking study on competitiveness that uses the engineering approach (Hatzichronoglou, 1996). It defines a company's capacity to compete as its ability to search for, identify, and assimilate best practices, and sees the competitive capacity of a nation as the combination of competitive capacities of its individual enterprises. It evaluates the competitiveness of a company in terms of its operational practices and outcomes, which are the drivers of competitiveness. In the evaluation, it considers "best practice" as a reference point. Best practice is defined as the co-operative way in which firms and their employees undertake business activities in all key areas: leadership, planning, customers, suppliers, community relations, production and supply of products and services, and the use of bechmarking. These practices, when effectively linked together, can be expected to lead to sustainable world-class outcomes in quality and customer service, flexibility, timeliness, innovation, cost, and competitiveness (Australian Manufacturing Council, 1994).

The main objective of the thesis is to examine the extent of best practice adoption by the companies operating in the Turkish manufacturing industry, and the impact of this adoption on the overall business performance. The second objective is to examine their competitive strategies for the next two years. To serve the objectives of the thesis, the data of 82 companies from the Turkish electronics, cement, automotive, and white goods suppliers industrial sectors are used. These data are obtained by the "Competitive Strategies and Best Practices Benchmarking Questionnaire" applied in 1997 and 1998.

This section first presents the development and structure of the questionnaire by which the data were gathered, then, the methodology used to measure the surveyed companies against best practice, and the methodology used to assess these companies' competitive strategies.

3.1. The Questionnaire

In the development phase of the questionnaire three steps are followed: preparation, testing, and finalization. The Global Manufacturing Futures Project (De Meyer et al.; 1992), the study of Australian Manufacturing Council (1994) and the studies of Voss et al. (such as "Made in Britain", 1993; "Made in Europe: A Four Nations Best Practice Study", 1994; and "Made in Europe 2:An Anglo-German Design Study", 1996), supported by IBM United Kingdom Limited and London Business School, served as references in the development phase of the questionnaire. After a careful examination of these studies, four questionnaires are prepared for the Turkish electronics, automotive, cement and white goods suppliers industrial sectors. These questionnaires are almost identical in serving the study objectives. However, some questions are customized, added or removed to incorporate the differences between the sectors studied. The prepared questionnaires are discussed with the surveyed companies to test the clarity, completeness and compliance of questions. Finally, these questionnaires are revised in response to the feedback obtained. The responses given to the survey questions are also validated by a number of site visits and during a number of meetings on the preliminary findings. Part of this questionnaire relevant to the thesis is given in Appendix A.

The questionnaire is structured in such a way that allows analysis of competitive strategies and the relationship between practices and resulting outcomes of the surveyed companies (Figure 3.1). It has four main modules: "competitive strategy", "manufacturing strategy", "practices", and "performance/outcomes".

The "competitive strategy" module of the questionnaire serves the objective of determining the competitive strategies of the companies by addressing their competitive priorities, manufacturing objectives and action plans. Competitive priorities refer to the competitive capabilities a company should develop to distinguish its products and services from its competitors. Manufacturing objectives outline what the company should achieve in

support of its competitive priorities. Action plans are the improvement programmes to be implemented in the future to achieve the manufacturing objectives. The questions included in this module require the respondents to select the most important five competitive priorities, five manufacturing objectives, and five action plans envisaged for the next two years out of a list of 15 competitive priorities, 15 manufacturing objectives, and 35 action plans, respectively. The survey of Global Manufacturing Futures Project (Miller et al., 1992) was used as a reference to construct the module.

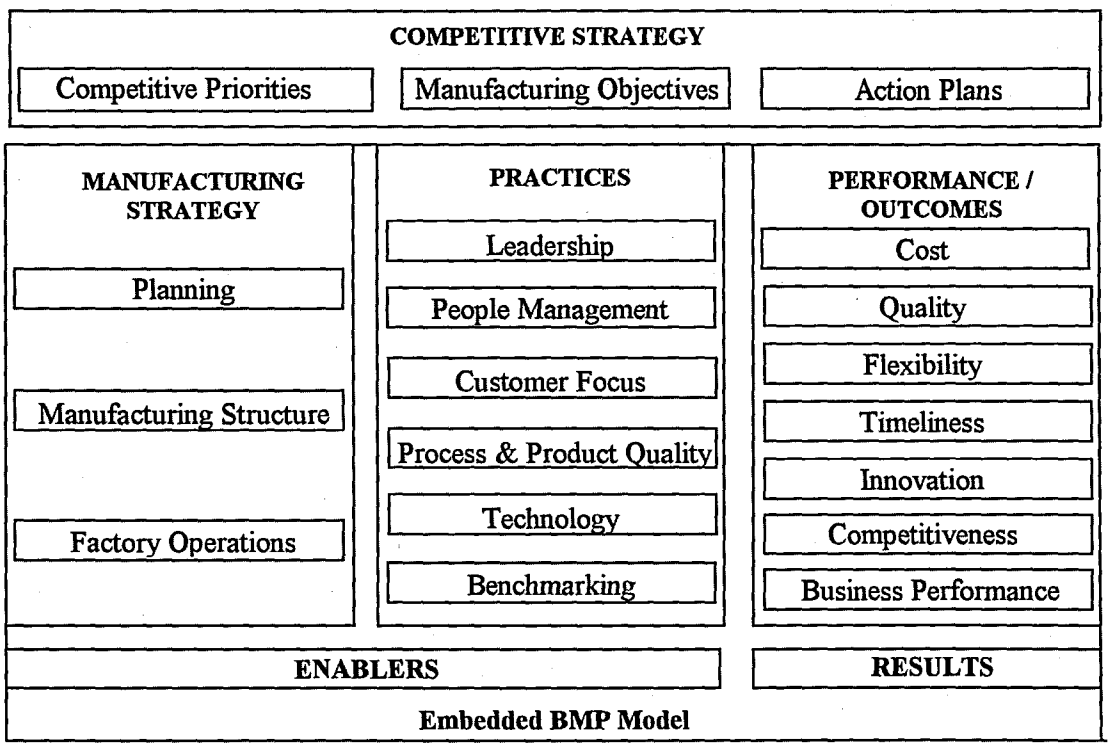

FIGURE 3.1. The structure of the questionnaire and the embedded BMP Model

The remaining three modules serve the objective of determining the relationship between the practices and the results obtained. They form the "Best Manufacturing Practice Model" (BMP Model), that was also used in the study of Australian Manufacturing Council (1994). The BMP Model links strategy to practices, which in turn lead to the achievement of outcomes, with those outcomes feeding into revised strategies, and so on. In this respect, it reflects a comprehensive and an integrated approach to continuous improvement in all facets of an organization's operations that is embodied in the concept of best practice. The

model, in part, resembles the total quality models such as the European Foundation for Quality Management Model (EFQM Model), the Malcolm-Baldridge Quality Award Model, and the Association of Turkish Businessmen and Industrialists - Quality Association (TUSIAD-KalDer) Quality Award Business Excellence Model. The EFQM model is depicted in Figure 3.2 to illustrate the similarity.

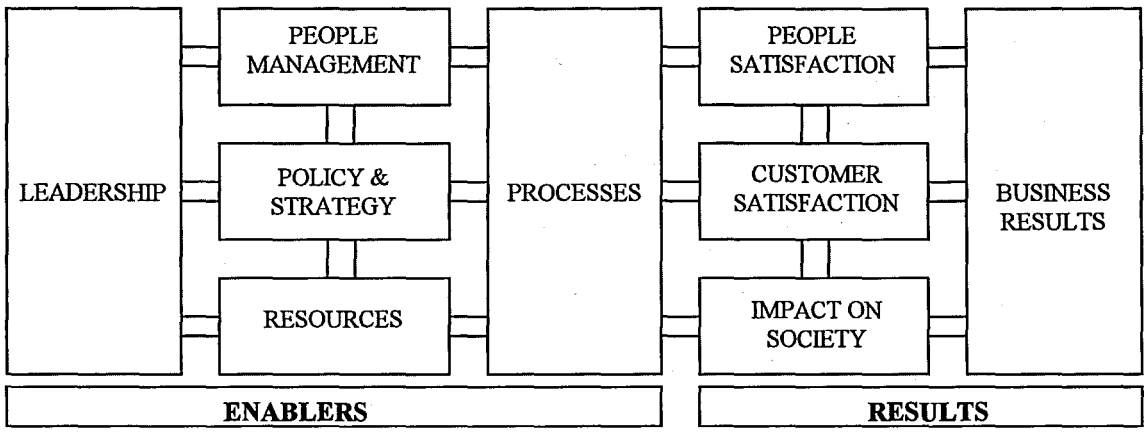

FIGURE 3.2. The EFQM Model

The EFQM model has two main modules: enablers and results. The "enablers" are leadership, people management, policy, and strategy, resources, and processes, which are aspects of total quality management. The "results" are people satisfaction, customer satisfaction, impact on society, and finally, business results. The model claims that the enablers stimulate and assist organizations in the pursuit of global competitiveness. In the BMP Model, the enablers refer to the "manufacturing strategy" and "practices" modules, and the results refer to the "performance/outcomes" module. As clearly seen, there is a strong relationship between the BMP Model and the EFQM Model with regard to capturing basic total quality management approaches.

The "manufacturing strategy" module of the questionnaire focuses on aspects of planning, structure, and operations. By doing so, it aims to capture the strategic management decisions reflected in the planning function, and in the alignment of

manufacturing operations with the central business mission. The "practices" module tries to identify the range of practices companies translate into action. It addresses six areas of practices: leadership, people management, customer focus, process and product quality, benchmarking, and technology. The "performance/outcomes" module aims to identify the outcomes of the practices and the resulting business performance. Outcomes refer to the operational measures of performance in the areas of cost, quality, flexibility, timeliness, and innovation. Business performance refers to financial measures such as cash flow, sales, value-added, and employment. While the outcomes are heavily influenced by the practices of companies, business performance is influenced by many factors external to the companies such as their competitive positions in markets and the impact of prevailing government policies.

In the "manufacturing strategy" module, respondents are asked to record the perceived contribution levels of factory operations to their manufacturing effectiveness on a scale ranging from "1" indicating a negative contribution to "5" indicating a major contribution. For those cases in which any of these operations does not apply, a choice of "0" is made available. The rest of the questions included in this module require the respondents to record the extent to which best practices in the areas of planning, strategic management, and manufacturing operations are adopted, on a Likert scale ranging from "1" indicating a strong disagreement to "5" indicating a strong agreement with the statement.

In the "practices" module of the questionnaire, respondents are required to answer the questions on the usage and the practice of benchmarking. These questions inquire whether a benchmarking study is practiced, and if practiced with which organizations and on which areas. The respondents are also required to indicate the factors on which information about competitors is reviewed periodically. These questions are "Yes" or "No" type of questions. Other questions included in this module require the respondents to record the extent to which best practices in the areas of leadership, people management, customer focus, quality of processes and products, and technology are adopted, on a Likert scale ranging from "1" indicating a strong disagreement to "5" indicating a strong agreement with the statement.

Finally, the respondents are asked to rank order five practices (leadership, planning, employee relations, customer relations, and supplier relations) and five outcomes (cost, quality, flexibility, timeliness, and innovation) in relation to their impact on the company's current success.

In the "performance/outcomes" module of the questionnaire, respondents are asked to indicate their level of operational outcomes on cost, quality, delivery, timeliness and innovation, on a scale ranging from "1" to "5", where "1" always includes the range of values specifying the lowest level of operational outcomes, and "5" the highest level. The respondents are also asked to make subjective assessments on these outcomes in comparison to their foreign and domestic competitors, again on a scale "1" indicating a lower achievement to "5" indicating a higher achievement. In addition, respondents are asked to record their number of employees, sales, exports, and value-added numbers for the last three years. These questions are open-ended questions aiming to determine the business performance of the surveyed companies.

The questionnaire also includes a section that aims to understand the business profile of the companies in terms of the nature of their business (independent, operating unit of a large company, subsidiary of a parent or a holding company), and their important markets.

The questionnaire is applied to the 27 electronics, 25 cement, and 10 automotive companies in 1997, and to the 20 white goods supplier companies in mid-1998. One might think that there would be a risk of misinterpretation in merging the data obtained in different years for further analyses. However, for a study of this nature a one-year time lag does not have a significant effect on the interpretation of the data.

3.2. The Methodology for Measuring against Best Practice

The studies of Australian Manufacturing Council (1994) and Voss et al. (1993, 1994, 1995, and 1996) are the two prominent studies aiming to measure the companies in terms of their operational practices and outcomes. They employed similar methodologies based on models that embody best manufacturing practices and high operational outcomes. These models were used to calculate a practice and a performance index for each of the surveyed companies. These two indices were used simultaneously to measure the proximity of an individual company to best practice. These companies were then classified into subgroups with respect to their practice and performance indices. The business performances of the identified subgroups were analyzed to reflect the effect of best practice adoption to business performance. The results of these studies revealed that best practice adoption has a positive effect on business performance regardless of the industrial sector.

A similar methodology is employed in the thesis. The BMP Model, embedded in the structure of the questionnaire in the form of "manufacturing strategy", "practices", and "performance/outcomes" modules provides a means for measuring the companies' adoption of best practice, and its impact on the overall business performance (Figure 3.1).

Responses to survey questions are scored and two indices are developed to measure the accomplishment of companies in the pursuit of best practice: the "strategy/practices index", and the "operational outcomes index". The responses to survey questions included in each of the indices are rescaled so as to contribute potentially a maximum total value of 100 to their respective index. The strategy/practices index allows an overall assessment of a company's adoption of the strategy and practices modules of the BMP Model, and the operational outcomes index allows assessment of the extent to which practices has been converted into operational outcomes on cost, quality, flexibility, timeliness, and competitiveness. The questions inquiring the employment, sales, value-added, and pre-investment cash flow levels are used to calculate the measures of business performance

(Table 3.1). Survey questions and the method used to construct the indices and to calculate the business performance measures are given in Appendix B.

TABLE 3.1. Construction of best practice indices and business performance measures

Manufacturing Strategy	**Practices**	**Outcomes**	**Business Performance**
Planning Focused Strategies Factory Operations	Leadership People Management Customer Focus Process and Product Quality Technology Benchmarking	Cost Quality Flexibility Timeliness Competitiveness	Employment Sales Value-added Cash Flow
Strategy/Practices Index		**Operational Outcomes Index**	**Measures of Business Performance**

Plotting the accomplishment of companies in the pursuit of best practice on a two-dimensional space provides a "best practice scorecard" (Figure 3.3). The horizontal axis shows the score on the "strategy/practice index" and the vertical axis shows the score on the "operational outcomes index". Each point in the plot represents a single company. A regression line is fit to the plot. Two 90 degrees angles are drawn intersecting the upper most and the lowest tips of the regression line. The 90 degrees angle at the upper most is moved down along the regression line until approximately 10 per cent of the companies are covered. These companies are called the "leader" companies. To identify the "lagger" companies, the 90 degrees angle at the lowest moved up along the regression line until approximately 10 per cent of the companies are covered. The vertical lines of the 90 degrees angles are extended to the horizontal borders of the plot to identify the "won't go the distance" and the "promising" companies. The companies left in the middle are called the "medium-performers".

The "leader" companies are those that score high on both the "strategy/practices index" and the "operational outcomes index". These companies not only have the practices in place but also have linked them effectively to achieve sustainable outcomes. On the other

hand, the "lagger" companies are those with low scores on both indices, which means that neither they have practices in place nor do they achieve improved outcomes. The "medium-performers" speak for themselves. The two subgroups, namely the "won't go the distance" and the "promising" companies deserve special attention. The "won't go the distance" companies achieve high scores on the operational outcomes index, but low scores on the strategy/practices index. According to the BMP Model, such companies cannot achieve sustainable high outcomes in the long run without a focus on improvements in practices. On the other hand, although the "promising" companies achieve high strategy/practices scores, they have not yet converted their improved practices into outcomes. This situation may simply reflect that the time lag between the length of time the practices have been in place and the length of time needed to convert them into measurable outcomes. The "won't go the distance" and the "promising" companies are considered to be the "outliers".

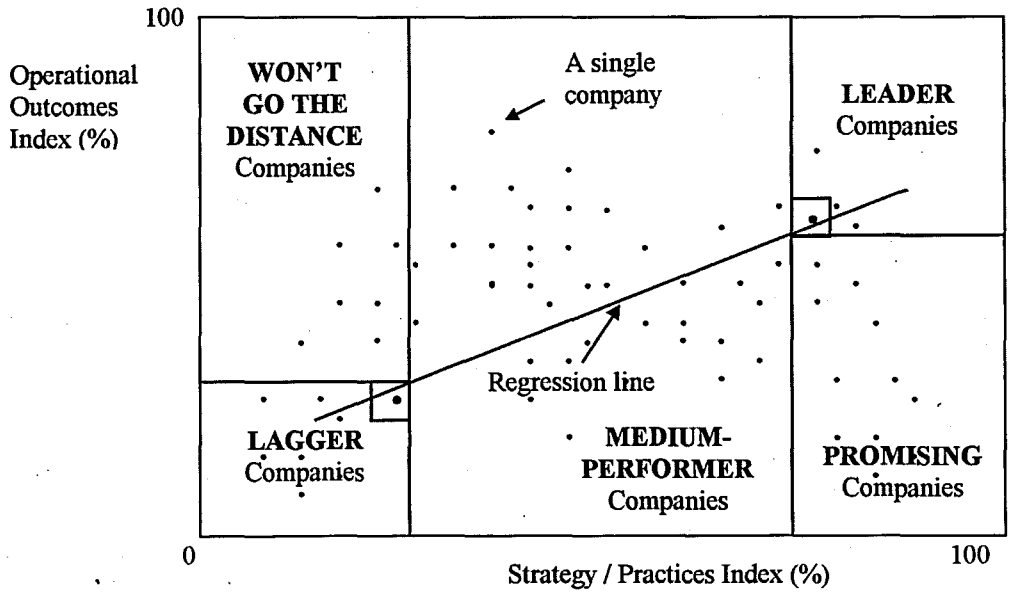

FIGURE 3.3. Construction of the best practice scorecard

The sample used in the study is composed of 82 companies of different sizes from different industrial sectors. One can think that there could be variation in individual company's pursuit of best practice on the basis of its industrial sector and company size. Hence, in the study it is also aimed to analyze whether there is a significant relationship

between industrial sector and the implementation of best manufacturing practices and the achievement of high operational outcomes. The effect of company size is also analyzed from the same point of view. The sample is divided into subgroups with respect to the industrial sector they belong to and with respect to their company size. Analysis of variance - single factor method is utilized in the analyses.

To understand the effect of best practice adoption to business performance, the responses to the questions included in the "performance/outcomes" module of the questionnaire are used. These questions require quantified responses related to the business performance. Business performance is measured in terms of three indicators: average annual growth in the sales per employee growth, average annual growth in the value-added per employee growth, and the level of pre-capital investment cash flow. Business performance of the "leader" and the "lagger" companies are calculated and compared to show how best practice adoption impacts the business performance.

3.3. The Methodology for Assessing the Competitive Strategies for Manufacturing

As reported in the article of Swamidass et al. (1987), manufacturing strategy can be seen as the effective use of manufacturing strengths as a competitive weapon for the achievement of business goals. Developing strategy for competing through manufacturing requires the selection of manufacturing capabilities. These capabilities represent a holistic set of tasks in the areas of cost, quality, dependability, and flexibility, which should be performed by the manufacturing function to support the business performance.

The methodology for studying the manufacturing strategies of the surveyed companies is based on the "process model of manufacturing strategy" (Figure 3.4) proposed by Kim et al. (1996). Part of this model is embedded in the structure of the questionnaire in the form of "competitive strategy" module (Figure 3.1).

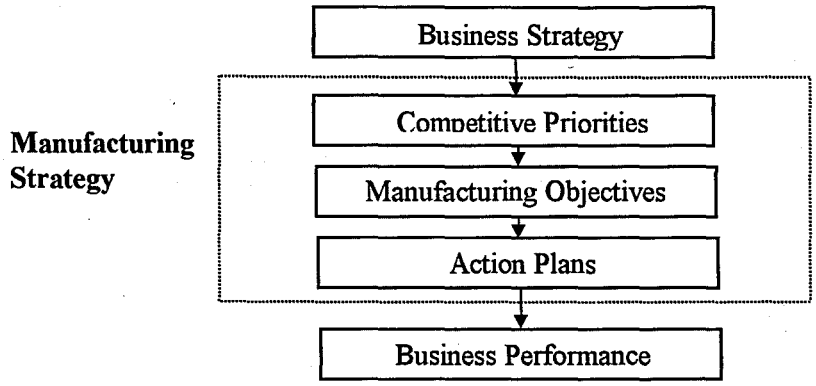

FIGURE 3.4. The process model of manufacturing strategy (Kim et al., 1996)

According to this model, manufacturing strategy formulation process requires to make three strategic decisions: selection and implementation of competitive priorities, manufacturing objectives, and action plans. "Competitive priorities" indicate what the manufacturing function should achieve with regard to cost, quality, flexibility and delivery, in order to support the company's business strategy. Once the manufacturing function sets its competitive priorities, measurable performance targets should be established. These targets refer to "manufacturing objectives" which are identified to support the envisaged competitive priorities. To achieve the established set of manufacturing objectives, in turn, the management should develop improvement programs; in other words, "action plans", to implement in the future. The ultimate outcome of this process is expected to be a positive contribution to the overall business performance.

Using the responses given to the questions included in the competitive strategy module, the five most important competitive priorities, manufacturing objectives and action plans of the companies envisaged for the next two years are analyzed to highlight the strategic aspects of manufacturing management in the electronics, cement, automotive, and white goods suppliers sectors of the Turkish industry. These aspects are also examined for the "leader" and the "lagger" companies to see the differences in their managerial focal points. The studies of Hörte et al. (1987), De Meyer et al. (1987, 1990, and 1992), Gelders et al. (1994), Hausmann et al. (1994), Kim et al. (1996), and Noble (1997) serve as references.

4. THE SAMPLE

The data used in the thesis are based on the information collected by the "Competitive Strategies and Best Practices Benchmarking Questionnaire". The questionnaire is applied to the Turkish electronics, cement, and automotive sectors in 1997, and to the Turkish white goods suppliers sector in mid-1998. In this section, general information on these companies (that is, the sample of the study) is presented including the industrial sectors nature of business, foreign investments, employment levels, sales, exports and the most important markets for their products.

4.1. The Sample by Industrial Sector

The analyses and results of the thesis are based on the data of 82 Turkish companies. The sample is composed of 27 member companies of the Association of Turkish Electronics Industrialist (TESID), 25 member companies of the Association of Turkish Cement Producers (TCMB), 10 member companies of the Association of Automotive Industrialists (OSD), and 20 member companies of the Association of White Goods Suppliers (BEYSAD). The distribution of the sample by industrial sector is depicted in Figure 4.1.

