INNOVATION PERFORMANCE AND COMPETITIVE STRATEGIES IN THE TURKISH MANUFACTURING INDUSTRY

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ABSTRACT

In this paper, we report on empirical investigation within the context of the *Innovations in Manufacturing Industries in Turkey Study*. The data was gathered in nine different cities in Turkey during the period August 2004 – January 2005. The survey was conducted through face-to-face interviews due to the complex nature of the survey and was implemented in 135 manufacturing firms operating in four sectors: Textiles, chemicals, food, and metal. The study has been an extension of the *European Manufacturing Survey* 2004 (EMS 2004) coordinated by the Fraunhofer Institute for Systems and Innovation Research and covering nine countries: Germany, Turkey, Austria, Switzerland, France, Slovenia, Croatia, Italy, and United Kingdom. An extended version of the questionnaire form used in EMS 2004 has been employed. Some of the basic results concerning competitive priorities, new product development, and operations management are presented.

1 INTRODUCTION

Any firm operating in a market has to compete with other firms in the same market. Firms develop strategies to increase their competitiveness. These strategies might even be tacit, meaning that they might not have been explicitly stated. In order to gain competitive advantage, firms try to reduce their costs as well as try to differentiate their products and services from those of their competitors [1]. These strategies are formulated as a response to the perceived determinants shaping the competitive environment in the markets in which these firms operate. An extensive amount of empirical work dealing with competitive and manufacturing strategies has been accumulated over time. We will restrict our literature survey to empirical work covering more than one country. Only a limited number of attempts can be observed in the literature and these will be cited here. A benchmarking study in a global context was introduced by Miller *et al* [2]. By employing the data gathered through consecutive application of the *European Manufacturing Futures Survey*, De Meyer [3] was able to introduce a longitudinal perspective into the analysis. The results of a global survey executed by the Global Manufacturing Resources Group (GMRG) were compiled by Whybark and Vastag [4]. Voss *et al* [5] presented a study covering four countries from Europe. Based on the data gathered in the first three phases by the partners of the *International Manufacturing Strategy Survey* (IMSS), Cagliano *et al* [6] provided an assessment concerning manufacturing strategy configurations. GMRG and IMSS data have been subject to a large number of investigations from different perspectives by several researchers beyond those reported above and both groups continue with their efforts to gather data on a global scale.

Innovation is an essential component of the competitive and manufacturing strategies. The strategic nature of innovation for the competitiveness of enterprises as well as regions and countries has been the subject of increasing attention particularly in the last two decades. A massive data gathering on innovation in enterprises has been accomplished through the *Community Innovation Survey* (CIS) involving Eurostat and OECD. CIS is implemented in European Union (EU) Member States, EU Candidate Countries, Iceland and Norway. The data is collected on a four-yearly basis. The first CIS was a pilot exercise, held in 1993, while the second survey was carried out in 1997/1998, except Greece and Ireland, where it was launched in 1999. The third survey was implemented in 2000/2001 for most of the participating countries with the exception of Norway, Iceland, Luxembourg and Greece, where the survey was launched in 2002. The last survey was carried out in 25 Member States, Candidate Countries, Iceland and Norway; was launched in 2005, based on the

reference period 2004, with the observation period being 2002 to 2004. Australia and Japan are also reported to implement *National Innovation Surveys* [7]. Another data gathering study on innovation in enterprises in Europe has been the *European Manufacturing Survey* 2004 (EMS 2004) performed in 2004 by a consortium led by the Fraunhofer Institute for Systems and Innovation Research. The consortium included Germany, Austria, France, United Kingdom, Slovenia, Switzerland, Croatia, Italy, and Turkey. Turkey was represented by the TUSIAD – Sabanci University Competitiveness Forum (REF). Some of the results obtained can be found in [8].

In this paper, some of the basic results concerning competitive priorities, new product development, and operations management obtained from the *Innovations in Manufacturing Industries in Turkey Study* will be presented. But first a brief description of the design and implementation of the survey will be provided.

2 DESIGN AND IMPLEMENTATION OF THE SURVEY

The *Innovations in Manufacturing Industries in Turkey Study* has been an extension of EMS 2004. The extension was realized in the structure of the questionnaire as well as in the industry sectors included in the field study. The questionnaire implemented in EMS 2004 contained 249 information requests organized under 23 main headings. It was extended by REF to 529 information requests under 62 main headings and was employed in the *Innovations in Manufacturing Industries in Turkey Study*.