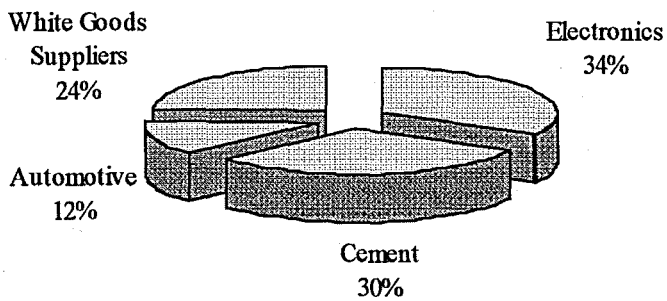

FIGURE 4.1. Distribution of the sample by industrial sector

The electronics companies of the sample represent various subsectors of the electronics industry: 33 per cent belongs to the professional and industrial apparatus, 26 per cent belongs to telecommunications, 22 per cent belongs to the components, and 19 per cent belongs to the consumable apparatus subsector. All of the cement companies of the sample are cement producers, some of which are also producing ready mix concrete. The automotive companies of the sample are operating in the following subsectors of the industry: 10 per cent in automobiles, 20 per cent in tractors, and 70 per cent in commercial vehicles. The white goods supplier companies are spread across a wide range of operating areas. The range of products they are producing includes the parts and components of ovens, refrigerators, washing machines, and dishwashing machines such as engines and components, cables, glasses, shock absorber and compressor parts.

4.2. The Sample by Business Nature

The companies in the sample are classified into three groups with respect to their business natures. In the overall sample, majority of companies (64 per cent) are independent companies (Figure 4.2).

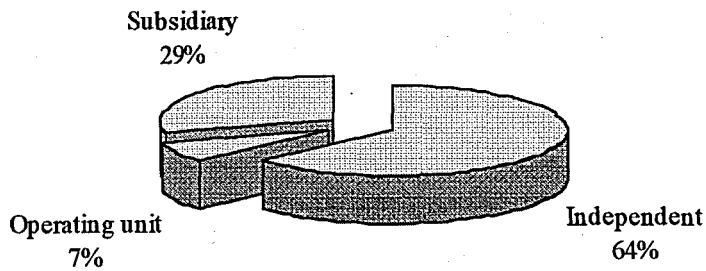

FIGURE 4.2. Distribution of the sample by business nature

Although the business nature distributions of the electronics, cement, and white goods supplier companies are similar to the distribution of the overall sample, the automotive

companies exhibit a different pattern (Table 4.1). While 60 per cent of the automotive companies are subsidiaries of parent or holding companies, 10 per cent is independent.

TABLE 4.1. Business nature of the sample by industrial sector

	Percentage of companies that were			
Industrial sector	Independent	Operating Unit	Subsidiary	Row Totals
Electronics	70 %	7 %	22 %	100 %
Cement	64 %	8 %	28 %	100 %
Automotive	30 %	10 %	60 %	100 %
White Goods Suppliers	70 %	5 %	25 %	100 %
Overall Sample	63 %	7 %	29 %	100 %

4.3. The Sample by Foreign Capital Contribution

The majority (79 per cent) of the companies in the overall sample have domestic capital only (Figure 4.3). The fraction of companies with foreign capital contribution is 21 per cent, and the foreign capital contribution averages 46 per cent (Table 4.2).

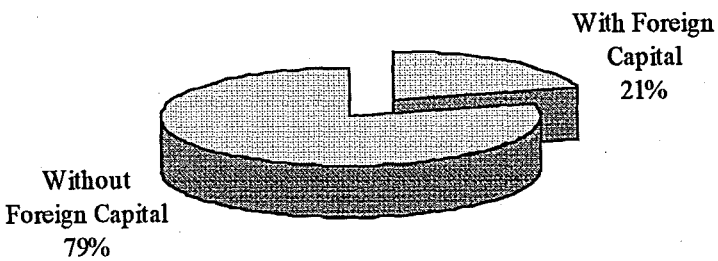

FIGURE 4.3. Distribution of the sample by foreign capital contribution

The percentage of companies with foreign capital contribution differs from industry to industry. For instance, while 60 per cent of the automotive companies have foreign capital contribution at variable levels, all of the white goods supplier companies are operating with domestic capital. The average fractions of foreign capital contribution calculated for the

electronics, cement, and automotive companies are 49, 44, and 46 per cent, respectively, which do not differ significantly from each other (Table 4.2).

TABLE 4.2. Foreign capital contribution of the sample by industrial sector

Industrial sector	Percentage of companies with Foreign Contributions	Average percentage of Foreign Contributions
Electronics	19 %	49 %
Cement	24 %	44 %
Automotive	60 %	46 %
White Goods Suppliers	0 %	0 %
Overall Sample	21 %	46 %

4.4. The Sample by Employment

The companies in the sample are classified into three groups with respect to their company sizes. Company size is a measure of total number of employees in a company. In the classification of the sample by company size, a widely accepted scale is used. According to that scale, companies with total number of employees less than 100, between 100 and 499, and more than or equal to 500 are considered to be small-sized, medium-sized, and large-sized companies, respectively. In the overall sample, approximately half of the sample consists of medium-sized companies (Figure 4.4).

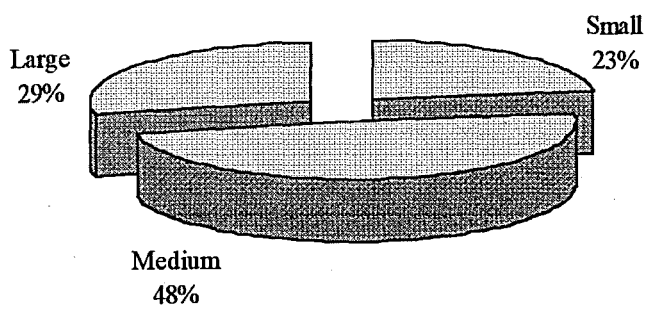

FIGURE 4.4. Distribution of the sample by company size

The distribution of companies with respect to their total number of employees differs across the industrial sectors. As shown in Table 4.3, while approximately half of the electronics companies are small-sized, the majority (70 per cent) of the automotive companies are large-sized. Moreover, 84 per cent of the cement producers and more than 55 per cent of the white goods suppliers are medium-sized companies.

TABLE 4.3. Company size of the sample by industrial sector

	Percentage of companies that were			
Industrial sector	Small-Sized	Medium-Sized	Large-Sized	Row Totals
Electronics	52 %	26 %	22 %	100 %
Cement	8 %	84 %	8 %	100 %
Automotive	0 %	30 %	70 %	100 %
White Goods Suppliers	30 %	55 %	15 %	100 %
Overall Sample	23 %	48 %	29 %	100 %

4.5. The Sample by Sales and Exports

The companies in the sample are classified with respect to their annual total sales. In the overall sample, 42 per cent of the companies have total sales less than 10 million USD and 23 per cent have total sales more than 100 million USD (Figure 4.5).

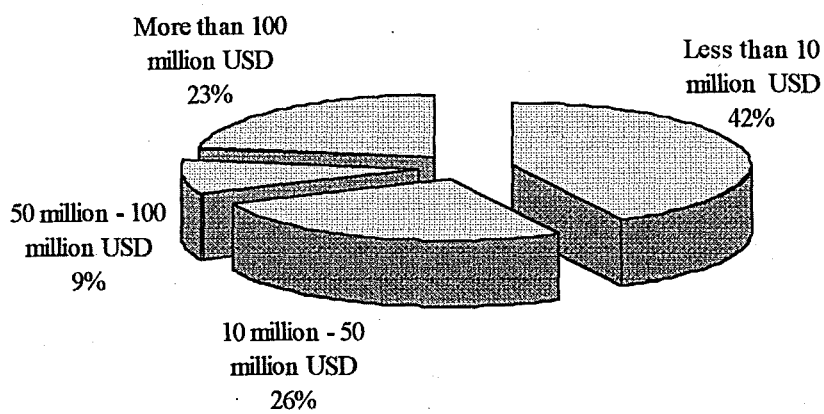

FIGURE 4.5. Distribution of the sample by total sales

With respect to the total sales of companies, the automotive companies are the largest and the white goods supplier companies are the smallest ones in the sample. While 80 per cent of the automotive companies have total sales more than 100 million USD, 75 of the white goods supplier companies have total sales less than 10 million USD (Table 4.4).

TABLE 4.4. Total sales of the sample by industrial sector

	Percentage of companies with total sales (million USD)				
Industrial sector	Less than 10	10 - 50	50 - 100	More than 100	Row Totals
Electronics	63 %	11 %	4 %	22 %	100 %
Cement	12 %	60 %	16 %	12 %	100 %
Automotive	0 %	0 %	20 %	80 %	100 %
White Goods Suppliers	75 %	15 %	0 %	10 %	100 %
Overall Sample	42 %	26 %	9 %	23 %	100 %

Across the sample, the figure for sales from production does not differ much from that of total sales. Moreover, the distribution of the sample by sales from production is similar to that of the sample by total sales (Table 4.4 and Table 4.5).

TABLE 4.5. Sales from production of the sample by industrial sector

	Percentage of companies with sales from production (million USD)				
Industrial sector	Less than 10	10 - 50	50 - 100	More than 100	Row Totals
Electronics	63 %	11 %	4 %	22 %	100 %
Cement	8 %	56 %	12 %	24 %	100 %
Automotive	0 %	0 %	20 %	80 %	100 %
White Goods Suppliers	70 %	15 %	0 %	15 %	100 %
Overall Sample	40 %	24 %	7 %	28 %	100 %

The companies in the sample are also classified with respect to their annual export sales. In the overall sample, 36 per cent of the companies have no export sales and only 12 per cent have export sales more than 20 million USD (Figure 4.6).

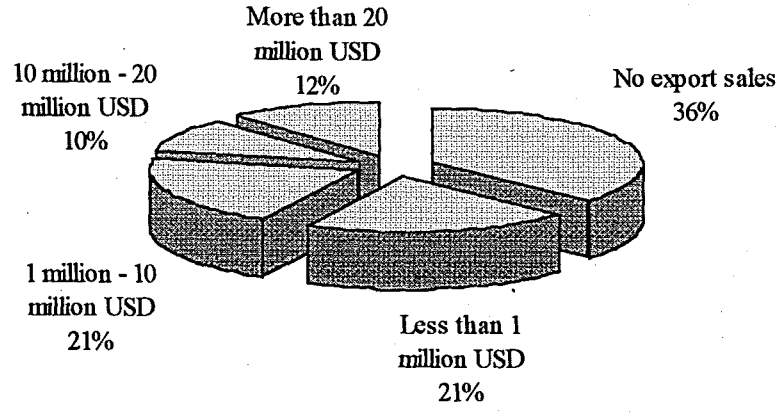

FIGURE 4.6. Distribution of the sample by export sales

The automotive companies of the sample are more export oriented than the rest of the sample. While half of the automotive companies of the sample have export sales more than 10 million USD, more than half of the electronics, cement, and white goods supplier companies has either no export sales or has export sales less than one million USD (Table 4.6).

TABLE 4.6. Export sales of the sample by industrial sector

	Percentage of companies with export sales (million USD)					
Industry	0	Less than 1	1 -10	10 –20	More than 20	Row Totals
Electronics	41 %	22 %	19 %	0 %	19 %	100 %
Cement	52 %	12 %	16 %	16 %	4 %	100 %
Automotive	0 %	0 %	50 %	40 %	10 %	100 %
White Goods Suppliers	30 %	40 %	15 %	0 %	15 %	100 %
Overall Sample	36 %	21 %	21 %	10 %	12 %	100 %

In the questionnaire, the companies are asked to indicate the three most important markets for their products. In the overall sample, Turkey is considered to be the most important market. Middle East countries and Germany are the two largest markets following Turkey with respect to their perceived importance. The second most important markets of the surveyed companies are Germany, Middle East and North African countries, Middle East countries and Turkish Republics, Germany and Italy, respectively.

5. MEASURING AGAINST BEST PRACTICE

This chapter serves as a background for the succeeding chapters. It has seven sections. In the first section, the proximity of the 82 surveyed companies to best practice is mapped on a "best practice scorecard" that plots the position of each company. In the second section, the surveyed companies are categorized into five groups according to their relative positions on the scorecard. They are identified as "leader", "lagger", "medium-performer", "promising", or "won't go the distance" companies. In the third section, a series of statistical analysis is carried out to demonstrate that the categories are in fact different than each other both in implementing best manufacturing practices and in achieving high operational outcomes. The business profiles of the five categories in terms of industrial sector, company size, nature of business, and foreign investment are analyzed in the fifth section. Since the sample is composed of companies from four different industrial sectors and of varying sizes, two statistical analyses are conducted to see whether the industrial sector and company size affect the adoption of best practice, and if they do, how. These analyses are covered in the sixth and seventh sections.

5.1. Best Practice Scorecard of the Sample

The best practice scorecard is constructed to measure the proximity of the companies to best practice. Two indices are calculated to construct the scorecard: the "strategy/ practices index" and the "operational outcomes index". The horizontal axis of the scorecard shows the score on the "strategy/practices index", and the vertical axis shows the score on the "operational outcomes index". When measuring how close a company has been to best practice, the two indices are considered simultaneously. Each of the 82 companies in the sample is plotted as a single point on the scorecard after calculating their individual scores on these indices (Figure 5.1).

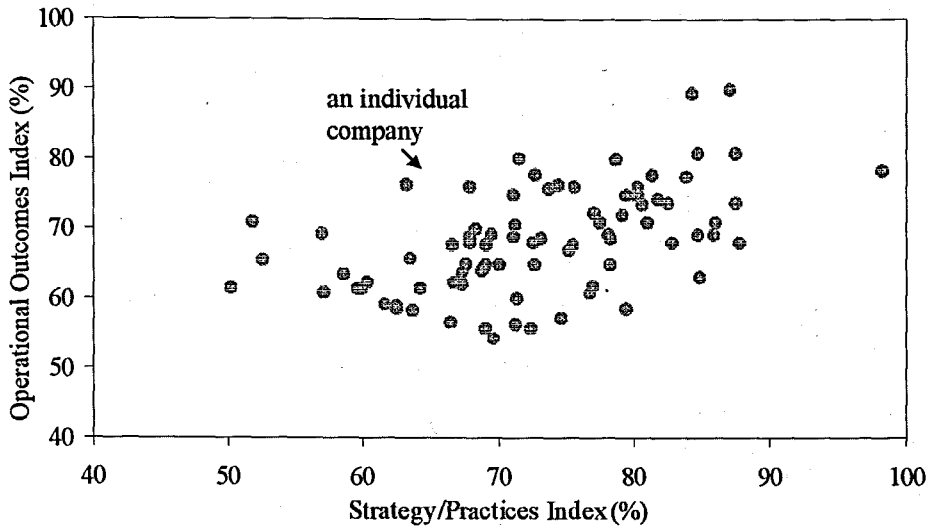

FIGURE 5.1. The best practice scorecard of the sample

The average score of the overall sample on the "strategy/practices index" is 73 with a minimum value of 50, a maximum value of 98, and a standard deviation of 9.44. The average score on the "operational practice index" is 68 with a minimum value of 54, a maximum value of 90, and a standard deviation of 7.58.

An "overall practices/performance index" is calculated for each of the 82 companies in the sample. A company's "overall practices/performance index" is the sum of its scores on the "strategy/practices index" and on the "operational outcomes index". Therefore, it has potentially a maximum value of 200. The minimum and the maximum scores attained by the sample on the "overall practices/performance index" are 112 and 177, respectively. The average value is 141 with a standard deviation of 14.86. Figure 5.2 shows the "overall practices/ performance index" for the entire sample as a histogram. The histogram reveals that majority of the surveyed companies have scores between 120 and 160, out of 200.

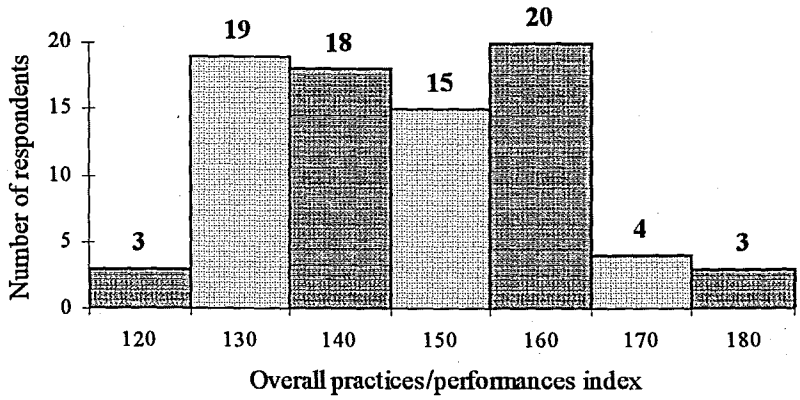

FIGURE 5.2. Scores of the sample on the overall practices/performance index

5.2. Categorization of the Sample with respect to Best Practice Adoption

In order to categorize the surveyed companies according to their proximity to best practice, first, a linear regression analysis is performed on the distribution of companies depicted in the best practice scorecard of the sample (Figure 5.1). In the linear regression analysis, "operational outcomes index" is considered as the dependent variable, and the "strategy/practices index" as the independent variable. The regression line fitted to the distribution is:

Operational outcomes index = 37.955 + 0.418 * Strategy/practices index

The coefficient of determination (r^2) for the distribution is approximately 27 per cent, compared with 25 per cent found in the study of Australian Manufacturing Council (1994). This demonstrates that the practices described in the model are a significant determinant of the operational outcomes sought.

The next step is to divide the overall sample into subgroups with respect to their best practice adoption (Figure 5.3).

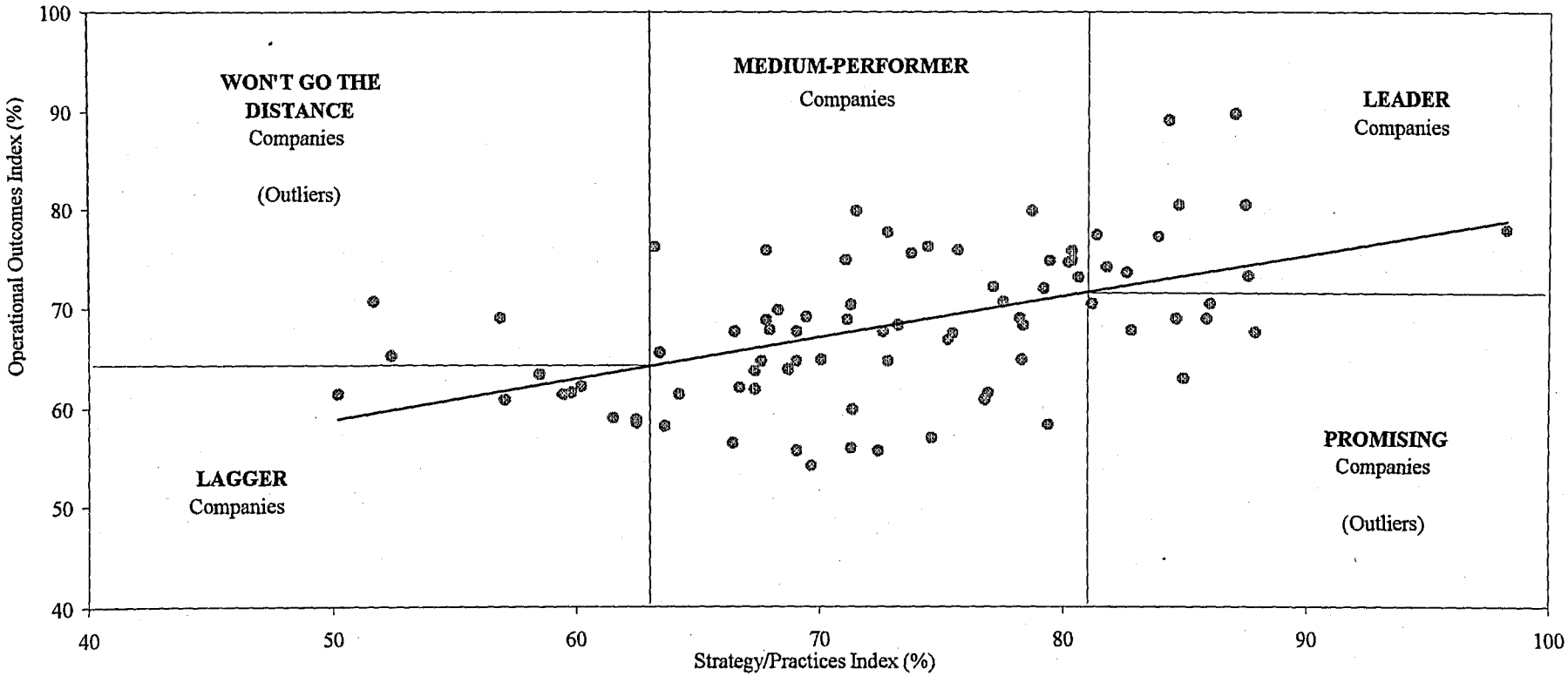

FIGURE 5.3. Categorization of the sample with respect to best practice adoption

Approximately the top-scoring 10 per cent and the lowest-scoring 10 per cent in the overall sample are described as the "leaders" and the "laggers", respectively. The companies in the lower right rectangle of the scorecard are called the "promising" companies, and the companies in the upper left rectangle are called the "won't go the distance" companies. The "promising" and the "won't go the distance" companies are considered as the "outliers" according to the "Best Manufacturing Practice Model" (BMP Model). Companies in the middle rectangle are described as the "medium-performers" (Figure 5.3).

The distribution of the sample by category is given in Table 5.1 in terms of both the number and the percentage of companies included in each category. The most crowded category is the category of the "medium-performers" which covers 65 per cent of the sample. The outliers, namely the "promising" and the "won't go the distance" companies, together represent 13 per cent of the sample. While 11 per cent of the companies fall into the category of the "leader", 12 per cent fall into the category of the "lagger" companies.

TABLE 5.1. Distribution of the sample by category

Category	Number of companies	Percentage of companies
Leader	10	12 %
Lagger	9	11 %
Medium-performer	53	65 %
Promising	7	9 %
Won't go the distance	3	4 %
Overall sample	82	100 %

5.3. Best Practice Adoption of the Sample by Category

Best practice adoption is a function of the "strategy/practices index" and the "operational outcomes index". The statistics (average, minimum and maximum scores, and the standard deviation) on the "strategy/practices index", "operational outcomes index", and on the "overall practices/performance index" of the companies in each category are tabulated in Table 5.2, Table 5.3, and Table 5.4, respectively.

On the "strategy/practices index", the "leader" companies have an average total score of 86, whereas the "lagger" companies have 59 (Table 5.2). On the "operational outcomes index", the "leader" and the "lagger" companies have an average total score of 80 and 61, respectively (Table 5.3). This implies that to be a leader, all-round excellence is needed, and there are no short cuts. The "won't go the distance" companies achieve an average score on the "operational outcomes index" equal to those of the "medium-performers" and the "promising" companies, but with a lower average score on the "strategy/practices index". Moreover, while the average score on the "operational outcomes index" of "promising" companies is equal to those of the "medium-performers" and the "won't go the distance" companies, their average score on the "strategy/practices index" is significantly higher.

TABLE 5.2. Statistics on the strategy/practices index by category

	Strategy/Practices Index (out of 100)			
Category	Minimum	Maximum	Mean	Standard Deviation
Leader	81	98	86	5
Lagger	50	62	59	4
Medium-performer	63	81	72	5
Promising	81	88	85	2
Won't go the distance	52	57	54	3
Overall sample	50	98	73	9

TABLE 5.3. Statistics on the operational outcomes index by category

	Operational Outcomes Index (out of 100)			
Category	Minimum	Maximum	Mean	Standard Deviation
Leader	74	90	80	6
Lagger	59	64	61	2
Medium-performer	54	80	68	7
Promising	63	71	68	3
Won't go the distance	65	71	68	3
Overall sample	54	90	68	8

On the "overall practices/performance index" which aggregates the strategy/practices and the operational outcomes indices, the distinction between the best practice adoption of the categories is seen more clearly (Table 5.4).

TABLE 5.4. Statistics on the overall practices/performance index by category

	Overall Practices/Performance Index (out of 200)			
Category	Minimum	Maximum	Mean	Standard Deviation
Leader	156	177	165	8
Lagger	112	123	120	3
Medium-performer	122	159	140	10
Promising	148	157	153	3
Won't go the distance	118	126	122	4
Overall sample	122	177	141	15

5.4. Validating the Differences in Best Practice Adoption of the Categories

As discussed earlier, a company's adoption of best practice is measured by its implementation of best manufacturing practices and achievement of high operational outcomes; that is, in terms of their total scores on the "strategy/practices index" and on the "operational outcomes" index. A higher total score on the "strategy/practices index" implies more successful implementation of best manufacturing practices, and a higher total score on the "operational outcomes index" implies more successful achievement of operational outcomes. Based on this method, it is assumed that the "leader" companies are performing better than the "medium-performers", and that the "medium-performers", in turn, are performing better than the "lagger" companies in adopting best practice. This assumption is trivial when the implementation of best manufacturing practices is considered. This is because, the ranges of possible total scores on the "strategy/practices index" a "leader" company, a "lagger" company, and a "medium-performer" could get are non-overlapping and wide enough (Figure 5.3). Therefore, to validate the assumption, a series of hypothesis tests are conducted only on the "operational outcomes indices" of these categories. These tests are meaningful from the statistics viewpoint, since although the ranges of possible total scores on the "operational outcomes index" a "leader" and a "lagger" company could get are non-overlapping and wide enough, a "medium-performer" could get every possible value on this index. The "won't go the distance" and the "promising" companies are excluded from the hypothesis tests, since they are considered as "outliers" from the viewpoint of the BMP Model.

Two hypothesis tests are set on the "operational outcomes indices" of the "leader", "medium-performer", and the "lagger" companies to see whether these categories differ statistically from each other in achieving operational outcomes. In the first hypothesis test, the null hypothesis claims that the mean "operational outcomes indices" of the "leaders" and the "medium-performers" are equal to each other, whereas the alternative hypothesis claims that the mean operational outcomes index of the "leaders" is greater than that of the "medium-performers":

H_o: $\mu_{Leaders} = \mu_{Medium\text{-}performers}$

H_1: $\mu_{Leaders} > \mu_{Medium\text{-}performers}$

A t-test with the assumption that the variances are equal is performed. The outcome reveals that H_o should be rejected, and that "leaders" are performing better than "medium-performers" in achieving high operational outcomes. In fact, the t statistics value is greater the one-tail t-distribution value at 0.05 level of significance (Table 5.5)

TABLE 5.5. Leaders are better than medium-performers in achieving high operational outcomes

	Category	
	Leader	Medium-performer
Mean	79.5991	67.5734
Variance	34.5209	47.3522
Number of observations	10	53
Degrees of freedom	61	
t - value	5.1733	
t - critical one - tail ($\alpha = 0.05$)	1.6702	

In the second hypothesis test, the null hypothesis claims that the mean "operational outcomes indices" of the "medium-performers" and the "laggers" are equal to each other, whereas the alternative hypothesis claims that the mean operational outcomes index of the "medium-performers" is greater than that of the "laggers":

H_o: $\mu_{Medium\text{-}performers} = \mu_{Laggers}$

H_1: $\mu_{Medium\text{-}performers} > \mu_{Laggers}$

A t-test with the assumption that the variances are equal is performed. The outcome reveals that H_0 should be rejected, and that "medium-performers" are performing better than "laggers" in achieving high operational outcomes. In fact, the t statistics value is greater than the one-tail t-distribution value at 0.05 level of significance (Table 5.6)

TABLE 5.6. Medium-performers are better than laggers in achieving high operational outcomes

	Category	
	Medium-performer	Lagger
Mean	67.5734	60.8697
Variance	47.3522	2.7616
Number of observations	53	9
Degrees of freedom	60	
t - value	2.8896	
t - critical one - tail ($\alpha = 0.05$)	1.6706	

The results of these two hypothesis tests (Table 5.5 and Table 5.6) reassure that "leaders" are performing better than "medium-performers", which are in turn performing better than "laggers" in achieving high operational outcomes. Together with the fact that these results also apply for the implementing best manufacturing practices by definition, the assumption saying that these categories differ from each other in terms of best practice adoption is statistically validated.

5.5. Business Profile of the Sample by Category

The business profiles of the companies in each category are analyzed in terms of the industrial sector they belong to, their nature of business, foreign capital contribution and company size. The results are shown in Table 5.7 through Table 5.10, respectively.

The cement companies of the sample form 50 per cent of the "leader" and 57 per cent of the "promising" companies (Table 5.7). Sixty-six per cent of the "won't go the distance" companies are the electronics companies. Majority (66 per cent) of the white goods supplier companies fall into either "lagger" or "won't go the distance" category.

TABLE 5.7. Industrial sector distribution of the sample by category

	Industrial Sector				
Category	Electronics	Cement	Automotive	White Goods Suppliers	Row Totals
Leader	10 %	50 %	30 %	10 %	100 %
Lagger	22 %	33 %	11 %	33 %	100 %
Medium-performer	40 %	25 %	8 %	28 %	100 %
Promising	14 %	57 %	29 %	0 %	100 %
Won't go the distance	66 %	0 %	0 %	33 %	100 %
Overall sample	34 %	30 %	12 %	24 %	100 %

In the overall sample, 63 per cent of the companies are independent companies (Table 5.8). Hence, one would expect that, most of the companies in each category are also independent. However, it is interesting to find out that 60 per cent of the "leader" companies are subsidiaries of parent or holding companies.

TABLE 5.8. Business nature of the sample by category

	Nature of Business			
Category	Independent	Operating unit	Subsidiary	Row Totals
Leader	40 %	0 %	60 %	100 %
Lagger	78 %	6 %	6 %	100 %
Medium-performer	66 %	9 %	25 %	100 %
Promising	57 %	0 %	43 %	100 %
Won't go the distance	66 %	0 %	34 %	100 %
Overall sample	63 %	7 %	29 %	100 %

In the overall sample, the percentage of companies with foreign capital contributions is only 21 per cent. However, it is observed that while 50 per cent of the "leader" companies have foreign capital contribution, this ratio is 11 per cent for the "laggers" (Table 5.9).

TABLE 5.9. Existence of foreign capital contribution by category

	Foreign contribution in the company		
Category	Yes	No	Row Totals
Leader	50 %	50 %	100 %
Lagger	11 %	89 %	100 %
Medium-performer	17 %	83 %	100 %
Promising	19 %	81 %	100 %
Won't go the distance	0 %	100 %	100 %
Overall sample	21 %	79 %	100 %

In the overall sample, 71 per cent of the companies are small- or medium-sized companies. It is found that while 50 per cent of the "leaders" are large-sized, all of the "laggers" are small- or medium-sized companies (Table 5.10).

TABLE 5.10. Company size of the sample by category

	Company Size			
Category	Large	Medium	Small	Row Totals
Leader	50 %	40 %	10 %	100 %
Lagger	0 %	78 %	22 %	100 %
Medium-performer	19 %	51 %	30 %	100 %
Promising	57 %	29 %	14 %	100 %
Won't go the distance	0 %	33 %	66 %	100 %
Overall sample	29 %	48 %	23 %	100 %

5.6. Effect of Industrial Sector on Best Practice Adoption

The sample used in the study is composed of 82 companies from four different industrial sectors. Hence, it would be interesting to see whether industrial sector affects best practice adoption. Table 5.11 shows the percentages of companies in each industrial sector that are called the "leader", "lagger", "medium-performer", "promising", and "won't to go the distance".

TABLE 5.11. Category distribution of the sample by industrial sector

Industrial Sector	Category Leader	Lagger	Medium-performer	Promising	Won't go the distance	Row Totals
Electronics	4 %	7 %	78 %	4 %	7 %	100 %
Cement	20 %	12 %	52 %	16 %	0 %	100 %
Automotive	30 %	10 %	40 %	20 %	0 %	100 %
White Goods Suppliers	5 %	15 %	75 %	0 %	5 %	100 %
Overall sample	12 %	11 %	65 %	9 %	4 %	100 %

Figure 5.4 shows the average scores of the companies by industrial sector on both the "strategy/practices index" and on the "operational outcomes index" as a bar chart. The length of a bar indicates the average score on the "overall practices/performance index", which actually measures how close a company is to best practice, out of 200.

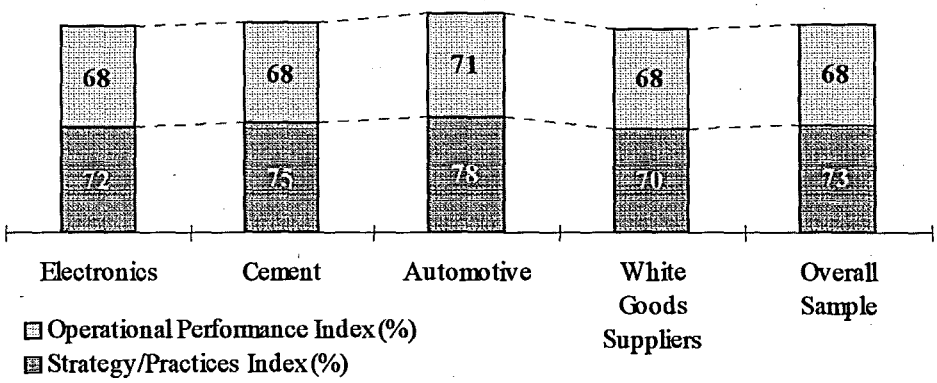

FIGURE 5.4. Best practice adoption of the sample by industrial sector

To investigate statistically the effect of industrial sector on best practice adoption, two hypothesis tests are conducted using the analysis of variance technique for the four sectors: one on the "strategy/practices index" and one on the "operational outcomes index".

In the first test, the null hypothesis H_o claims that the mean "strategy/practices indices" of the electronics, cement, automotive, and white goods supplier companies are equal to each other, whereas the alternative hypothesis H_1 states that these means are different at least for one pair.

H_o: $\mu_{Electronics} = \mu_{Cement} = \mu_{Automotive} = \mu_{White\ Goods\ Suppliers}$

H_1: $\mu_i \neq \mu_j$ for at least one pair (i,j)

A single factor analysis of variance is conducted to test the hypothesis. The analysis reveals that H_o cannot be rejected, for F-value computed is less than the $F_{critical}$-value at 0.05 level of significance (Table 5.12).

TABLE 5.12. Industrial sector doesn't affect implementing best manufacturing practices

SUMMARY

Groups	Count	Sum	Average	Variance
Electronics	27	1932.69	71.11	84.36
Cement	25	1877.79	75.11	104.66
Automotive	10	776.06	77.61	82.82
White Goods Suppliers	20	1393.71	69.68	61.30

ANOVA

Source of Variation	SS	df	MS	F	P-value	F_{crit}
Between Groups	597.30	3	199.10	2.3476	0.0791	2.7218
Within Groups	6615.03	78	84.81			
Total	7212.32	81				

In the second test, the null hypothesis H_o claims that the mean "operational outcomes indices" of the electronics, cement, automotive, and white goods supplier companies are equal to each other, whereas the alternative hypothesis H_1 states that these means are different at least for one pair.

H_o: $\mu_{Electronics} = \mu_{Cement} = \mu_{Automotive} = \mu_{White\ Goods\ Suppliers}$

H_1: $\mu_i \neq \mu_j$ for at least one pair (i,j)

A single factor analysis of variance is conducted to test the hypothesis. The analysis reveals that H_o cannot be rejected, for F-value computed is less than the $F_{critical}$-value at 0.05 level of significance (Table 5.13).

TABLE 5.13. Industrial sector doesn't affect achieving high operational outcomes

SUMMARY

Groups	Count	Sum	Average	Variance
Electronics	27	1827.37	67.68	63.72
Cement	25	1711.37	68.45	68.89
Automotive	10	708.40	70.84	56.95
White Goods Suppliers	20	1362.26	68.11	39.68

ANOVA

Source of Variation	SS	df	MS	F	P-value	F_{crit}
Between Groups	75.22	3	25.08	0.4274	0.7340	2.7218
Within Groups	4576.61	78	58.67			
Total	4651.83	81				

From the results of the two hypothesis tests, it is concluded that industrial sector does not have a significant effect the implementation of best manufacturing practices and achievement of high operational outcomes. The variation across industrial sectors is greater than the variations in practices and outcomes within each sector.

5.7. Effect of Company Size on Best Practice Adoption

The sample used in the study is composed of 82 companies of varying company sizes. Therefore, it is also interesting to see whether there is a significant relationship between company size and the adoption of best practice. Table 5.14 shows the percentages of companies in each company size category that are called the "leader", "lagger", "medium-performer", "promising", and "won't to go the distance" companies.

TABLE 5.14. Category distribution of the sample by company size

	Category					
Company Size	Leader	Lagger	Medium-performer	Promising	Won't go the distance	Row Totals
Large (more than 500)	26 %	0 %	53 %	21 %	0 %	100 %
Small (less than 100)	5 %	9 %	73 %	5 %	9 %	100 %
Medium (100 – 499)	10 %	17 %	66 %	5 %	2 %	100 %
Overall sample	12 %	11 %	65 %	9 %	4 %	100 %

Figure 5.5 shows the average scores of the companies by company size category on both the "strategy/practices index" and on the "operational outcomes index" as a bar chart. The length of a bar indicates the average score on the "overall practices/performance index", which actually measures how close a company is to best practice adoption.

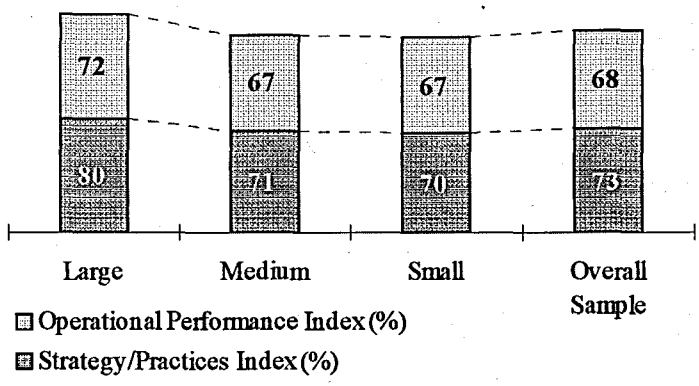

FIGURE 5.5. Best practice adoption of the sample by company size

To investigate statistically the effect of company size on best practice adoption, two hypothesis tests are conducted using the analysis of variance technique for the three company size categories: one for the "strategy/practices index" and one for the "operational outcomes index". In the first test, the null hypothesis H_o claims that the mean "strategy/practices indices" of the companies classified as small-, medium-, and large-sized companies are equal to each other, whereas the alternative hypothesis H_1 states that these means are different at least for one pair.

H_o: $\mu_{Small} = \mu_{Medium} = \mu_{Large}$

H_1: $\mu_i \neq \mu_j$ for at least one pair (i,j)

A single factor analysis of variance is conducted to test the hypothesis. The analysis reveals that H_o should be rejected, for F-value computed is greater than the $F_{critical}$-value at 0.05 level of significance (Table 5.15).

TABLE 5.15. Company size affects implementing best manufacturing practices

SUMMARY

Groups	Count	Sum	Average	Variance
Large	19	1517.45	79.87	29.38
Medium	41	2923.08	71.30	90.11
Small	22	1539.71	69.99	88.82

ANOVA

Source of Variation	SS	df	MS	F	P-value	F_{crit}
Between Groups	1214.26	2	607.13	7.9964	0.0007	3.1123
Within Groups	5998.07	79	75.93			
Total	7212.32	81				

In the second test, the null hypothesis H_o claims that the mean "operational outcomes indices" of the companies classified as small-, medium-, and large-sized companies are equal to each other, whereas the alternative hypothesis H_1 states that these means are different at least for one pair.

H_o: $\mu_{Small} = \mu_{Medium} = \mu_{Large}$

H_1: $\mu_i \neq \mu_j$ for at least one pair (i,j)

A single factor analysis of variance is conducted to test the hypothesis. The analysis reveals that H_o should be rejected, for F-value computed is greater than the $F_{critical}$-value at 0.05 level of significance (Table 5.16).

TABLE 5.16. Company size affects achieving high operational outcomes

SUMMARY

Groups	Count	Sum	Average	Variance
Large	19	1375.96	72.42	59.99
Medium	41	2757.60	67.26	57.63
Small	22	1475.65	67.08	41.33

ANOVA

Source of Variation	SS	df	MS	F	P-value	F_{crit}
Between Groups	398.93	2	199.46	3.7051	0.0290	3.1123
Within Groups	4252.90	79	53.83			
Total	4651.83	81				

From the results of the two hypothesis tests, it is concluded that there is a significant relationship between company size and the implementation of best manufacturing practices and achievement of high operational outcomes. In fact, the variation in practices and outcomes within each industrial sector is greater than the variation across sectors.

As seen in Table 5.15 and Table 5.16, the source of differences on both indices is actually the category of large-sized companies. In implementing best manufacturing practices, the large-sized companies seem to be more successful than the medium-sized, which in turn more successful than the small-sized ones. On the other hand, in achieving high operational outcomes, the large-sized companies seem to be more successful than the medium-sized ones, and the small-sized companies are as successful as the medium-sized ones. In order to validate these observations, three hypothesis tests are conducted: two on the "strategy/practices index" and one on the "operational outcomes index" of the company size categories.

In the first hypothesis test, the null hypothesis claims that the mean "strategy/practices index" of the large-sized and the medium-sized companies are equal to each other, whereas the alternative hypothesis says that the mean of the large sized companies are greater than that of the medium-sized:

H_o: $\mu_{Large} = \mu_{Medium}$

H_1: $\mu_{Large} > \mu_{Medium}$

A t-test with the assumption that the variances are equal is performed. The outcome reveals that H_o should be rejected, and that large sized companies are performing better than medium-sized ones in implementing best manufacturing practices. The t statistics value is greater than the one-tail t-distribution value at 0.05 level of significance (Table 5.17)

TABLE 5.17. Large-sized companies are better than medium-sized companies in implementing best manufacturing practices

	Company Size	
	Large	Medium
Mean	79.8659	71.2946
Variance	29.3748	90.1049
Number of observations	19	41
Degrees of freedom	58	
t – value	3.6586	
t – critical one - tail ($\alpha = 0.05$)	1.6716	

In the second hypothesis, the null hypothesis claims that the mean "strategy/practices index" of the medium-sized and the small-sized companies are equal to each other, whereas the alternative hypothesis says that they are not.

H_o: $\mu_{Medium} = \mu_{Small}$

H_1: $\mu_{Medium} \neq \mu_{Small}$

A t-test with the assumption that the variances are equal is performed. The outcome reveals that H_o cannot be rejected, and the difference in the practices of the medium-sized and the small-sized companies is not statistically significant. In fact, the t statistics value is less than the one-tail t-distribution value at 0.05 level of significance (Table 5.18)

TABLE 5.18. Medium-sized and small-sized companies do not differentiate themselves in implementing best manufacturing practices

	Company Size	
	Medium	Small
Mean	71.2946	69.9867
Variance	90.1049	88.8153
Number of observations	41	22
Degrees of freedom	61	
t – value	0.5227	
t - critical one - tail ($\alpha = 0.05$)	1.9996	

In the third hypothesis, the null hypothesis claims that the mean "operational outcomes index" of the large-sized and the medium-sized companies are equal to each other, whereas the alternative hypothesis says that the mean of the large-sized companies are greater than that of the medium sized:

H_o: $\mu_{Large} = \mu_{Medium}$

H_1: $\mu_{Large} > \mu_{Medium}$

A t-test with the assumption that the variances are equal is performed. The outcome reveals that H_o should be rejected, and that large-sized companies are performing better than medium-sized ones in implementing best manufacturing practices. The t statistics value is greater than the one-tail t-distribution value at 0.05 level of significance (Table 5.19)

TABLE 5.19. Large-sized companies are better than medium-sized companies in achieving high operational outcomes

	Company Size	
	Large	Medium
Mean	72.4190	67.2586
Variance	59.9857	57.6313
Number of observations	19	41
Degrees of freedom	58	
t – value	2.4339	
t – critical one - tail ($\alpha = 0.05$)	1.6716	

The results of the hypothesis test reveals that large-sized companies are performing better than the medium-sized and the small-sized companies both in implementing best manufacturing practices and achieving high operational outcomes. However, there is no significant difference between the medium-sized and the small-sized companies from those aspects.

6. BEST PRACTICE ADOPTION

This chapter is the most comprehensive part of the thesis. It has three main sections ordered as "impact of best practice adoption on business performance", "implementation of best manufacturing practices", and "achievement of high operational outcomes".