The field study covered nine cities in Turkey representing approximately 72% of the added value created in the manufacturing sector. Due to the complex nature of the survey, face-to-face interview method for implementation of the survey was preferred in order to increase the number of responses and to reduce possible errors. Face-to-face interviews were conducted with 135 firms in food processing, textiles, metal and chemical industries in these nine cities. These firms were randomly selected from the database of the Union of Chambers and Commodity Exchanges of Turkey. The chance of a firm of being selected for interview was taken to be directly related to the relative density of the manufacturing base in the city it was located. Those declining to be interviewed were replaced randomly using the same database. The interviews were conducted by six graduate assistants. In the majority of the interviews two of them were present. Each interview took roughly from 90 to 180 minutes. Data collection took place from August 2004 to January 2005. In retrospect, the choice for the method of implementation turned to be correct although indeed it was a relatively expensive one.

The distribution of the firms into the four sectors was as follows: food processing 16%, textiles 34%, metal 35% and chemical industries 16%. Following the official classification, firms were classified as small, medium, and large depending on whether their workforce falls into the range of 1-49, 50-99, 100 or more, respectively. The classification of the firms in the sample as small, medium, and large turned out to be 22%, 27%, and 51%, respectively. Around 75% of the firms designated themselves mainly as end product manufacturers with the remainder designating themselves mainly as suppliers. The percentage of family ownership was 60% with family establishments being particularly dominant among small firms. Foreign direct investment was present in 14% of the firms. The presence of foreign direct investment was observed to increase with increasing firm size.

3 COMPETITIVENESS ISSUES

3.1 Determinants of Competitiveness

The most important determinants of competitiveness in these four sectors were specified by the firms participating in the study as *product quality/performance*, *delivery lead time*, and *product cost* (Figure 1). Firms displayed a tendency to assess their competitive position as being better or equal to their competitors in many of the determinants listed in the questionnaire. An exception was the product cost. The percentage of firms stating that their performance was inferior compared to the leading competitor in the sector was relatively high for product cost. This result can be interpreted as an indication of the difficulties faced by these companies in keeping their product costs under control.

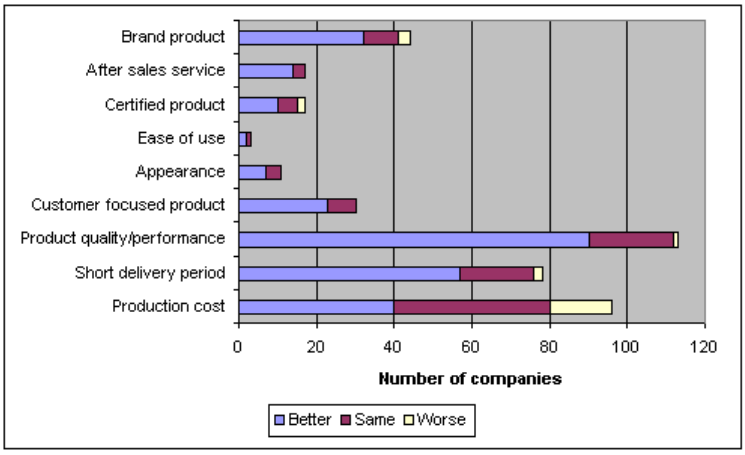

Figure 1. The determinants of competitiveness and the relative positioning of the firms against the leading competitor

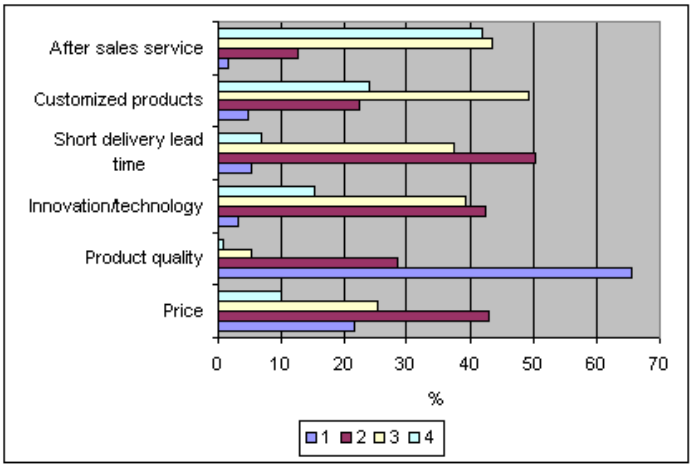

Figure 2. The ranking of competitive priorities across the sectors

3.2 Competitive Priorities

In the *Innovations in Manufacturing Industries in Turkey Study*, the firms were asked to rank their competitive priorities from the following list: Customized products, short delivery lead time, innovation/technology, quality and price. The ranking was asked to be made from "1 to 6" with "1" indicating highest importance. For ease of reporting a "1 to 4" scale is adopted,