In each section, the "leader" and the "lagger" companies together with the companies in the overall sample are analyzed in detail in terms of their responses to surveyed questions that are used to measure the business performance, and to construct the strategy/practices and the operational outcomes indices. These analyses are not carried out for the "won't go the distance" and the "promising" companies which are considered as "outliers" in the BMP Model, and for the "medium-performers" which represent 65 per cent of the overall sample. Although the surveyed companies are categorized into five groups to gain a broader view on the proximity to best practice, understanding the gap between the "leader" and the "lagger" companies both in implementing best manufacturing practices and in achieving high operational outcomes is the central theme for answering the question "does best practice adoption lead to higher business performance?"

The first section examines the business performance of the "leaders" and the "laggers" in terms of average annual growth in total sales per employee, average annual growth in value-added per employee in the last three years, and the level of pre-capital investment cash flow to quantify the impact of best practice adoption on the business performance. The importance of practices and outcomes in relation to company success is also reported. The second section reports on the successful implementation of best manufacturing practices in the areas of planning, focused strategies, factory operations, leadership, people management, customer focus, quality, technology, and benchmarking by the "leaders", by the "laggers", and by the companies in the overall sample. In the third section, the responses given to the survey questions that made up the operational outcomes index are analyzed one by one. Results are given in terms of self-comparison of companies with the best results

achieved by the domestic and foreign competitors, perceived level of operational performance in terms of customer satisfaction, employee morale, process changeover time, technological competitiveness, and productivity; and evaluation of operational performance in terms of performance indicators including delivery full on time, ratio of production operators involved in quality-related mechanisms, and ratio of quality control inspectors to direct operators.

6.1. Impact of Best Practice Adoption on Business Performance

The central hypothesis of the study is that "the more close a company to best practice, both in the practices it adopts and in the operational outcomes that result, the more likely it is to achieve higher business performance". This is strongly supported by the data on the business performance of the "leaders" and the "laggers". It is shown that the "leaders" have achieved substantially higher business performance than the "laggers".

Average annual growth in total sales per employee, average annual growth in value-added per employee, and the level of pre-capital investment cash flow are considered as the three measures of business performance. Value-added per employee is a widely-used indicator of employee productivity. Total sales per employee is an indicator of growth. A high level of pre-capital investment cash flow indicates a healthy growth of the business.

While for the electronics, cement, and automotive companies, the average annual growth in total sales per employee and value-added per employee are calculated over the period 1994 to 1996 and the level of pre-capital investment cash flow reflects the current situation of these companies in 1997, for the white goods supplier companies the period was 1995 to 1997, and the level of cash flow reflects the current situation of these companies in 1998.

As seen in Figure 6.1, the "leader" companies achieved higher average annual total sales growth than the "lagger" companies. The "leaders" accomplished an average annual total sales per employee growth of 20 per cent, which is almost twice as large as that of the "laggers". The overall sample achieved an average annual growth of 12 per cent.

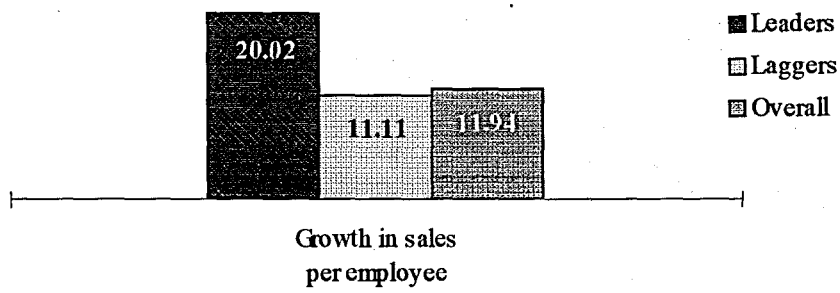

FIGURE 6.1. Average annual growth in total sales per employee in the last three years

As Figure 6.2 shows, while the "leader" companies achieved superior average annual growth in value-added per employee, the growth is negative in the "lagger" companies. The calculated growth is approximately 21 per cent and minus 1 per cent for the "leader" and the "lagger" companies, respectively. In the overall sample, it is 9 per cent.

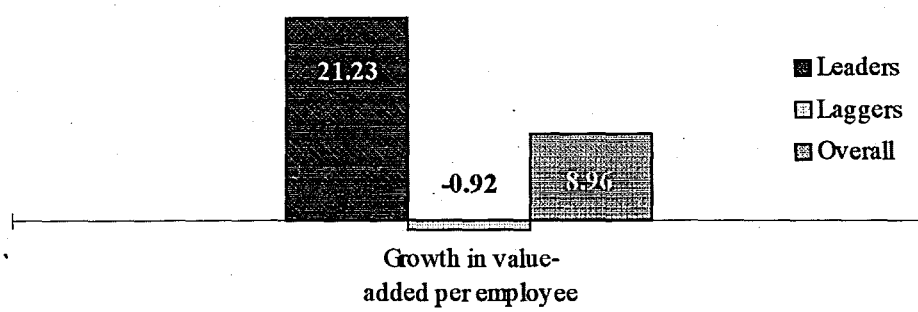

FIGURE 6.2. Average annual growth in value-added per employee in the last three years

As seen in Figure 6.3, the "leader" companies are more likely to experience positive cash flows. Compared with 11 per cent of the "lagger" companies, 63 per cent of the "leader" companies reported a positive pre-capital investment cash flow. This ratio is 44 per cent for the overall sample.

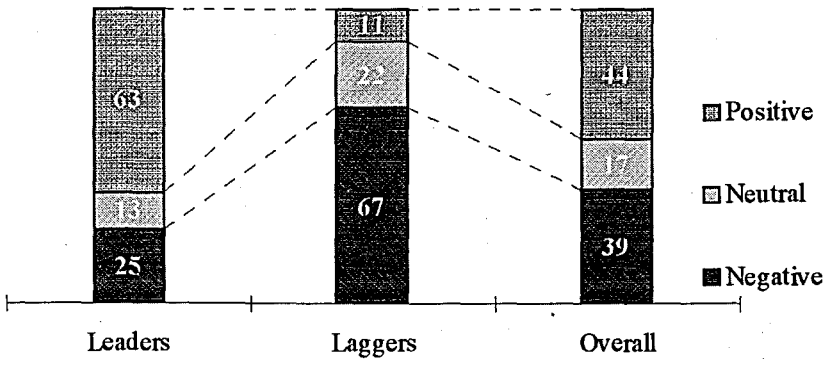

FIGURE 6.3. Pre-capital investment cash flow levels

Moreover, 75 per cent of the "leader" companies reported that their cash flows increased over the last two years, compared with 33 per cent of the "lagger" companies The percentage of companies in the overall sample that reported an increase is 45 per cent (Figure 6.4).

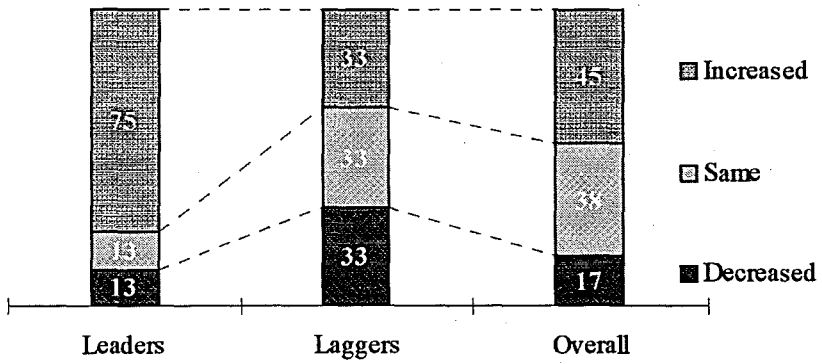

FIGURE 6.4. Change in pre-capital investment cash flow levels in the last two years

The results of the business performance analysis of the "leader" and the "lagger" companies reassured that implementation of best manufacturing practices and achievement of high operational outcomes have a positive impact on business performance. The "leaders" have achieved higher growths in sales per employee and value-added per employee over the last three years, and had positive pre-capital investment cash flows. Besides, majority of the "leader" companies increased their level of cash flows in the last two years.

The average annual growth in employment for the "leader" and the "lagger" companies is also analyzed. As Figure 6.5 shows, the overall sample had nearly 13 per cent of growth in the total number of employees. While the "lagger" companies experienced almost 17 per cent employment growth, the "leader" companies had approximately 11 per cent. As it is reported in the company size distribution of the sample by category (Table 5.10), while 50 per cent of the "leaders" are large-sized, all of the "lagger" companies are either small- or medium-sized with less than 500 employees. The 17 per cent average annual growth in employment over the past three years experienced by the "laggers" might indicate that these companies are increasing their total number of employees with a goal to become a large-sized company, for as discussed in section 5.7, company size affects best practice adoption, which in turn, affects the overall business performance.

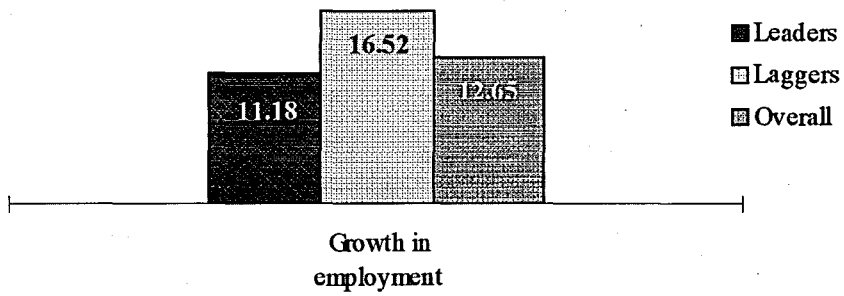

FIGURE 6.5. Average annual growth in employment in the last three years

It might be interesting to examine the average annual change in the ratio of the number of direct workers to the number of total employees. As shown in Figure 6.6, while the ratio is decreased at an average annual rate of 1.35 per cent in the "leader" companies, it is decreased by 0.65 per cent in the "lagger" companies during the last three years. This implies that, the number of direct workers in the total number of employees is increasing more steeply in the "leaders" than in the "laggers". While the "leader" companies are trying to increase the fraction of their white-collared (indirect) employees, the "lagger" companies are trying to increase the fraction of their blue-collared (direct) employees.

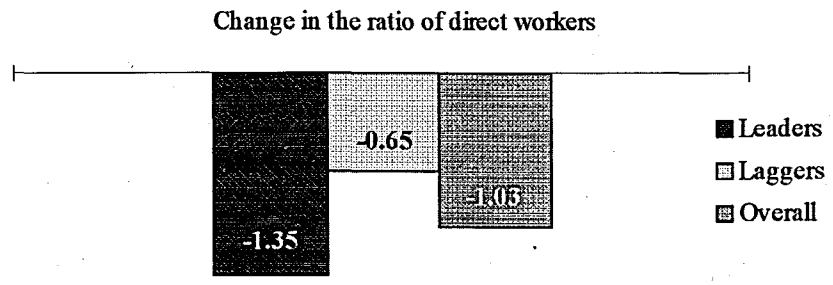

FIGURE 6.6. Average annual change in the ratio of number of direct employees to total number of employees in the last three years

In the survey, companies are asked to rank five practices and five outcomes in relation to their impact on their success. Figure 6.7 and Figure 6.8 displays the percentages of the "leader" and the "lagger" companies that rank the listed practices and outcomes as the "most important" to their current success.

As shown in Figure 6.7, in the overall sample, out of five practices including planning, employee relations, customer relations, and supplier relations, leadership is considered to be the most important ones in relation to their current success. On the other hand, none of the companies considers supplier relations as the most important practice. Recently, developing new supplier management practices and forging stronger relationships with the suppliers take on paramount importance for continuous improvement throughout the supply chain.

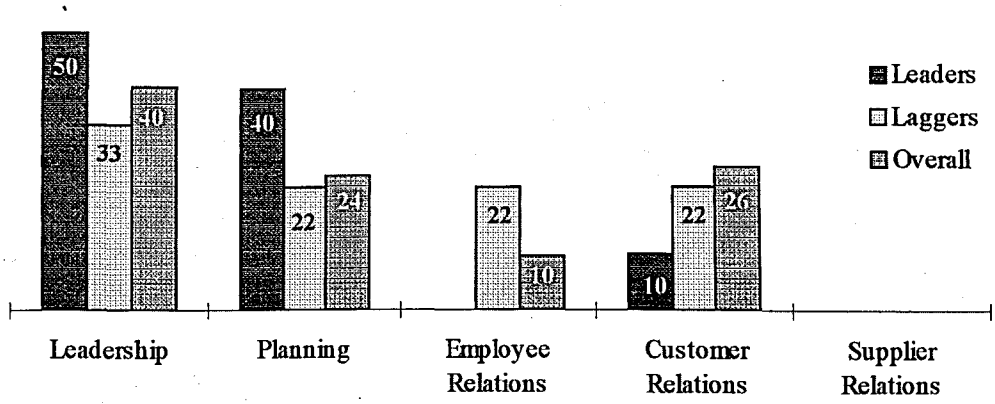

FIGURE 6.7. Practices ranked as "most important" in relation to company success

Among the five outcomes (cost, quality, flexibility, timeliness, and innovativeness), quality is ranked first as the key factor contributing to their success by 54 per cent of the companies in the overall sample, and cost as the second. Timeliness and innovativeness are not considered the most important factor by any of the "leader" companies. The "leader" companies attribute their current success mostly on the quality and cost issues. Timeliness is the first success factor together with quality for the "lagger" companies (Figure 6.8).

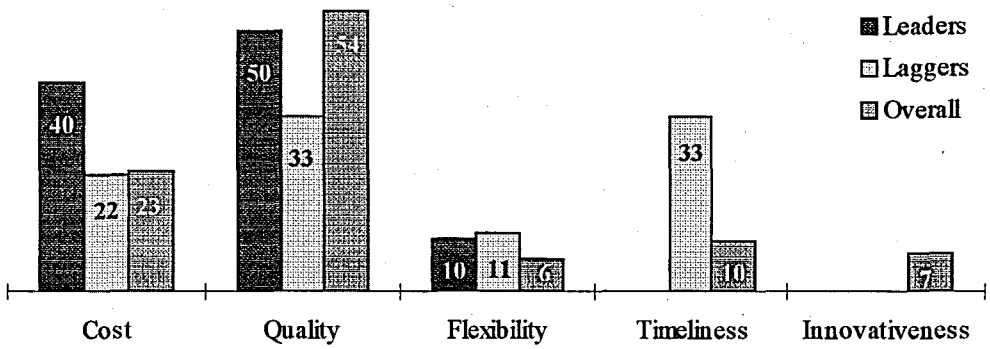

FIGURE 6.8. Outcomes ranked as "most important" in relation to company success

6.2. Implementation of Best Manufacturing Practices

Implementation of best manufacturing practices is measured by means of calculating a "strategy/practices index". To remind, Figure 6.9 shows the average total scores on the index out of 100 attained by the "leaders", "laggers", and by the overall sample.

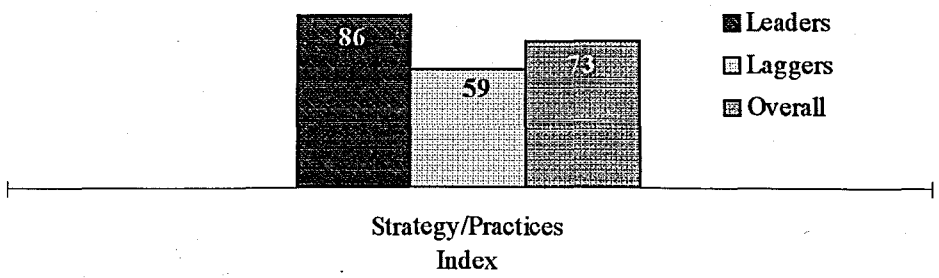

FIGURE 6.9. Average total scores on the strategy/practices index

By definition, "strategy/practices index" is an index that measures the companies in terms of their manufacturing strategies and practices. While the scores on planning, focused strategies, and factory operations contribute to the "strategy" part of the index, the scores on leadership, people practices, customer focus, product and process quality, benchmarking, and technology contribute to the "practices" part. The scores of the "leader" and the "lagger" companies on the components of the "strategy/practices index" are given in Table 6.1. The numbers in the table indicate average total scores out of 100. In the table, "P" stands for planning, "FS" for focused strategies, "FO" for factory operations, "L" for leadership, "PP" for people practices, "CF" for customer focus, "PPQ" for product and process quality, "B" for benchmarking, and "T" for technology.

TABLE 6.1. Mean scores on the components of the strategy/practices index

	Components of Strategy/Practices Index								
Category	P	FS	FO	L	PP	CF	PPQ	B	T
Leader	93	60	86	89	88	88	88	81	96
Lagger	77	53	41	63	58	69	68	60	69
Overall	81	62	67	76	70	78	77	70	82

The scores of the "leader" companies are significantly higher than those of the "lagger" companies on each component of the "strategy/practices index". For the overall sample, the highest score is achieved in the area of technology, whereas the lowest score is in the area of focused strategies.

Figure 6.10 exhibits the relative positions of the "leaders" and the "laggers" in a spider diagram. The distance between the "leader" and the "lagger" companies is largest in the area of factory operations but smallest in the area of focused strategies. Meanwhile, the distance between the overall sample and the "laggers" is largest in the area of factory operations but smallest in the area of planning.

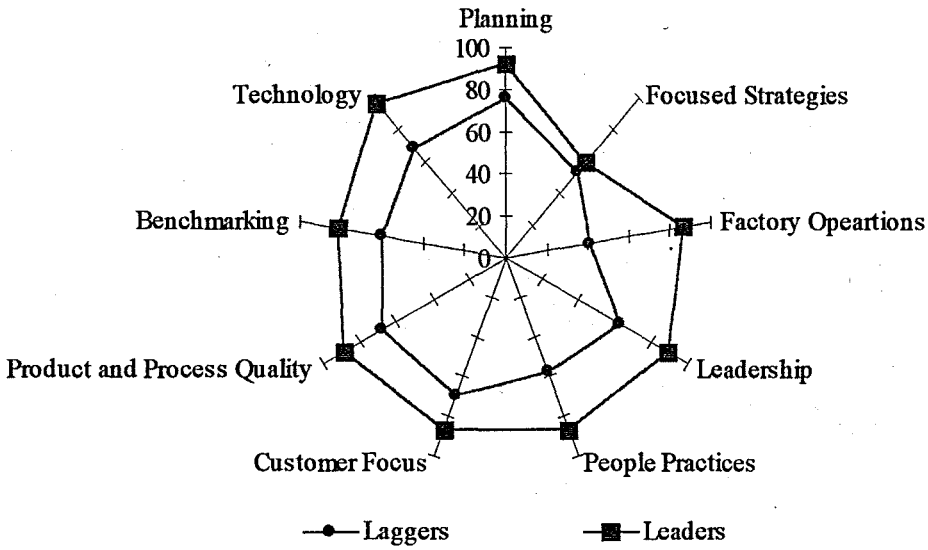

FIGURE 6.10. Relative positions of the leaders and the laggers on the components of strategy/practices index

Responses to the statements inquiring the current positions of companies related to the manufacturing strategy and manufacturing practices from the viewpoint of best practice adoption are analyzed one by one to capture the whole picture. The results are reported in the subsections 6.2.1 through 6.2.7 in the form of tables.

For each practice, a hypothesis test is set on the adoption of the practice. While the null hypothesis claims that the adoption of the practice, measured by the average score attained on the practice (with a maximum of 5 and a minimum of 1) by the "leader" and by the "lagger" companies are equal to each other, the alternative claims that the "leader" companies are better than the "lagger" companies:

H_o: $\mu_{Leaders} = \mu_{Laggers}$

H_1: $\mu_{Leaders} > \mu_{Laggers}$

The purpose is to find a "p-value" which is the smallest level of significance (α) that would lead to rejection of the null hypothesis. The smallest the "p-value", the more

confident we are to reject the null hypothesis and conclude that the "leader" companies are more successful than the "lagger" companies in implementing the practice. One-tail "p-values" are calculated and reported for each of the practices to show to what extent the "leader" companies differentiated themselves from the "lagger" companies.

6.2.1. Manufacturing Strategy

To begin with, transforming an organization to achieve and sustain best practices requires an appropriate manufacturing strategy. Systematic and participative planning processes, focused strategies, and factory operations were the three key elements the BMP Model related to the manufacturing strategy. Figure 6.11 shows the mean scores out of 100 attained by the "leader", "lagger", and the overall sample on the three elements of manufacturing strategy component of the BMP Model.

On the practices related to planning, companies in each category achieved higher scores, and lower scores on the practices related to focused strategies. The "leader" companies, by far, performed better than the "lagger" companies in adopting best manufacturing practices related to factory operations.

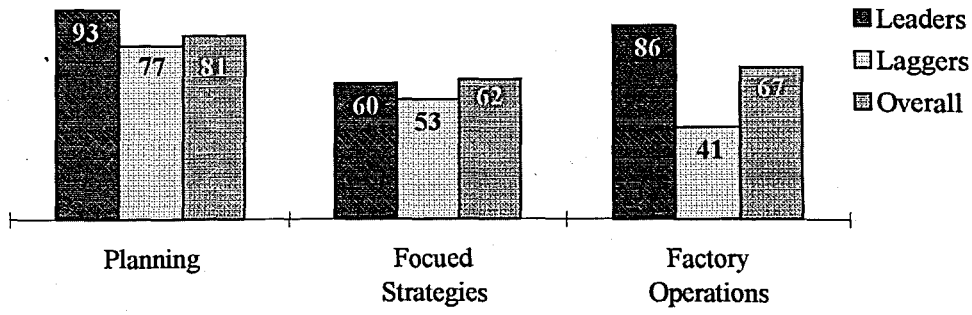

FIGURE 6.11. Adoption of best manufacturing practices related to manufacturing strategy

In any organization, the first step in a planning process should be the development of a clear and shared mission. A mission statement is a declaration of the organization's purpose, explaining what the organization stands for. The mission statement should be supported by a comprehensive and structured planning process, which regularly sets and reviews short-term and long-term goals. In developing business plans, it is critical to incorporate the concerns and requirements of customers, suppliers and other stakeholders, including the community. It is critical, because it allows a company to adjust its strategic position. These plans should focus on the achievement of best practices to attain superior performance. A company's business strategy should also cover its all manufacturing operations. Moreover, manufacturing operations should be effectively aligned with the business mission, for the capability of manufacturing function is central to success of a manufacturing firm. While 40 per cent of the "leaders" consider "planning" as the first factor contributing to their success, this ratio is 22 per cent in the "lagger" companies (Figure 6.7).

TABLE 6.2. Planning aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
There is a mission statement which has been communicated throughout the company	100 %	68 %	72 %	0.0040
There is a comprehensive and structured planning process	100 %	72 %	71 %	0.0050
Plans focus on the achievement of best practices	100 %	85 %	83 %	0.0160
Customer requirements, supplier capabilities, and the needs of other stakeholders are incorporated into the planning process	90 %	95 %	91 %	0.3510
There is a written statement of strategy covering all manufacturing operations	100 %	72 %	72 %	0.0190
The site's manufacturing operations are effectively aligned with its central business mission	100 %	92 %	90 %	0.5320
The capability of the site's manufacturing operations is central to its marketplace success	100 %	85 %	85 %	0.0178

Table 6.2 shows the planning aspects of manufacturing strategy and the extents to which they are adopted by the companies in each category. The numbers in the table indicate the percentages of companies in the specified categories that strongly agreed or agreed with the statement inquired. The "leaders" are performing better than the "laggers" in almost all aspects of planning, except in the practice of incorporation the concerns and requirements of customers, suppliers, and other stakeholders, including the community. In this aspect, the "laggers" and the overall sample reported a higher achievement.

A good strategy formulation requires the alignment of manufacturing strategy with the business strategy. Companies that have misalignment could tend to develop and maintain too many products, address too many markets or introduce too many simultaneous improvement initiatives.

As seen in Table 6.3, there is a lack of alignment, in general. Nevertheless, the "leaders" are more likely to have achieved the alignment, since the percentages of these companies that agreed with the statements inquiring a lack of alignment are less than those of the "laggers" especially in developing and maintaining technologies and attempting too many simultaneous improvement initiatives.

TABLE 6.3. Focused strategies aspects of best manufacturing practices

	Level of unsuccessful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
We are trying to make too many products	56 %	56 %	43 %	0.4344
We are trying to address several different markets, each which has different competitive priorities	56 %	67 %	49 %	0.3749
We have too many technologies to develop and maintain	33 %	67 %	50 %	0.0549
We are attempting too many simultaneous improvement initiatives	22 %	56 %	41 %	0.0810

The last key element of the BMP Model related to the manufacturing strategy is the aspects of factory operations. In the survey, companies are asked to indicate whether they have applied the factors listed in Table 6.4 and if they did, to what extent these factors have contributed to their factory operations. The numbers in the table indicate the percentages of companies in the specified categories that had applied the factors and that these factors had reasonably significant or major contribution to their factory operations.

TABLE 6.4. Factory operations aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
Just in time production	100 %	11 %	67 %	0.0000
Just in time procurement	100 %	11 %	57 %	0.0000
Machine set-up time reduction	90 %	33 %	54 %	0.0023
Warehouse management	90 %	11 %	52 %	0.0001
Materials management	100 %	22 %	63 %	0.0013
Production planning and control	100 %	67 %	87 %	0.0038
Statistical process control	100 %	11 %	52 %	0.0000
Total quality management	100 %	33 %	60 %	0.0022
Preventative maintenance	80 %	0 %	62 %	0.0000
Housekeeping	100 %	11 %	59 %	0.0000
Working with suppliers	100 %	33 %	60 %	0.0012
Quality circles	60 %	0 %	40 %	0.0000
Employee empowerment	90 %	33 %	70 %	0.0028

Table 6.4 shows that, the "leader" companies have achieved quite high scores than the "lagger" companies. The most important result of this analysis is that, while 80 per cent and 60 per cent of the "leaders" had reported a significant or major contribution for the preventative maintenance and for the quality circles, respectively, these ratios are zero in the "laggers". In the overall sample, the lowest scores are in the areas of quality circles, statistical process control, warehouse management, and machine set-up time reduction.

6.2.2. Leadership

The achievement of high performance requires continuous improvement both in the products and processes. Continuous improvement is a necessity because the business environment is changing daily and it is becoming a more knowledgeable and a competitive global community (Chang, 1995). Continuous improvement is only possible through initiation and implementation of successful change management. Committed and visionary leadership becomes the key success factor. The objective is to create a learning organization able to adapt quickly to changes in the environment. Leadership is defined as one of the primary roles of the chief executive and senior managers to shape, maintain and develop the cultural values and attitudes that prevail within the organization (Morden, 1997).

Figure 6.12 shows the mean scores out of 100 attained by the "leaders", "laggers", and by the overall sample on the leadership component of the BMP Model. The "leader" companies, to a great extent, performed better than the "laggers", on the average.

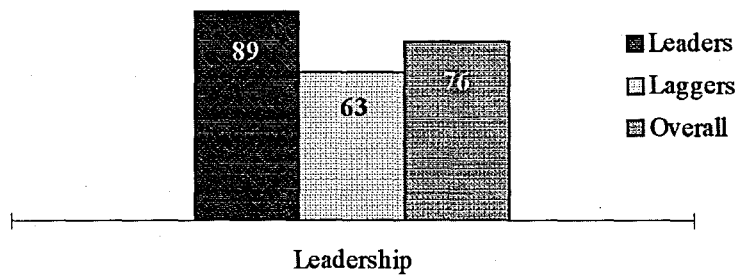

FIGURE 6.12. Adoption of best manufacturing practices related to leadership

Active encouragement of change by senior management, high degree of unity of purpose, effective use of motivation, pursuit of continuous improvement rather than fire fighting, and active use of ideas from production operators are the aspects of leadership inquired in the survey. Table 6.5 shows the percentages of companies in the specified categories that strongly agreed or agreed with these aspects.

TABLE 6.5. Leadership aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
Senior managers actively encourage change and implement a culture of trust, involvement and commitment	100 %	44 %	82 %	0.0012
There is a high degree of unity of purpose throughout this site, and barriers between individuals and / or departments were all eliminated	100 %	33 %	63 %	0.0025
Team spirit and motivation are effectively used to drive best practice in this site	100 %	22 %	62 %	0.0013
We proactively pursue continuous improvement rather than reacting to crises	100 %	67 %	73 %	0.0021
Ideas from production operators are actively used in assisting management	100 %	44 %	77 %	0.0014

Although 50 per cent of the "leader" and 33 per cent of the "lagger" companies considered "leadership" as the first factor contributing to their current success (Figure 6.7), the "leader" companies seemed to surpass the "laggers" with a large margin in successfully implementing best manufacturing practices related to leadership (Table 6.5). Particularly, there are significant differences observed between the "leaders" and the "laggers" in the effective use of team spirit and motivation, and in the assurance of unity of purpose throughout the organization.

6.2.3. People Management

Human resources are the most valuable asset of a company, the development of which is viewed as the key to high performance and sustainable competitiveness. Peeffer (1995) argued that people and how they are managed are becoming more important because many other sources of competitive success are less powerful than they once were. The author claimed that traditional sources of success such as product and process technology, protected or regulated markets, access to financial resources, and economies of scale can

still provide competitive leverage, but at a lesser degree now than in the past, leaving organizational culture and capabilities, derived from how people are managed, as comparatively more vital.

Figure 6.13 shows the mean scores out of 100 attained by the "leaders", "laggers", and by the overall sample on the people management component of the BMP Model. The "leader" companies, on the average, seemed to surpass the "lagger" companies with a large margin in implementing best manufacturing practices related to people management.

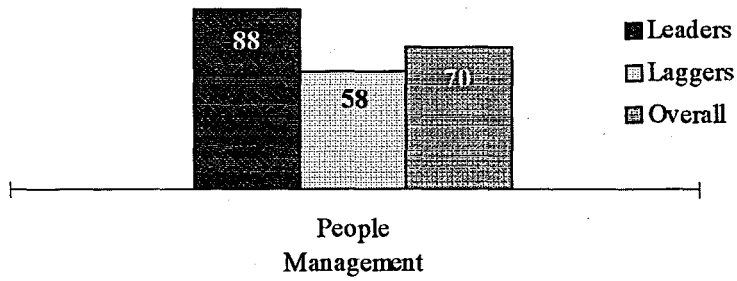

FIGURE 6.13. Adoption of best manufacturing practices related to people management

In the survey, various aspects of human resources management are addressed. These include issues such as communication, employee satisfaction, organization-wide training and career path planning, and the integration of comprehensive occupational health and safety policies into daily operations. Table 6.6 shows the percentages of companies in the specified categories, which strongly agreed or agreed with the listed statements.

As seen in Table 6.6, the "leader" companies are significantly better than the "lagger" companies in almost all aspects of people management. They reported successful implementation of effective top-down and bottom-up communication, formal and regular measurement of employee satisfaction, excellent occupational health and safety practices, and active employee flexibility, multi-skilling and training. A significant difference is also observed between the "leader" and the "lagger" companies to the extent organization-wide

training and development, and career path planning are employed. However, it is surprising to find out that the "leaders" failed to differentiate themselves from the "laggers" in the practice of developing human resources plans that focus on the core skills and competencies required to manufacture competitive products. Interestingly, the companies in the overall sample are more likely to have applied this practice successfully. In the overall sample, the two areas of major weakness are the availability of a formal and regular process for the measurement of employee satisfaction and the availability of an organization-wide training and development process, including career path planning.

TABLE 6.6. People management aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
Our site has effective "top-down" and "bottom-up" communication processes	100 %	22 %	67 %	0.0000
Employee satisfaction is formally and regularly measured	90 %	0 %	32 %	0.0000
We have an organization-wide training and development process, including career path planing, for all our employees	70 %	33 %	44 %	0.0056
Our human resources plan is clearly focused on the core skills and competencies required to manufacture competitive products	44 %	44 %	63 %	0.4262
Employee flexibility, multi-skilling and training are actively used to support improved performance	90 %	56 %	71 %	0.0082
Our occupational health and safety practices are excellent	100 %	33 %	65 %	0.000

6.2.4. Customer Focus

From the viewpoint of enterprises, competitiveness is generally shaped around the customer, leading to the operational definition of competitiveness as the ability to ensure customers prefer company's products and services against alternatives on a sustainable basis. Global competitive pressures are forcing today's manufacturing companies to become more customer focused in terms of offering quality products and services, and shorter order

to delivery cycle times (Gunn, 1992). Customers are more discriminating and competition is much more sophisticated. Successful enterprises of today are characterized by being flexible, adaptive, innovative, and responsive. They are focused on customer needs. Many researches, today, correlate customer satisfaction with improved performance. Customer relationships are recognized to be the key to long term profitability.

Figure 6.14 shows the mean scores out of 100 attained by the "leaders", "laggers", and by the overall sample on the customer focus component of the BMP Model.

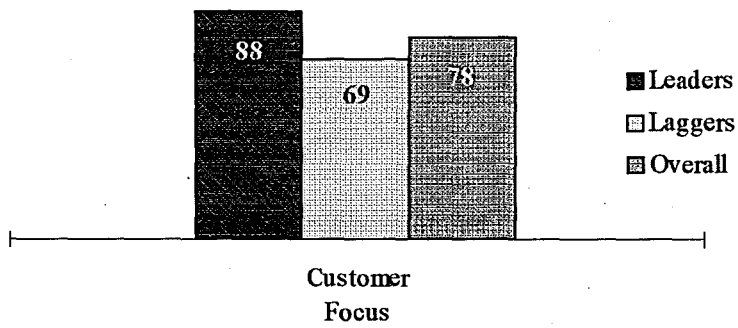

FIGURE 6.14. Adoption of best manufacturing practices related to customer focus

Customer focus is an integral part of the effective pursuit of best practice. The survey address customer focus in terms of various aspects related to the usage of customer requirements and measurement of customer satisfaction. Table 6.7 shows the percentages of companies in the specified categories that strongly agreed or agreed with the listed statements. In the overall sample, it is observed that, in general, there is a widespread and keen awareness of the importance of customer focus (Figure 6.14).

In a highly global competitive market, the voice of the customer takes on paramount importance. Customer requests are considered a primary basis for developing new products and services more frequently than are internally generated observations of competitors or market analysis. Feedback from current customers, customer visits, and personnel contact through customer surveys are some of the methods used to generate innovative ideas.

TABLE 6.7. Customer focus aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
We know our customers' current and future requirements both in terms of volume and product characteristics	100 %	89 %	87 %	0.0083
Customer requirements are effectively disseminated and understood throughout the workforce	100 %	33 %	65 %	0.0002
In designing new products and services we use the requirements of domestic customers	100 %	86 %	94 %	0.0160
In designing new products and services we use the requirements of foreign customers	60 %	29 %	58 %	0.0538
We have an effective process for resolving customers' complaints	100 %	78 %	93 %	0.0021
Customer complaints are used as a method to initiate improvements in our current processes	100 %	89 %	88 %	0.0247
We systematically and regularly measure customer satisfaction	100 %	44 %	72 %	0.0000

Understanding customers' current and future requirements and disseminating them throughout the organization is essential to ensure that customer expectations are correctly translated into designs for new products and services. As shown in Table 6.7, a high percentage of both the "leader" and the "lagger" companies stated that they know current and future requirements of customers to a great extent, and that they use these requirements in designing new products and services. However, information on these requirements is mostly gathered from the domestic customers. Only 60 per cent of the "leaders" and 29 per cent of the "laggers" reported that they use the foreign customer requirements. In the "lagger" companies, there seem to be some obstacles in the dissemination of this information to the employees. Only 33 per cent of these companies indicated that customer requirements are effectively disseminated and understood throughout the workforce.

From the viewpoint of a customer-focused company, fewer customer complaints are the chief measure of process improvement. Customer-focused companies have effective processes for resolving customer complaints, and they use customer complaints to initiate

improvements in their current processes. The primary purpose of process improvement techniques such as capability studies, value analysis, cycle time analysis, and process simplification is to increase the quality and value of the products and services perceived by the customers. What is measured is managed. Hence, instead of waiting the customers to communicate their complaints, measuring customer satisfaction is a more proactive practice. Table 6.7 reveals that, in the overall sample, 93 per cent of the companies have effective processes for resolving customer complaints and 88 per cent are using customer complaints effectively to initiate improvements in current processes. The "laggers" also seem to adopt these practices to a great extent. On the other hand, only 44 per cent of these companies systematically and regularly are measuring customer satisfaction.

6.2.5. Product and Process Quality

From a range of outcomes, including cost, flexibility, timeliness, and innovativeness, "quality" was ranked first as the key factor contributing to company success by 54 of the companies in the overall sample, by the 50 per cent of the "leaders", and by the 33 per cent of the "laggers" (Figure 6.8). These findings may reflect that, over the recent years, quality-oriented programs have often been the first initiative for many companies seeking to undertake an improvement programme. Figure 6.15 shows the mean scores out of 100 attained by the "leaders", "laggers", and by the overall sample on the product and process quality component of the BMP Model.

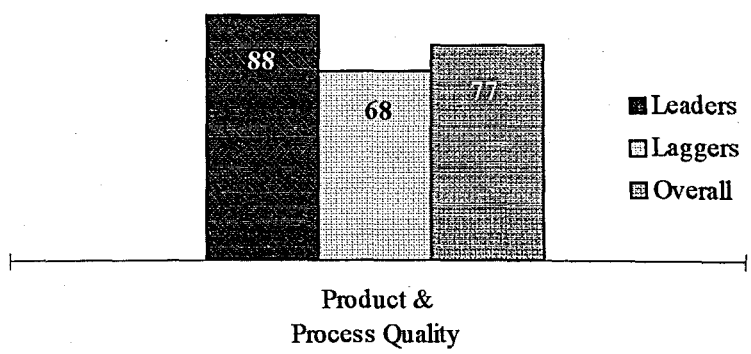

FIGURE 6.15. Adoption of best manufacturing practices related to product and process quality

Table 6.8 shows the aspects of quality inquired in the survey and the companies' reported adoption of them. The numbers in the table indicate the percentages of companies in the specified categories that strongly agreed or agreed with the listed statements.

TABLE 6.8. Product and process quality aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
We have site-wide standardized and documented operating procedures	100 %	78 %	94 %	0.0023
We have well established methods to measure the quality of our products and services	100 %	44 %	76 %	0.0128
All employees believe that quality is their responsibility	100 %	78 %	87 %	0.0002
The concept of "internal customer" is well understood	100 %	13 %	51 %	0.0000
We work closely with our suppliers to improve each others processes	100 %	44 %	67 %	0.0071
Our suppliers have an effective system for measuring the quality of materials they send to us	80 %	22 %	46 %	0.0157

As shown in Table 6.8, more than 75 per cent of the companies in the sample stated that they have site-wide standardized and documented operating procedures, and methods to measure the quality of their products and services. This success can be attributed to the existence of quality certificates since these practices constitute the essentials of certification. Half of the companies surveyed have a quality certificate from ISO9000 series (Figure 6.16), and some have also ISO14000 environmental management certificate. Moreover, 68 per cent of the companies without a certificate indicated that they are working towards obtaining one. The percentage of companies with one or more quality certificates is 60 in the "leaders" and 22 in the "laggers". This may explain why only 44 per cent of the "laggers" have well established methods to measure the quality of their products and services.

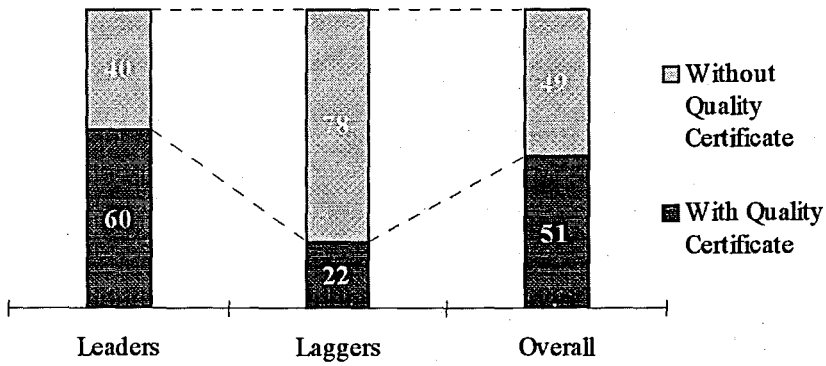

FIGURE 6.16. Quality certification, ISO series

Among the companies without any quality certificate, 86 per cent of the "laggers" and 75 per cent of the "leaders" stated that they are at work to obtain one. On the other hand, among the "lagger" companies with certificates, none of them had plans to obtain another. This ratio is 50 per cent in the "leader" companies that were already certificated. In the overall sample, the ratio of companies cited that they are either at work or they applied to have one was 50 per cent for the non-certificated companies and 72 per cent for the certificated companies. These findings imply that within in two years, most of the companies will have a quality certificate for processes. Having these certificates will become a standard.

Table 6.8 also reveals that, in the overall sample while 87 per cent of the companies has been successful at instilling in all their employees the belief that quality is ultimately an individual's responsibility, rather than a job requirement for a group of quality inspectors. This ratio is 100 per cent in the "leaders" and 78 per cent in the "laggers". Besides, all of the "leader" companies stated that their employees had a clear understanding of internal customer concept (that is, an employee is the customer of another who provides inputs to its process, and the next employee receiving inputs from him, is in turn, his customer) compared with only 13 per cent of the "lagger" companies. This is the weakest area of the "lagger" companies.

One of the most importing finding of the analysis is that, the companies in the sample have poor supplier relations. While majority of companies recognized a strong customer focus is essential (Table 6.7), far fewer attached importance to relationships with their suppliers. None of the companies in any category ranked "supplier relationships" first as a key contributor to their current success (Figure 6.7).

Developing closer and stronger supplier relationships is as essential as customer relationships, for suppliers are located in the upstream of supply chain when the direction of materials flow is considered. Having a poor performance in the upstream of the supply chain will result in poor performance in the internal operations and at last in the very downstream of the supply chain in which consumers are located. Meanwhile, only 67 per cent of the companies in the overall sample reported working closely with their suppliers in product or process development, and only 46 per cent reported that their suppliers have an effective system for measuring the quality of the materials they send to them (Table 6.8). The "leader" companies performed far better than the "lagger" companies in these areas.

6.2.6. Technology

Being technologically competitive is crucial in achieving sustainable competitiveness. Figure 6.17 shows the mean scores out of 100 attained by the "leader", "lagger", and by the overall sample on the technology management component of the BMP Model.

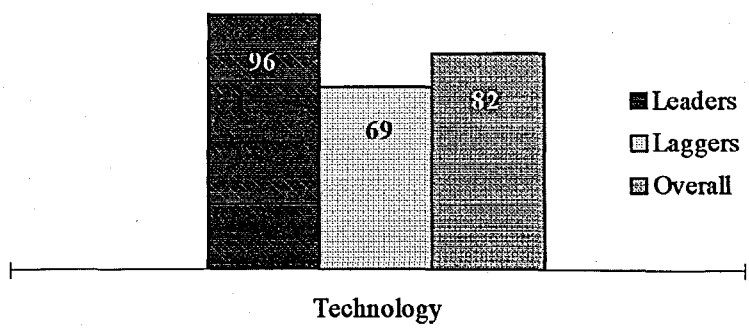

FIGURE 6.17. Adoption of best manufacturing practices related to technology management

Technology should be considered as an integral part of manufacturing to ensure continuous improvement in production systems. The core technology should be appropriate for the competitive needs of the business, should allow the company to be competitive in its market place, and should be utilized to its maximum potential to obtain optimal benefits.

Table 6.9 shows the extent to which these aspects of technology were successfully adopted by the companies. The numbers in the table indicate the percentages of companies in the specified categories that strongly agreed or agreed with the listed statements.

TABLE 6.9. Technology aspects of best manufacturing practices

	Level of successful adoption by			
	Leaders	Laggers	Overall	One-tail p-value
Our core manufacturing technology is appropriate for our needs and allows us to be competitive	100 %	67 %	87 %	0.0006
We utilize our manufacturing technology to its maximum potential	100 %	67 %	77 %	0.0026

As shown in Table 6.9, 100 per cent of the "leader" and 67 per cent of the "lagger" companies reported their core manufacturing technology to be appropriate for their business needs, compared with 87 per cent of the overall sample. Moreover, while all of the "leader" companies indicated that they utilized their manufacturing technology to its maximum potential, this ratio is 67 per cent in the "lagger" companies, and 77 per cent in the overall sample. Hence, aspects of technology emerge as another area that differentiates the "leader" companies from the "lagger" companies.

6.2.7. Benchmarking

The main objective of a benchmarking practice is to share experience. It should not be reduced to the practices of simple comparison, copying, industrial espionage, or a truistic

excursion to other organizations. In the survey, benchmarking was defined as an ongoing and systematic process to search for best practices that produce superior performance when adopted and implemented. The search may be focused on products, services, or the business processes of competitors, or those organizations recognized as leaders in the industry or in specific business processes. The foregoing implies the types of best practices benchmarking which is widely applied in learning organizations.

Benchmarking has become increasingly popular as a key means of improving organizational performance and has been seen as a quality improvement concept in today's business environment. The rise of benchmarking as a quality improvement concept is reinforced as more emphasis is put on benchmarking in the total quality management models such as the Malcolm Baldridge National Quality Award and European Foundation for Quality Management (EFQM).