where “2” represents “2 and 3” and “3” represents “4 and 5” combined. As a result of the ranking of these competitive priorities quality turned out to be top competitive priority for the firms in all sectors (Figure 2). Particularly in food processing industry, quality came out very strong. The second most sought for competitive priority in all sectors was specified as price. These two top competitive priorities indeed overlap with the results obtained in previous field studies performed in different sectors of the Turkish manufacturing industry [9]. Although quality turns out to be the top competitive priority, it serves as a qualifier for participation in the competition game. Price, on the other hand, becomes the top selection criterion for the customer.

In all sectors, the competitive priority after sales service is ranked as the last among the five competitive priorities. This is mainly because some of the firms do not provide any after sales service. Food processing and chemical industries seem to rank innovation/technology slightly higher than short delivery periods. The reverse is true for textiles and metal industries.

Investigation of the ranking of competitive priorities within the small, medium, and large company groups did not reveal any significant difference among the rankings of the companies in these groups. In general, the ranking of competitive priorities was as: quality, price, short delivery lead time, innovation/technology, customer specific products, and after sales service.

4 NEW PRODUCT DEVELOPMENT

4.1. Product Strategy

It is observed that the most widely used product strategy is *differentiation through product variety* (Figure 3). Other product strategies employed were found to be *focus on specific products* followed by *focus on cost*. Differentiation through product variety strategy requires an indigenous product development capability in the firm. Product variety leads to additional costs compared to product focused strategy. Being able to keep the product costs at least at the level of the competitors’ is a prerequisite for the attempts to differentiate. Recall the observation reported earlier about the perceived assessment of the firms regarding their product costs being relatively inferior compared to the leading competitors in that aspect. It should not surprise one that product costs arise as a problem for the firms, which base their product strategy mainly on differentiation through product variety.

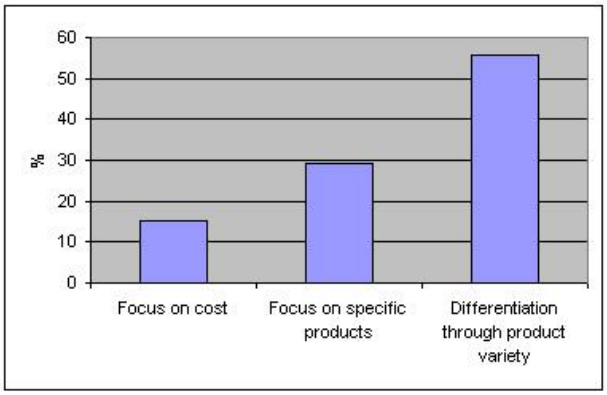

Figure 3. Product strategy of the firms

When developing new products, the strategy more widely adopted was determined as being the *first in the market strategy* followed by being the *follower in the market strategy*. It appears that around 60% of the firms reported to implement the first in the market strategy (Figure 4).

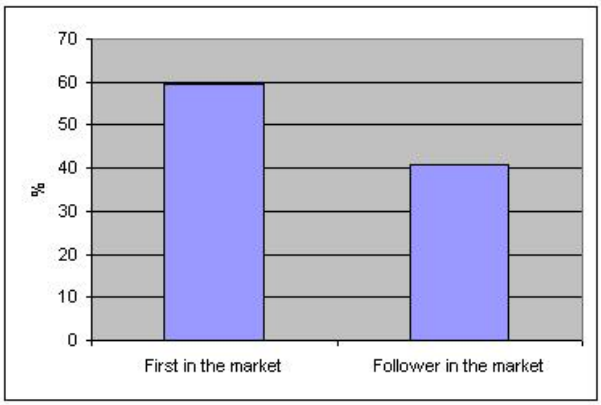

Figure 4. New product introduction strategy of the firms

This result supports the result concerning the product strategy reported above. First in the market strategy is a relatively aggressive strategy like the differentiation through product variety strategy and might require more resources and might involve more risk.