Figure 6.18 shows the mean scores out of 100 attained by the "leaders", "laggers", and by the overall sample on the benchmarking practices component of the BMP Model.

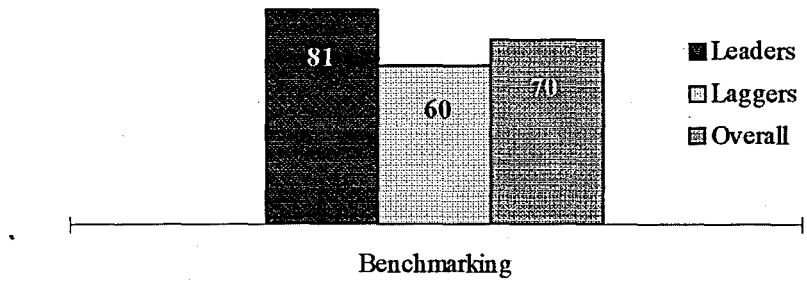

FIGURE 6.18. Adoption of best manufacturing practices related to benchmarking

The importance of benchmarking is pronounced in the survey results. As Figure 6.19 shows, 80 per cent of the "leader" and 33 per cent of the "lagger" companies reported that they applied benchmarking, compared to 65 per cent of the companies in the overall sample.

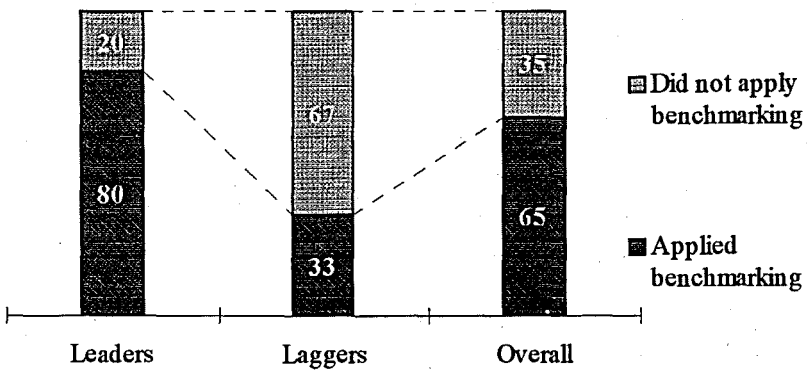

FIGURE 6.19. Benchmarking application

Benchmarking is a cooperative process which requires the formation of a partnership between two or more companies to share information and experience. In the survey, the companies that responding affirmatively to the question "do you benchmark?" were asked to pick with which organizations they had practiced benchmarking from a list of eight possible benchmarking partners. The list included domestic or foreign companies within the same industry or across industries, parent or associated companies, customers, suppliers, and government agencies. The results of the survey also indicate that roughly 75 per cent of the "leaders" and the "laggers", and the companies in the overall sample practiced benchmarking with domestic companies within the same industry. The percentage of the "leader" companies that practiced benchmarking with a parent or associated company within their group is 75.

In the survey, the companies that claimed to perform benchmarking are also asked to pick which areas they practiced benchmarking from a list of six possible areas. The list includes relative cost position, operating procedures, quality procedures, technology, customer service, and human resources utilization. The results demonstrate that the most widely practiced areas are technology, relative cost position, and quality procedures picked by more than 75 per cent of the companies in the sample.

Despite the fact that benchmarking is reported as widely practiced, interviews demonstrated that the concept is far from being uniformly understood. Furthermore, majority of companies claiming that they practiced benchmarking are in fact practicing benchmarking at the simplest possible level. That is, most of the benchmarking applications are ad hoc observations of competitors' products and services mostly by means of attending trade shows and site visits or are comparisons of the performance with the previous year. Information needed for benchmarking against a competitor is generally obtained from the customers. These findings suggest that higher levels of benchmarking is a new and uncertain concept for many companies in the sample, regardless of being a "leader" or a "lagger".

Since competition takes place between a number of competitors in the market place, accessing and reviewing competitors' information is essential to finding out strengths and weaknesses of a company relative to its competitors. This information is deemed to be very useful especially in developing competitive strategies. In the survey, companies are asked to pick the factors from a list of thirteen on which they review information about their competitors. Table 6.10 shows the response rates for each factor as a percentage of companies in the specified categories.

TABLE 6.10. Reviewing information about competitors

	Reviewed by		
Competitor information on	Leaders	Laggers	Overall
Market share	80 %	56 %	67 %
Use of manufacturing technologies	70 %	67 %	67 %
Product quality and procedures	70 %	67 %	66 %
Human resource practices and policies	80 %	22 %	44 %
Product range	80 %	56 %	62 %
Access to and cost of raw materials	80 %	44 %	55 %
Relative cost position	80 %	56 %	54 %
Processes in bringing new products to market	80 %	33 %	45 %
Safety records	50 %	11 %	23 %
planning and investment justification processes	50 %	11 %	29 %
Customer service procedures	80 %	33 %	55 %
Time taken from order receipt to product delivery	60 %	11 %	41 %
Strategies for downtime minimization	60 %	11 %	37 %

In the overall sample, more than 60 per cent of the companies are reviewing information about their competitors on market share, use of manufacturing technologies, product quality and procedures, and product range. On these factors and on relative cost position, there is not a significant difference observed between the "leaders" and the "laggers". Nevertheless, the "leader" companies are performing far better than the "lagger" companies in devoting concern to and making use of competitors' information on the other factors questioned. The least frequently reviewed factors are safety records, and planning and investment justification processes of competitors, with 50 per cent of the "leaders" in comparison to less than 30 per cent of the companies in the overall sample.

6.3. Achievement of High Operational Outcomes

The extent of achieving high operational outcomes is measured by means of calculating an "operational outcomes index". This index is constructed by the responses given to the selected questions incorporated in the "performance/outcomes" module of the "Competitive Strategies and Best Practices Benchmarking Questionnaire". The purpose of these questions is to assess companies' operational performance in terms of cost, quality, flexibility, timeliness, and competitiveness. Figure 6.20 shows the average total scores on the "operational outcomes index" out of 100 attained by the "leaders", "laggers", and by the companies in the overall sample.

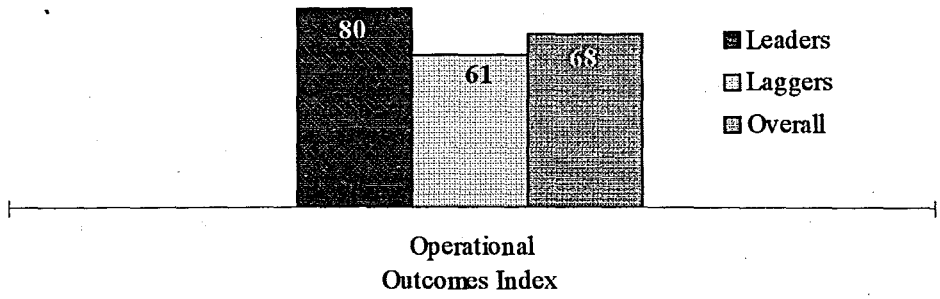

FIGURE 6.20. Average total scores on the operational outcomes index

In this section, it is aimed to present the whole picture of the surveyed companies in terms of operational performance so that differentiation between the "leaders" and the "laggers" would be seen in more detail. The responses given to the questions that made up the "operational outcomes index" are classified into three groups: self-comparison of companies with the best results achieved by the domestic and foreign competitors; assessment of operational performance in terms of customer satisfaction, employee morale, process changeover time, productivity, and technological competitiveness; assessment of operational performance in terms of performance indicators including delivery full on time, proportion of production operators involved in process improvement or problem solving teams, and proportion of quality control inspectors to direct operators.

6.3.1. Comparisons with the Best Results Achieved by Competitors

In the survey, companies are required to compare their current performance levels with the best results achieved by their domestic and foreign competitors in terms of total cost per unit of product, finished product defect rate, order to delivery time, and lost capacity due to production breakdowns, on a scale 1 (much higher) to 5 (much lower). The results are depicted in Figures 6.21 through 6.25. The numbers in the figures indicate the percentages of companies in the specified categories that reported lower or much lower levels achieved in these factors relative to their domestic and foreign competitors. Hence, these numbers indicate the percentage of advantageous companies in each factor with respect to their competitors.

The result of the analysis reveals that companies are not so much aware of their foreign competitors. As shown in Figure 6.21, more than 20 per cent of the companies in all categories reported that they do not know the results achieved by their foreign competitors. In today's global competitive market, having information on the foreign competitors is as crucial as having information on the domestic competitors. The "leader" companies seem to be more knowledgeable about their competitors.

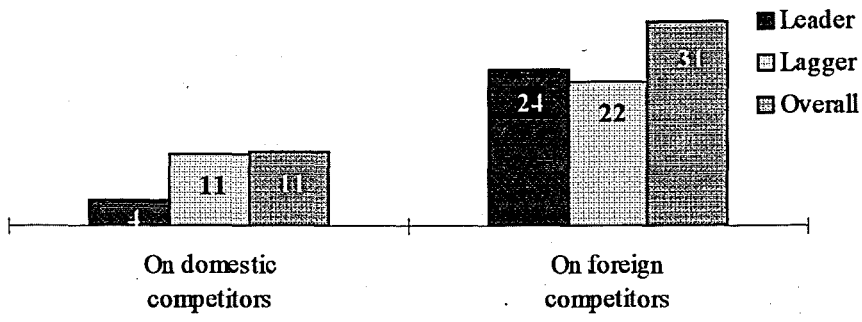

FIGURE 6.21. Companies without any knowledge on their competitors

Figure 6.22 shows the percentages of companies that assessed their total cost per unit of product lower or much lower than that of their domestic and foreign competitors.

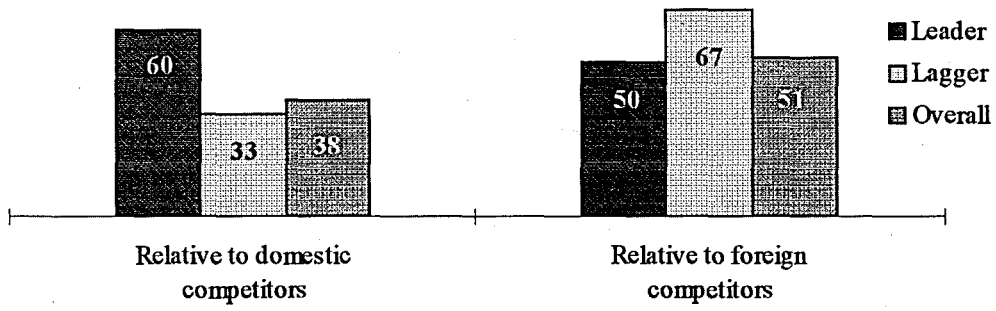

FIGURE 6.22. Companies with less total cost per unit of product relative to competitors

In the overall sample, 38 and 51 per cent of the companies reported lower total cost per unit of product relative to their domestic and foreign competitors, respectively. While more than half of the "leaders" thought that they had cost advantage relative to their domestic and foreign competitors, the "laggers" thought that they had cost advantage especially relative to foreign competitors (Figure 6.22).

Figure 6.23 shows the percentages of companies in each category assessing their finished product defect rate lower or much lower than that of their domestic and foreign competitors.

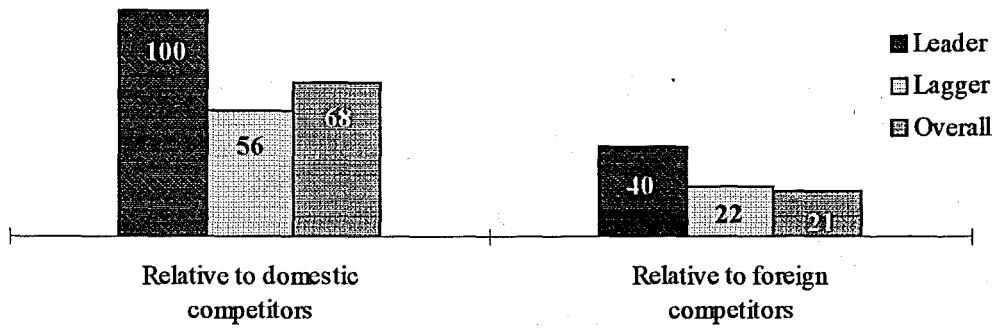

FIGURE 6.23. Companies with less finished product defect rate relative to competitors

Finished product defect rate is a widely used indicator of product quality. In the overall sample, only 21 per cent of the companies reported that their finished product defect rate is lower than that of foreign competitors, which implies admission of a handicap. It seems to be a handicap also for the "leaders". Yet, larger percentage of the "leader" companies thought that they were more advantageous relative to competitors (Figure 6.23).

Figure 6.24 shows the percentages of companies in each category perceiving their order to delivery cycle time lower or much lower than that of their domestic and foreign competitors.

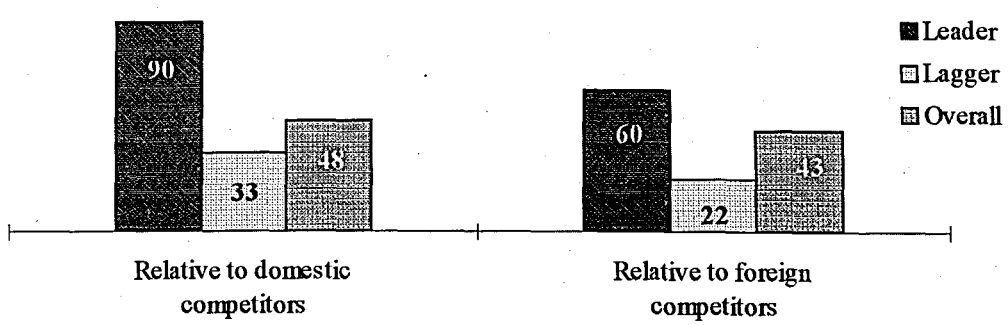

FIGURE 6.24. Companies with less order to delivery time relative to competitors

Order to delivery cycle time is a widely used indicator of service quality. In general, order to delivery cycle time is not considered to be a point of superiority. Relative to foreign competitors, 60 per cent of the "leaders" reported lower cycle times, compared with 33 per cent of the "laggers". Moreover, the "leaders" are performing far better than the "laggers" in comparison to their competitors (Figure 6.24).

One of the primary reasons of capacity loss in a manufacturing firm is the production downtimes caused by machine breakdowns or unplanned stops. Preventative maintenance is considered to be an effective tool to decrease production downtimes. Figure 6.25 shows the percentages of companies in each category that reported lower or much lower capacity loss than those of their domestic and foreign competitors. The results imply that, in general, companies had problems in this area, particularly relative to foreign competitors. However, this is the single performance outcome that most clearly separated the "leaders" from the "laggers".

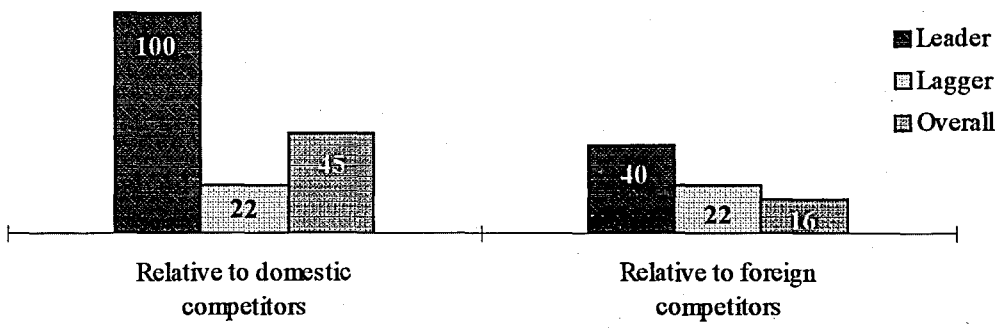

FIGURE 6.25. Companies with less percentage of lost capacity due to production downtime relative to competitors

6.3.2. Operational Outcomes in Terms of Performance Attributes

In the survey, companies are required to assess their operational performance in terms of customer satisfaction, employee morale, process changeover time, productivity, and technological competitiveness on a scale 1 to 5, where 1 always indicates the lowest performance level and 5 indicates always the highest level. The results are depicted in Figure 6.26 through Figure 6.30. In the figures, the numbers indicate the percentages of companies in specified categories that reported high performance levels. It was found that, in general, the "leader" companies are far better than the "lagger" companies in the achievement of high performance levels.

Global competitive pressures are forcing today's manufacturing companies to become more customer focused in terms of offering quality products and services, and offering faster and reliable deliveries. As companies compete to provide the best customer service, service is fast becoming a major point of differentiation. Leveraging customer service is paramount to superior performance, for customers now tell suppliers what they want, when they want it, and what they will pay for it.

Customer satisfaction is highly correlated with improved performance. Meeting customers' requirements and expectations is a broad indicator of customer satisfaction. However, as shown in Figure 6.26, more than half of the companies in the overall sample declared that they occasionally fail to meet customer expectations. The "leader" companies differentiate themselves from the "lagger" companies in that respect. Sixty per cent of the "leader" companies believed that expectations were always met and sometimes exceed, compared with 22 per cent of the "lagger" companies.

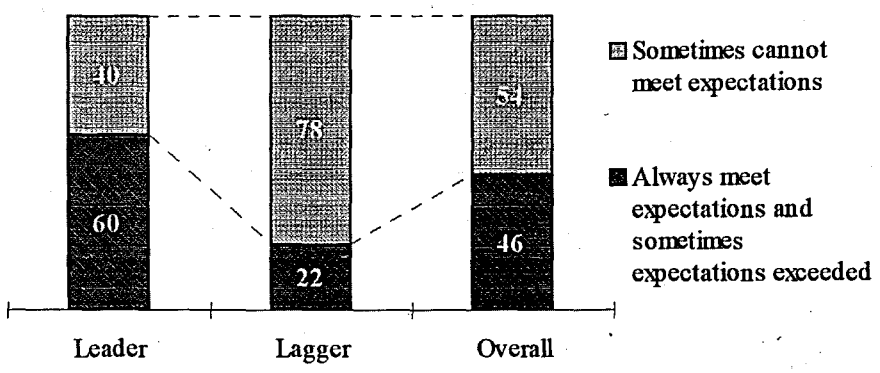

FIGURE 6.26. Level of customer satisfaction

Employee morale is an indicator of employee satisfaction. As shown in Figure 6.27, all of the "leader" companies reported high level of employee morale, compared with the 11 per cent of the "lagger" companies. This ratio is 41 per cent in the overall sample.

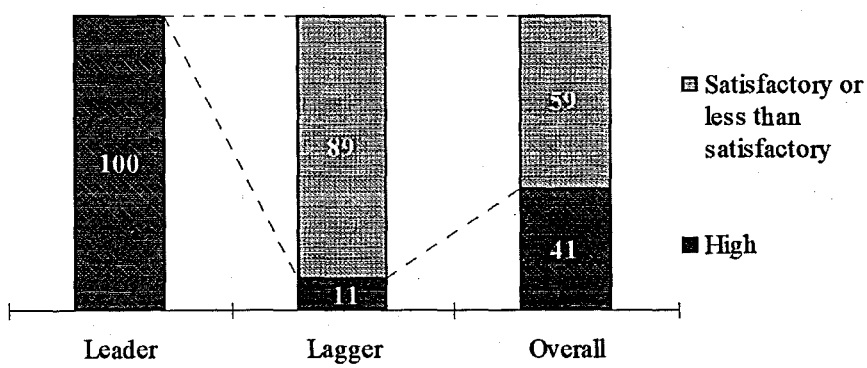

FIGURE 6.27. Level of employee morale

Value-added per employee is a widely-used indicator of productivity. Figure 6.28 shows the level of productivity achieved by the companies in each category. All of the "leader" companies reported that their level of productivity is consistently improving and they gained significant benefits, compared with 33 per cent of the "lagger" companies. In the overall sample, 41 per cent of the companies stated that their level of productivity needs improvement to some extent.

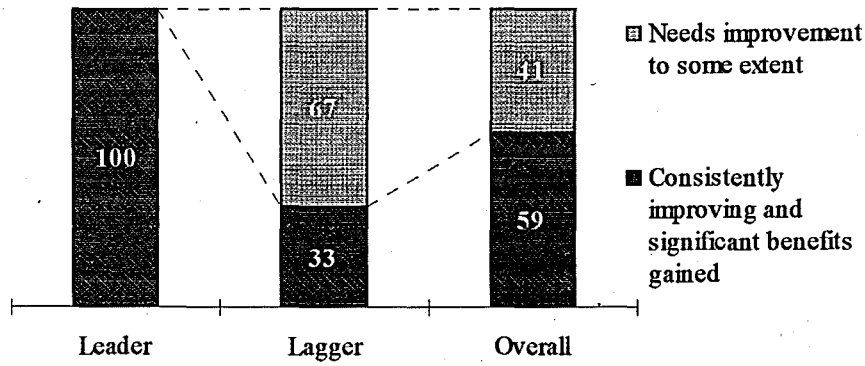

FIGURE 6.28. Level of productivity

Average process changeover time is one of the indicators of flexibility. It is the time required to change a specific machine, work center, or line from making the very last piece of product to the very first piece of another different product. It may include the run and inspection time for the first piece. As shown in Figure 6.29, 67 per cent of the companies in the overall sample argued that the average process changeover time needs improvement to some extent. Although, the "leaders" are much better than the "laggers" in that respect, still 40 per cent reported a need for improvement.

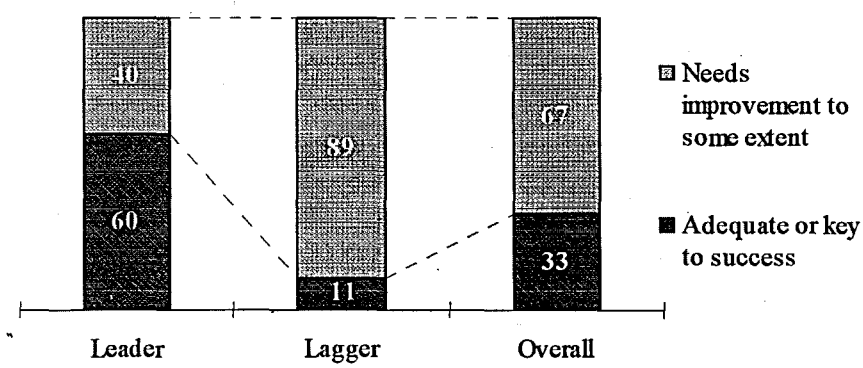

FIGURE 6.29. Average process changeover time

Committing to remain technologically competitive is a necessity for manufacturing companies to ensure continuous improvement in their production systems. As shown in Figure 6.30, all of the "leader" companies reported that they have advantages over competitors or that they are technologically leader, compared with only 11 per cent of the

"lagger" companies. In the overall sample, 45 per cent of the companies believed that their relative level of technological competitiveness is on par or behind competitors.

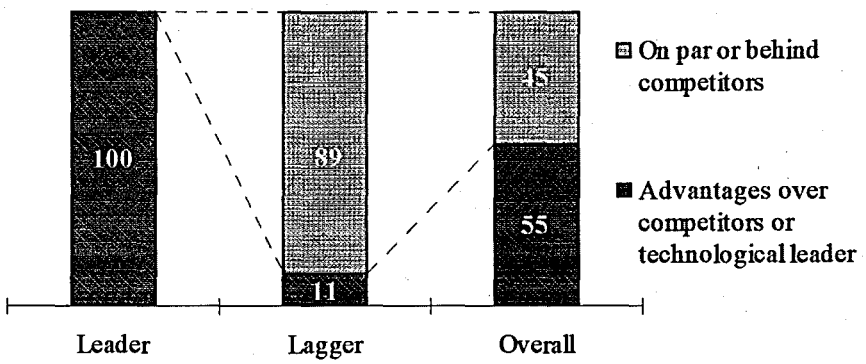

FIGURE 6.30. Relative level of technological competitiveness

6.3.3. Operational Outcomes in Terms of Performance Indicators

In the survey, companies are required to indicate the percentage of delivery full on time to customers, proportion of production operators involved in process improvement / problem solving teams / quality circles, and ratio of quality control inspectors to direct production operators on a predetermined scale 1 to 5, where 1 indicates the lowest ratio and 5 the highest ratio. The results are depicted in Figure 6.31, 6.32, and 6.33, respectively. In the figures, the numbers indicate the percentages of companies within specified range of values. It is found that, in general, the "leader" companies are far better than the "lagger" companies in the achievement of high operational outcomes .

Delivery full on time is the most widely used performance indicator in measuring delivery performance. It is defined as the percentage of time a company delivers the orders at the right quantities and at the right time to its customers. As shown in Figure 6.31, almost 80 per cent of the companies in the sample reported that more than 91 per cent of the time, they deliver orders full and on time. While the percentage of the "lagger" companies that reported more than 96 per cent delivery full on time performance is 44, it is

40 in the "leaders". Moreover, the percentage of the "leaders" that reported delivery performance less than 50 per cent is 20, compared with 11 per cent of the "laggers". However, in general, it can be said that the "leaders" outperform the "laggers", since while 80 per cent of the "leaders" declared that they achieved a delivery performance of more than 91 per cent, it is only 55 per cent of for the "laggers".

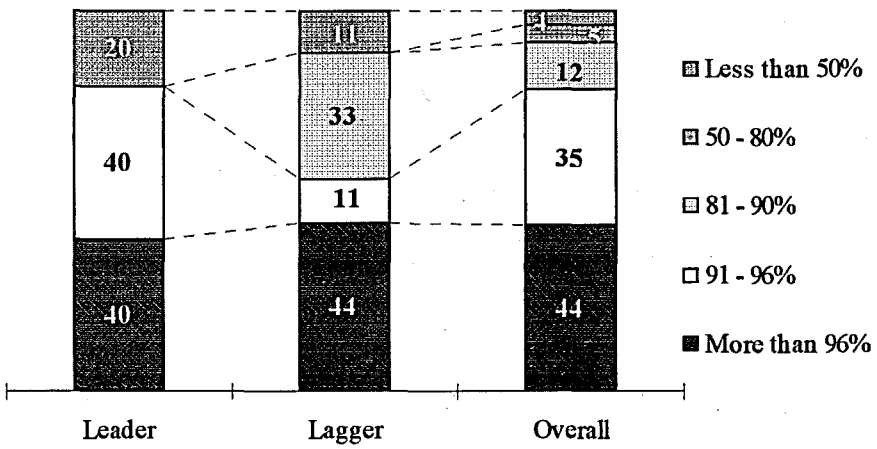

FIGURE 6.31. Delivery full on time to customers

Lean production approach and total quality management advocate lowering of the number of quality inspectors and delegation of quality related responsibilities to production operators. Moreover, quality advocates have long stresses employee involvement as an important key to turning quality strategies into demonstrable quality performance. Hence, involvement of workforce in quality-related mechanisms such as suggestion systems, problem-solving teams, and quality improvement teams is of great importance. The concept of internal customer and the belief that quality is an individual's responsibility promote that understanding.

In the survey, the ratio of quality control inspectors to direct production operators is used as an indicator of how well these concepts are disseminated among the surveyed companies. The smaller the ratio, the more these concepts are said to be disseminated. As shown in Figure 6.32, 57 per cent of the companies in the overall sample, 50 per cent of the

"leader" companies and 56 per cent of the "lagger" companies reported this ratio as between 2.1 and 10.0 per cent. However, 30 per cent of the "leader" companies reported a ratio of less than 1.0 per cent. Despite the fact that, the "leader" companies are far better than the "lagger" companies in employing less quality control inspectors, this ratio needs to be decreased further.

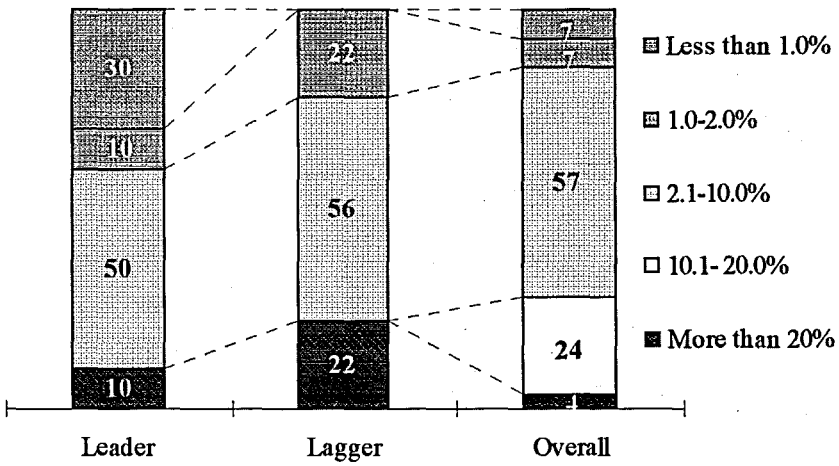

FIGURE 6.32. Ratio of quality control inspectors to direct production operators

The proportion of production operators involved in process improvement or problem solving teams, or quality circles is used as another indicator of how well total quality philosophy is proliferated among the surveyed companies. As shown in Figure 6.33, 52 per cent of the companies in the overall sample reported this ratio as less than 5 per cent, which is very low. The "leaders" are clearly separated from the "laggers" in that respect. While 40 per cent of the leader companies reported a ratio of more than 50 per cent, all of the lagger companies reported a ratio of less than 5 per cent.

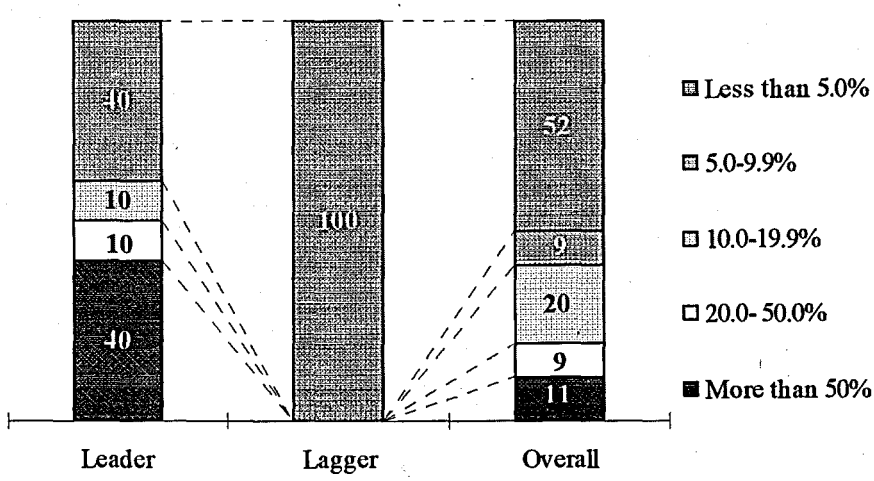

FIGURE 6.33. Proportion of production operators involved in process improvement / problem solving teams / quality circles

Figure 6.32 and Figure 6.33 reveal that, in general, human side of quality is a new issue for the surveyed companies. To become a world-class company, it is essential to involve employees in the pursuit of improvement goals.

7. COMPETITIVE STRATEGIES FOR MANUFACTURING

This chapter examines the competitive strategies of the surveyed companies from the viewpoint of the "process model of manufacturing strategy" which was proposed by Kim et al (1996). It has three sections ordered as competitive priorities, manufacturing objectives, and action plans. Competitive priorities indicate what the manufacturing function should achieve with regard to cost, quality, flexibility and delivery, in order to support the company's business strategy. Once the manufacturing function sets its competitive priorities, measurable performance targets should be established. These targets refer to manufacturing objectives which are identified to support the envisaged competitive priorities. To achieve the established set of manufacturing objectives, in turn, the management should develop improvement programmes; in other words, action plans, to implement in the future.

Using the responses given to the questions included in the competitive strategy module of the "Competitive Strategies and Best Practices Benchmarking Questionnaire", the five most important competitive priorities, manufacturing objectives and action plans of the companies envisaged for the next two years are analyzed to highlight the strategic aspects of manufacturing management in the companies operating in the electronics, cement, automotive, and white goods suppliers sectors of the Turkish industry. These aspects are also examined for the "leader" and the "lagger" companies to see the differences in their managerial focal points.

7.1. Competitive Priorities

The first step in the formulation of a manufacturing strategy is the selection of a set of "competitive priorities". In the questionnaire, companies are required to form their rank ordered list of five most important competitive priorities from a list of 15, that will

predominate their actions for the next two years. Table 7.1 lists the competitive priorities presented in the questionnaire, and their importance to the surveyed companies by category. Each number in the table indicates the percentage of companies selected the respective competitive priority as one of its most important five.

TABLE 7.1. Competitive priorities of the sample by category

	Category		
Competitive Priorities	Leader	Lagger	Overall
Consistent quality level	70 %	89 %	80 %
Reliable products	60 %	78 %	65 %
Low price products	20 %	56 %	56 %
Rapid deliveries	60 %	44 %	38 %
Dependable deliveries	50 %	11 %	35 %
Rapid design changes / new products	40 %	22 %	34 %
After sales services	50 %	11 %	34 %
Brand image	30 %	44 %	33 %
Rapid adoption to volume changes	10 %	33 %	30 %
Product specilization	20 %	22 %	23 %
A broad product line	20 %	33 %	17 %
High performance products	40 %	0 %	16 %
Durable products	20 %	22 %	10 %
Wide distribution	10 %	22 %	10 %
Niche market	0 %	0 %	5 %

Table 7.1 suggests that the "leader" companies put much more emphasis on providing high performance products relative to the "laggers", whereas the "laggers" put much more emphasis on offering low price products.

The top five competitive priorities of the surveyed companies derived form Table 7.1 are listed in Table 7.2 for each category in descending order of importance. The tie breaker is the rank attributed to the competitive priorities. That is, the competitive priority ranked first by a larger number of companies was considered to be more important than the others, even though both were selected by the same percentages of companies.

TABLE 7.2. The top five competitive priorities of the sample by category

Leader	Lagger	Overall
1. Consistent quality level	1. Consistent quality level	1. Consistent quality level
2. Reliable products	2. Reliable products	2. Reliable products
3. Rapid delivery	3. Low price products	3. Low price products
4. Dependable deliveries	4. Rapid delivery	4. Rapid delivery
5. After sale service	5. Brand image	5. Dependable deliveries

The first two competitive priorities of the overall sample are "ability to offer a consistent quality level" and "ability to provide reliable products", implying that the surveyed companies are placing strategic importance on quality as a key means of competing in the next two years. The competitive priority of "ability to offer low price products" suggests that companies would also be competing on the basis of price. Looking at the overall sample, we can conclude that the surveyed companies are aiming to serve its customers high quality products at lower prices. The fourth and the fifth priorities, "ability to provide rapid and dependable deliveries" highlight the importance of delivery (Table 7.2). In sum, competitive priorities of the companies in the next two years would be *quality, price,* and *delivery* in descending order of importance.

The first four competitive priorities of the "lagger" companies are the same as those of the overall sample. The fifth one being "to create a brand image" implies that these companies are intending to grow by establishing themselves in the market (Table 7.2). Briefly, competitive priorities of the "lagger" companies in the next two years would be on *quality, price, delivery,* and *growth* in descending order of importance.

The list of top five competitive priorities of the "leaders" differs slightly from those of the overall sample. Ability to offer low price products, selected only by 20 per cent, would not be an important competitive priority. Instead, ability to provide effective after sales service was heavily emphasized. In sum, competitive priorities of the "leaders" in the next two years would be on *quality, delivery,* and *service* in descending order of importance.

7.2. Manufacturing Objectives

Once a manufacturing function sets its competitive priorities, measurable performance targets should be established. These targets refer to "manufacturing objectives" which are identified to support the envisaged competitive priorities. In the questionnaire, companies are required to form their rank ordered list of five most important manufacturing objectives from a list of 15, that will predominate their actions for the next two years. Table 7.3 lists the objectives presented in the questionnaire, and their importance to the surveyed companies by category. Each number in the table indicates the percentage of companies that selected the respective manufacturing objective as one of its most important five.

TABLE 7.3. Manufacturing objectives of the sample by category

	Category		
Manufacturing Objectives	Leader	Lagger	Overall
Reduce unit cost	100 %	100 %	91 %
Increase market share	80 %	78 %	76 %
Increase conformance quality	80 %	56 %	60 %
Improve profitability	50 %	56 %	44 %
Reduce breakdowns and unplanned stops	20 %	33 %	37 %
Increase production rate	30 %	33 %	32 %
Reduce new product development lead time	50 %	11 %	30 %
Increase direct labour productivity	10 %	22 %	26 %
Increase delivery reliability	10 %	33 %	24 %
Increase delivery rate	30 %	22 %	24 %
Reduce production lead time	10 %	11 %	18 %
Increase inventory turnover rate	10 %	11 %	12 %
Increase return on investment	10 %	22 %	9 %
Reduce set-up times	0 %	0 %	6 %
Decrease product break-even point	0 %	0 %	5 %

Table 7.3 suggests that the "leader" companies relative to the "lagger" companies put much more emphasis on reducing new product development lead time, whereas the "laggers" put much more emphasis on increasing delivery reliability. That is, while the "lagger" companies are aiming to increase their *dependability*, the "leader" companies are aiming to increase their *innovativeness*.

The top five manufacturing objectives of the surveyed companies derived form Table 7.3 are listed in Table 7.4 for each category in descending order of importance. The tie breaker is the rank attributed to the manufacturing objectives. That is, the manufacturing objective ranked ranked first by a larger number of companies was considered to be more important than the others, even though both were selected by the same percentages of companies.

TABLE 7.4. The top five manufacturing objectives of the sample by category

Leader	Lagger	Overall
1. Reduce unit cost	1. Reduce unit cost	1. Reduce unit cost
2. Increase conformance quality	2. Increase market share	2. Increase market share
3. Increase market share	3. Increase conformance quality	3. Increase conformance quality
4. Reduce new product development lead time	4. Improve profitability	4. Improve profitability
5. Improve profitability	5. Increase production rate	5. Reduce breakdowns and unplanned stops

As shown in Table 7.4, in the next two years, reducing unit cost, increasing conformance quality, improving profitability, and increasing market share would be the four common manufacturing objectives of the companies in all categories. Reducing unit cost and increasing conformance quality are consistent with the competitive priorities of low price and high quality. Improving profitability would be the other most important manufacturing objective. While improving profitability has a direct relationship with the objective of reducing unit cost, it has also a close relationship with product differentiation by offering customers high value-added products. The objective of increasing market share implies that companies are planning to take an aggressive posture in the next two years. The site visits revealed that the main targets of this aggressive activity would be markets outside Turkey.

A recent study made in North America (European Commission for Industry, 1996) examined the relationship between quality, market share, and profitability (Figure 7.1). The study revealed that, regardless of the market being mature or emerging, a company with a

large market share is expected to generate higher profits with respect to its competitors offering similar quality levels. Moreover, higher levels of quality is another factor increasing the profitability regardless of the size of the market share. The competitive priorities and the manufacturing objectives of the surveyed companies were deemed to be consistent with results of this study.

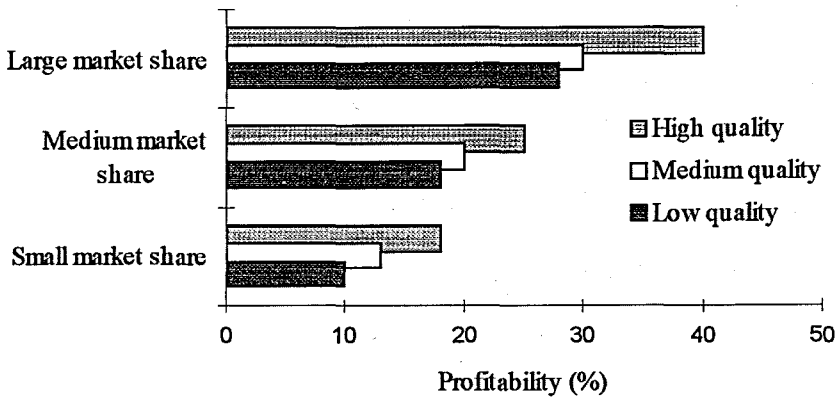

FIGURE 7.1. Relationship between quality, market share, and profitability (European Commission For Industry, 1996)

An inconsistency observed between the most important competitive priorities (Table 7.2) and the most important manufacturing objectives of the surveyed companies in each category (Table 7.4) is the lack of emphasis on increasing delivery rate and reliability. Although rapid and reliable deliveries are among the top five competitive priorities of the companies, increasing delivery rate and reliability, as manufacturing objectives, are emphasized by fewer than one third of the respondents.

The list of top five manufacturing objectives of the companies in each category differs slightly from each other (Table 7.4). While increasing production rate is considered one of the most important manufacturing objectives by the "lagger" companies, the "leader" companies highlight reducing new product development lead time. The objective of increasing production rate is closely related with the objective of reducing unit cost. On the other hand, the objective of reducing new product development lead time implies the

objective of competing on the basis of new products. The site visits revealed that one of the areas on which the surveyed companies assess themselves as competitively weak with respect to their foreign competitors is the ability to develop new products rapidly. To strengthen their competitive postures, the "leader" companies put more emphasis on the speed of developing new products.

7.3. Action Plans

Both to satisfy the competitive priorities and to realize the manufacturing objectives, certain action plans (that is, improvement programmes) have to be put in effect. In the questionnaire, companies are required to form their rank ordered list of five most important action plans from a list of 35, to be implemented in the next two years. Table 7.5 lists the action plans presented in the questionnaire, and their importance to the surveyed companies by category. Each number in the table indicates the percentage of companies selected the respective action as one of its most important five.

The actions that manufacturers plan to take to achieve their objectives in cost, quality, flexibility and delivery vary widely by company and industry. However, there is a common tread (Table 7.5). For the next two years, total quality management would be the top-rated action plan of the surveyed companies, regardless of the industrial sector they belong to and regardless of their status as a "leader" or a "lagger". Site visits revealed that it is also a top-rated action plan during the last two years. The second most popular action plan would be the training of managers. The emphasis on manager training is consistent with the restructuring which is the fifth most popular action plan. Managers are responsible for giving strategic decisions related to restructuring. Restructuring as an action plan for the next two years imply that companies are dissatisfied with their existing manufacturing structure. As it appears, the surveyed companies regard restructuring as a tool for change. Production automation and energy saving, being the forth and fifth most important action

plans, are consistent with the objective of reducing costs. According to a recent survey, Turkey ranks at the top of OECD countries in terms of unit cost of energy.

TABLE 7.5. Action plans of the sample by category

	Category		
Action Plans	Leader	Lagger	Overall
Total quality management	20 %	67 %	40 %
Training of managers	20 %	22 %	24 %
Restructuring	10 %	33 %	21 %
Production automation	10 %	33 %	21 %
Energy saving	30 %	11 %	21 %
Employee empowerment	20 %	22 %	20 %
Conformance to environmental standards	20 %	22 %	20 %
Developing new processes for new products	10 %	33 %	18 %
Just-in-time production	30 %	11 %	18 %
Improvement of quality control laboratory facilities	20 %	22 %	18 %
Preventive maintenance	10 %	0 %	18 %
Quality certificate for products	10 %	11 %	18 %
Quality circles	20 %	0 %	17 %
Training of employees	20 %	22 %	16 %
Quality function deployment	30 %	33 %	16 %
Quality certificate for processes	0 %	22 %	16 %
Zero defect	10 %	0 %	15 %
Quality certificate for environmental issues	10 %	33 %	15 %
Just-in-time procurement	20 %	22 %	13 %
Statistical process control	10 %	0 %	12 %
Improvement of supplier relationships	20 %	11 %	12 %
Automatic production and inventory control systems	10 %	0 %	12 %
Activity-based costing	10 %	0 %	11 %
Set-up time reduction	0 %	11 %	11 %
Value engineering	10 %	11 %	10 %
Manufacturing requirements planning	10 %	0 %	9 %
Improvement of facility layout	30 %	11 %	9 %
Aligning strategy and business strategies	0 %	11 %	6 %
Integration of information systems to manufacturing	20 %	0 %	6 %
Cross-functional teams	0 %	0 %	6 %
Computer-aided design	20 %	11 %	6 %
Warehouse management	0 %	0 %	6 %
Integration of information systems of functions	0 %	0 %	5 %
Green production technologies	0 %	0 %	4 %
Developing new processes for existing products	0 %	11 %	2 %

Interpreting the Table 7.5, the five most popular action plans in the manufacturing strategy portfolio of the companies in the overall sample, and of the "leader" and "lagger" companies are identified and shown in Table 7.6 in descending order of importance. The tie breaker is again the rank attributed to the action plans, as discussed earlier.

TABLE 7.6. The top five action plans of the sample by category

Leader	Lagger	Overall
1. Total quality management	1. Total quality management	1. Total quality management
2. Production automation	2. Employee empowerment	2. Training of managers
3. Employee empowerment	3. Value engineering	3. Production automation
4. Training of managers	4. Improvement of facility layout	4. Energy saving
5. Quality circles	5. Restructuring	5. Restructuring

Table 7.6 shows that production automation is also emphasized by the "leader" companies. Production automation is consistent with the objective of increasing production rate and reducing labour costs. Automation might require a significant amount of investment. Hence, caution is required as that the benefits to be realized will have to balance the cost. The emphasis on total quality management, training, employee empowerment, and quality circles implies that the "leader" companies tend to invest in an infrastructure that will help to accomplish quality improvement and cost reduction.

Total quality management and employee empowerment are also emphasized by the "lagger" companies (Table 7.6). They are the most two important action plans to be implemented in the next two years. The third one is value engineering. Value engineering is a disciplined approach to the elimination of waste from products and processes through an investigative process that focuses on the functions to be performed and whether such functions add value. Hence, the emphasis on value engineering is consistent with the objective of cost reduction. It is also related with improvement of facility layout and restructuring; being the fourth and the fifth most important plans, respectively.

In summary, a high level of consistency is observed between the objectives and the action plans of the companies in quality and cost related issues. It is also safe to say that, quality improvement and cost reduction would set the agenda of the surveyed companies in the next two years.

8. CONCLUSION

The thesis includes two studies addressing domestic electronics, cement, automotive, and white goods suppliers industrial sectors. The first study involved the examination of to what extent prevailing best manufacturing practices are adopted and high operational outcomes are achieved by a sample of companies from these four sectors. The investigated companies are later classified as the "leader", "lagger", "medium-performer", "promising" and the "won't go the distance" companies depending on how well their practices and operational outcomes match up to best practice. In the second study, the "leader" and the "lagger" companies are analyzed to identify which of the commonly known manufacturing strategies they followed.

8.1. Measuring Best Practice Adoption and Its Impact on Business Performance

In the first part of the thesis, a questionnaire tailored from the Australian Manufacturing Council's "Manufacturing Practices Survey" (1994) is applied to a total of 82 companies. Following the validation and verification of the responses, available data are analyzed to segregate the sample according to their success in adopting universal best practice. Ten leaders and nine laggers stand out from the rest of the sample. Each of these groups are later analyzed closely to find out:

(i) how well they implemented the best manufacturing practices in planning, focused strategies, factory operations, leadership, people management, customer focus, process and product quality, technology, and benchmarking;

(ii) their success in achieving high operational outcomes in terms of cost, quality, flexibility, timeliness, and competitiveness;

(iii) whether adopting best practice correlated positively with business performance measured by average annual growth in total sales per employee, average annual growth in value-added per employee, and the level of pre-capital investment cash flow.

One of the key findings is that large-sized companies outperformed the rest both in terms of their success in implementing best manufacturing practices and in achieving high operational outcomes. There is no appreciable difference between industrial sectors in this regard.

In the overall, while best practices for planning are generally followed, there is a lack of alignment between the manufacturing strategy and the business strategy. A manifestation of this is observed in the form of launching too many concurrent improvement initiatives.

Another notable observation is the wide misconception on benchmarking. Most companies do not know what benchmarking is, and those who have a feel for it have often misapplied it.

Throughout the sample, the respondents are generally uninformed about the foreign competition they are bound to face sooner or later. Those who declared a view thought they are disadvantageous in most respects. In quality terms, there is a strong conviction of inferiority. Even the traditionally held view on relative advantage in costs comes out to be unfounded.

It is clearly revealed that the leaders in adopting best practice are rewarded by higher business performance. They have achieved 20 per cent average annual growth in sales per employee in the last three years compared with 11 per cent achieved by the laggers; have achieved 21 per cent average annual growth in value-added per employee in the last three years compared with minus 1 obtained by the laggers; have achieved higher levels of cash flow and have increased their level of cash flow in the last two years.

8.2. Competitive Strategies for Manufacturing

In the second part of the study, manufacturing strategies of the sample companies are analyzed based on their responses to the extension to the tailored Australian Manufacturing Council (1994) questionnaire from Global Manufacturing Futures Project reported in "Benchmarking Global Manufacturing" of De Meyer et al. (1992).

The responses are analyzed to find out which:

(i) competitive priorities;

(ii) supporting manufacturing objectives; and

(iii) action plans

are set and intended for implementation in the next two years.

In general, a high level of consistency is observed between the objectives and the improvement programmes, and between the priorities and the objectives of the respondents.

The top competitive priorities for the overall sample comes out to be quality, price, and delivery in descending order of importance. Laggers emphasized brand image in addition to these. After sale service replaced price for the leader companies.

The four common most important manufacturing objectives of the three groups; namely the overall sample, the subset of leaders, and the subset of laggers, are: reducing unit costs, increasing conformance quality, increasing market share, and improving profitability. While reducing new product development lead time is one of the most important objectives of the leaders, for the laggers, it is increasing production rate.

Most of the action plans of the leaders and the laggers are quality- and cost-related. In the overall, total quality management, training, and employee empowerment are among the most emphasized action plans for the next two years.

8.3. A Final Word

A sizeable group of businesses from four prominent industrial sectors are the basis of this thesis. The overall view of the responses and the pursuing analyses paint a mixed picture.

Despite good intentions and long term initiatives, the current maturity levels of these companies are not as high as would be expected in the face of inevitable industrial competition, not only from the European Union, but also from the worldwide competition.

Quality, cost, and timeliness are the three prime drivers of competition. Quality seems to be a major goal for most of the companies. However, for the time being, more is said than done. Labour cost is no more a factor of advantage. Timeliness which comes from customer-orientation and discipline also seems to be far from satisfactory, especially for developing and launching new products.

One hopes that the intentions and the initiatives pay off and the Turkish industries become strong players in the international economy in the near future.

APPENDIX A

COMPETITIVE STRATEGIES & BEST PRACTICES BENCHMARKING QUESTIONNAIRE

SELECTED QUESTIONS USED IN THE THESIS

BUSINESS PROFILE

1. What is the nature of your company?

   Independent company _____ 1
   Operating unit of a large company_____ 2
   Subsidiary of parent or holding company__ 3

2. If any, what is the ratio of foreign capital in your company? _____ %

3. From the following list, nominate in order of priority the three most important markets from 1- most important to 3 - least important for the products manufactured in your company?

   ..... Turkey
   ..... Germany
   ..... Italy
   ..... United Kingdom
   ..... France
   ..... Spain
   ..... Other European United countries
   ..... Sweden
   ..... Scandinav countries
   ..... United States of America
   ..... Turkish Republics
   ..... Federal Republic of Russia
   ..... East European countries
   ..... Far East countries
   ..... Middle East countries
   ..... South American countries
   ..... North African countries
   ..... Other: .....

COMPETITIVE STRATEGY

Competitive Priorities

1. From the following list, nominate in order of priority the five most important competitive priorities from 1- most important to 5 - least important on which your company will emphasize in the following two years.

..... Reliable products
..... Dependable deliveries
..... Rapid design changes / new products
..... Consistent quality level
..... Durable products
..... Rapid delivery
..... Low price products
..... High performance products
..... A broad product line
..... After sale services
..... Rapid adoption to volume changes
..... Wide distribution
..... Niche market
..... Customize products
..... Brand image
..... Other: .....

Manufacturing Objectives

1. From the following list, nominate in order of priority the five most important manufacturing objectives from 1- most important to 5 - least important on which your company will emphasize in the following two years.

..... Reduce unit cost
..... Increase conformance quality
..... Increase direct labour productivity
..... Decrease product break-even point
..... Reduce production lead time
..... Increase production rate
..... Reduce new product development lead time
..... Increase delivery reliability
..... Increase delivery rate
..... Reduce set-up times
..... Improve profitability
..... Increase inventory turnover rate
..... Increase market share
..... Increase return on investment
..... Reduce breakdowns and unplanned stops
..... Other: .....

Action Plans

1. From the following list, nominate in order of priority the five most important **action plans** from 1- most important to 5 - least important on which your company will emphasize in the following two years.

..... Integration of information systems to manufacturing
..... Developing new processes for new products
..... Just-in-time production
..... Improvement of facility layout
..... Activity-based costing
..... Just-in-time procurement
..... Employee empowerment
..... Restructuring
..... Automatic production and inventory control systems
..... Value engineering
..... Quality function deployment
..... Green production technologies
..... Aligning strategy and business strategies
..... Cross-functional teams
..... Computer-aided design
..... Preventive maintenance
..... Statistical process control
..... Quality circles
..... Developing new processes for existing products
..... Integration of information systems of functions
..... Production automation
..... Manufacturing requirements planning
..... Conformance to environmental standards
..... Improvement of supplier relationships
..... Zero defect
..... Warehouse management
..... Improvement of quality control laboratory facilities
..... Quality certificate for environmental issues
..... Quality certificate for processes
..... Quality certificate for products
..... Energy saving
..... Training of managers
..... Training of employees
..... Total quality management
..... Set-up time reduction
..... Other: .....

MANUFACTURING STRATEGY

Planning

From question 1 to 7, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

1. We have a mission statement which has been communicated throughout the company and is supported by our employees _____ 1 2 3 4 5

2. We have a comprehensive and structured planning process which regularly sets and reviews short-term and long-term goals _____ 1 2 3 4 5

3. Our plans focus on the achievement of best practices _____ 1 2 3 4 5

4. When we develop our plans, policies and objectives we always incorporate customer requirements, supplier capabilities, and the needs of other stakeholders, including the community _____ 1 2 3 4 5

5. We have a written statement of strategy covering all manufacturing operations, which is clearly articulated and agreed to by our senior managers _____ 1 2 3 4 5

6. Our site's manufacturing operations are effectively aligned with the central business mission _____ 1 2 3 4 5

7. The capability of our manufacturing operations is central to our marketplace success _____ 1 2 3 4 5

Manufacturing Structure

1. Please prioritize the following practices and outcomes from 1: most important to 5: least important in relation to your site's present success.

Practices	Outcomes
..... Leadership	..... Cost
..... Planning	..... Quality
..... Employee relations	..... Flexibility
..... Customer relations	..... Timeliness
..... Supplier relations	..... Innovation

From question 2 to 6, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

2. We are trying to make too many products _____ 1 2 3 4 5

3. We are trying to address several different markets, each which has different competitive priorities _____ 1 2 3 4 5

4. We have too many technologies to develop and maintain _____ 1 2 3 4 5

5. We are attempting too many simultaneous improvement initiatives _____ 1 2 3 4 5

Factory Operations

1. Please circle the number which accurately reflects your company's present position.

1: Negative contribution 2: No contribution 3: Marginal contribution
4: Reasonably significant contribution 5: Major contribution 0: Does not apply

a. Just in time production _____ 1 2 3 4 5 0
b. Just in time procurement _____ 1 2 3 4 5 0
c. Machine set-up time reduction _____ 1 2 3 4 5 0
d. Warehouse management _____ 1 2 3 4 5 0
e. Materials management _____ 1 2 3 4 5 0
f. Production planning and control _____ 1 2 3 4 5 0
g. Statistical process control _____ 1 2 3 4 5 0
h. Total quality management _____ 1 2 3 4 5 0
i. Preventative maintenance _____ 1 2 3 4 5 0
j. Housekeeping _____ 1 2 3 4 5 0
k. Working with suppliers _____ 1 2 3 4 5 0
l. Quality circles _____ 1 2 3 4 5 0
m. Employee empowerment _____ 1 2 3 4 5 0

PRACTICES

Leadership

From question 1 to 6, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

1. Senior managers actively encourage change and implement a culture of trust, involvement and commitment in moving towards best practices _____ 1 2 3 4 5

2. There is a high degree of unity of purpose throughout our site, and we have eliminated barriers between individuals and / or departments _____ 1 2 3 4 5

3. Team spirit and motivation are effectively used to drive best practices in this site___ 1 2 3 4 5

4. At this site, we proactively pursue continuous improvement rather than reacting to crises / fire-fighting _____ 1 2 3 4 5

5. Ideas from production operators are actively used in assisting management_____ 1 2 3 4 5

6. Environmental ("green") protection issues are proactively managed at this site ____ 1 2 3 4 5

People Management

From question 1 to 6, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

1. We have an organization-wide training and development process, including career path planing, for all our employees _____ 1 2 3 4 5
2. Our site has effective "top-down" and "bottom-up" communication processes_____ 1 2 3 4 5
3. Employee satisfaction is formally and regularly measured _____ 1 2 3 4 5
4. Our occupational health and safety practices are excellent _____ 1 2 3 4 5
5. Employee flexibility, multi-skilling and training are actively used to support improved performance _____ 1 2 3 4 5
6. Our human resources plan is clearly focused on the core skills and competencies required to manufacture competitive products _____ 1 2 3 4 5

Customer Focus

From question 1 to 7, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

1. We know our customers' current and future requirements both in terms of volume and product characteristics _____ 1 2 3 4 5
2. Customer requirements are effectively disseminated and understood throughout the workforce _____ 1 2 3 4 5
3. In designing new products and services we use the requirements of domestic customers_____ 1 2 3 4 5
4. In designing new products and services we use the requirements of foreign customers_____ 1 2 3 4 5
5. We have an effective process for resolving customers' complaints _____ 1 2 3 4 5
6. Customer complaints are used as a method to initiate improvements in our current processes _____ 1 2 3 4 5
7. We systematically and regularly measure customer satisfaction _____ 1 2 3 4 5

Quality of Products and Processes

From question 1 to 6, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

1. We work closely with our suppliers to improve each others processes _____ 1 2 3 4 5

2. Our suppliers have an effective system for measuring the quality of the materials they send to us _____ 1 2 3 4 5

3. We have well established methods to measure the quality of our products and services _____ 1 2 3 4 5

4. We have site-wide standardized and documented operating procedures _____ 1 2 3 4 5

5. All employees believe that quality is their responsibility _____ 1 2 3 4 5

6. The concept of "internal customer" is well understood at this site _____ 1 2 3 4 5

7. Does your site have a ISO 14000, ISO 9000 or other quality certificates? Where does your site fit in relation to (new) quality certificates?

Yes ..... 1 No 2
We have .....

And we
Are on the job for getting a new one 1
Have plans to get a new one 2
Have no immediate plans for a new one 3

And we
Are on the job for getting one..... 1
Have plans to get one..... 2
Have no immediate plans for certificate..... 3

Technology

From question 1 to 2, please circle the number which accurately reflects your company's present position.

1: Strongly disagree 2: Disagree 3: Neither agree nor disagree
4: Agree 5: Strongly agree

1. Our core manufacturing technology (eg. type or age) is appropriate for our needs and allows us to be competitive in the market place _____ 1 2 3 4 5

2. We utilize our manufacturing technology to its maximum potential _____ 1 2 3 4 5

Benchmarking

1. Do you practice benchmarking?

   Yes ..... 1 No 2

   If you circle "No", go to question 4 of this section.

2. Please circle "Yes" for the organizations you have performed benchmarking with.

	No	Yes
Companies within the same industry located overseas	1	2
Companies within the same industry located domestically	1	2
Companies outside our industry located overseas	1	2
Companies outside our industry located domestically	1	2
Parent companies within our group	1	2
Customers	1	2
Suppliers	1	2
Government agencies	1	2

3. Please circle "Yes" for the areas of benchmarking you have undertaken.

	No	Yes
Relative cost position	1	2
Operating procedures	1	2
Technology	1	2
Quality procedures	1	2
Customer service	1	2
Human resources utilization	1	2

4. Please circle "Yes" for the following factors on which your company reviews the information about its competitors.

	No	Yes
Market share	1	2
Use of manufacturing technologies	1	2
Product quality and procedures	1	2
Human resource practices and policies	1	2
Product range	1	2
Access to and cost of raw materials	1	2
Relative cost position	1	2
Processes in bringing new products to market	1	2
Safety records	1	2
Planning and investment justification processes	1	2
Customer service procedures	1	2
Time taken from order receipt to product delivery	1	2
Strategies for downtime minimization	1	2

PERFORMANCE / OUTCOMES

Operational Outcomes

For question 1, please circle the number which accurately reflects your company's present position.

1: Much higher 2: Higher 3: On par
4: Lower 5: Much lower 0: Don't know

1. Relative to our major competitors:

Domestic competitors		Foreign competitors
a. 1 2 3 4 5 0	Our total cost per unit of product	1 2 3 4 5 0
b. 1 2 3 4 5 0	Our finished product defect rate	1 2 3 4 5 0
c. 1 2 3 4 5 0	Our order to delivery time	1 2 3 4 5 0
d. 1 2 3 4 5 0	Our lost time due to accidents per year per employee	1 2 3 4 5 0
e. 1 2 3 4 5 0	Our lost time due to industrial dispute	1 2 3 4 5 0
f. 1 2 3 4 5 0	Our lost capacity due to breakdowns	1 2 3 4 5 0

2. Please indicate (by writing a single number, ranging from 1 through to 5, in the vacant end column) your site's current performance level for each of the listed attributes.

	Attribute	*1*	*2*	*3*	*4*	*5*	*(1-5)*
a.	Customer satisfaction	Sometimes meets expectations	Generally meet expectations	Consistently meet expectations	Always meet expectations	Expectations exceeded, delighted customers	
b.	Average process changeover time	Lags competition	Could be improved	Adequate	More than adequate	A key to our success	
c.	Employee morale	Very low	Low	Satisfactory	High	Very high	
d.	Productivity	Decreasing	Static	Moderate improvement	Consistently improving	Major and significant gains	
e.	Relative technological competitiveness	Behind competitors	In catch-up mode	Some strengths that can be further developed	Advantages over competitors	Technological leader, competitors seek to catch-up	

3. Please indicate (by writing a single number, ranging from 1 through to 5, in the vacant end column) your site's current performance level for each of the listed categories.

	Category	*1*	*2*	*3*	*4*	*5*	*(1 - 5)*
a.	Delivery in full on time to our customers	Less than 60%	60% - 80%	81 % - 90%	91% - 96%	97% - 100%	
b.	Proportion of production operators involved in process improvement / problem solving teams	Less than 5.0%	5.0% - 9.9%	10.0% - 19.0%	20.0% - 50.0%	More than 50.0%	
c.	Ratio of quality control inspectors to direct production operators	Less than 20.0%	10.1% - 20.0%	2.1% - 10.0%	1.0% - 2.0%	Less than 1.0%	

Business Performance

1. Please indicate (by writing a single number, ranging from 1 through to 5, in the vacant end column) your site's current performance level for each of the listed attributes.

Attribute	*1*	*2*	*3*	*4*	*5*	*(1 - 5)*
Cash flow (pre-capital investment)	Negative	Neutral	Marginally positive	Positive	Extremely positive	

2. Please indicate the total number of full-time employees and number of direct workers at your site for the following years?

	Number of full-time employees	*Number of direct workers*
1995		
1996		
1997		

3. Please indicate the total sales, sales from production, and export sales in USD from your site for the following years.

	Total sales	*Sales from production*	*Export sales*
1995			
1996			
1997			

4. Please indicate the value added in USD of your site for the following years.

	Value added
1995	
1996	
1997	

APPENDIX B

CONSTRUCTION OF BEST PRACTICE INDICES AND CALCULATION OF BUSINESS PERFORMANCE MEASURES

To map the proximity of surveyed companies to best practice, two indices are constructed:

1. Strategy/practices index, and
2. Operational outcomes index.

To quantify the impact of best practice adoption on business performance, three measures of business performance are calculated:

1. Average annual growth in total sales per employee in the last three years,
2. Average annual growth in value-added per employee in the last three years,
3. Level of pre-investment cash flow at the time when the questionnaire was applied.

The responses given to the selected questions included in the "Competitive Strategies and Best Practices Benchmarking Questionnaire" (see Appendix A) are used to construct the indices and to calculate the measures of business performance. These questions are designed in a manner that they are universally relevant to all companies regardless of industrial sector or company size.

In this appendix, the construction of the indices and the calculation of the business performance measures are demonstrated. It is also explained how the missing values are dealt with in calculating the indices and the measures.

Construction of Indices

In the following tables, questions used to construct the two are tabulated, in reference to the questionnaire presented in Appendix A.

Strategy / Practices Index Construction		
Questionnaire Module	Construct	Question(s)
Manufacturing Strategy	Planning	1 through 7
	Manufacturing Structure	2 through 5
	Factory Operations	1a through 1m
Practices	Leadership	1 through 6
	People Management	1 through 6
	Customer Focus	1 through 7
	Quality of Products and Processes	1 through 6
	Technology	1 and 2
	Benchmarking	2, 3 and 4

Operational Outcomes Index Construction		
Questionnaire Module	Construct	Question(s)
Performance / Outcomes	Operational Outcomes	1a through 1f
	Operational Outcomes	2a through 2e
	Operational Outcomes	3a through 3c

Each question appearing in the "question(s)" columns of the tables is considered to be equally weighted. Moreover, each construct appearing in the "construct" columns of the tables is considered to have an equal amount of contribution to its respective index, such that the maximum total score that can be attained on an index becomes 100.

Calculation of Business Performance Measures

In the following table, the questions used to calculate the three business performance measures are tabulated, in reference to the questionnaire presented in Appendix A.

Calculation of Business Performance Measures			
Questionnaire Module	Construct	Question	Used to calculate the Business Performance Measure
Performance / Outcomes	Business Performance	1	Pre-capital investment cash flow level
		2	Average annual growth in sales per employee
			Average annual growth in value-added per employee
		3	Average annual growth in sales per employee
		4	Average annual growth in value-added per employee

Dealing with Missing Values

In the strategy/practices index construction:

For each respondent, missing values occurring in questions are retained. For each construct, total score with blanked questions attained by the respondent is calculated, and then rescaled so as to contribute a potentially maximum value of "per cent contribution" of its respective construct to the strategy/practices index. By doing so, the blanked questions are thought to be filled with values that actually reflect the respondent's current position with respect to implementing best manufacturing practices included in the construct.

In the operational outcomes index construction:

For each respondent, missing values occurring in each question are retained. On the operational outcomes index, total scores of the respondents with the blanked questions are calculated, and then rescaled so as to allow respondents to attain a maximum total score of 100 on the index. Again, by doing so, the blanked questions are thought to be filled with values that actually reflect the respondent's current position with respect to achieving high operational outcomes.

In the calculation of the business performance measures:

Whenever a missing value occurs in the question inquiring the pre-capital investment cash flow level, the record is excluded from the calculation to prevent over or understating its respective measure.

Missing values occurring in the questions used to calculate the average annual growth in sales per employee and value-added per employee are treated differently. The total sales, value-added numbers, and total number of employees required for the last three years are analyzed one by one to identify suspected errors and missing values. Some of the suspected errors are resolved and missing values are completed through contacts with the respondents. When either of the numerator or the denominator for the ratios: total sales per employee, and value-added per employee, the resulting value is set as a blank, and eliminated from further consideration. For the remainder, the ratios are calculated for the first, second and the third year. Average annual growth between each consecutive pairs of years are calculated. The overall average annual growth for the three years is calculated by averaging the growth figures for the two consecutive periods. In cases where one or two of the three ratios are missing for reasons described above, the overall average annual growth is based on the available ratios.

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