4.2 New Product Development Performance

The chemical industries appear to be the leading sector with their performance in new product development in the last three years. Around 90% of the firms in the chemical sector claimed that they designed and marketed at least one new product in the last three years. Following the firms in the chemical industries, 85% of the firms in the metal sector, 80% in food processing, and 75% in the textiles declared to have designed and marketed at least one new product in the last three years.

The assessment of the same data with respect to the size of the firms involved revealed that there was no difference among them. The percentage of firms claiming to have designed and marketed at least one new product in the last three years was 80% among large firms, and 85% among small and medium sized firms.

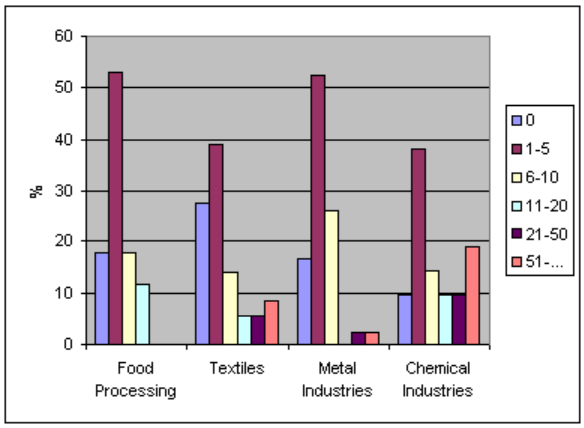

Figure 5. Number of new products introduced to the market in the last three years

The number of these new products fell mostly into the range 1-5 in all sectors (Figure 5). It is interesting to note that around 20% of the firms in the chemical industries introduced 51 or more new products in the last three years.

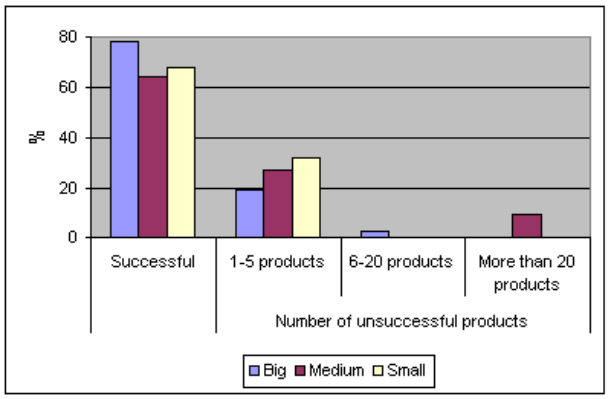

Figure 6. The success rate and the number of unsuccessful new product introductions in the last three years

Among the firms investigated in different sectors, 25% of those in food processing, 32% in textiles, 24% in metal industries, and 35% in chemical industries indicated that they had at least one new product project failure within the last three years. The assessment of failures showed that large firms are more successful in new product development: The rate of firms with failures was found to be 22% among large firms, 36% among medium sized firms, and 35% among small firms. The most frequently observed range of number of failures turned out to be 1-5. This range corresponded to 100% of all failures in small firms, and to 75% and 89% in medium and large firms, respectively (Figure 6).

An investigation into the reasons for failure in different sectors investigated indicated to differences among sectors. In food processing failures resulted mainly from demand deficiency, in metal and chemical industries from technical problems, in textiles from marketing problems. The relatively more complex technologies involved in metal and chemical industries might be the reason for the technical problems encountered in these sectors.

5 OPERATIONS MANAGEMENT ISSUES

5.1 Continuous Improvement

The main objective of quality management is to meet and to exceed the customer requirements and expectations. Besides meeting the customer needs and expectations, this customer oriented management approach is focused on the continuous improvement of product and service quality of the company [10]. Quality gurus such as Feigenbaum, Deming, Juran and Ishikawa have all emphasized the importance of continuous improvement in problem solving and in prevention of potential problems with the support of techniques such as measurement/evaluation and feedback mechanisms.

According to the results obtained in the *Innovations in Manufacturing Industries in Turkey Study*, continuous improvement turned out to be the most extensively used management

technique. The use of continuous improvement has reached 95% among the companies in all sectors covered. A large proportion of those that do not exercise it currently plan to do so in the coming 2 years. Although the implementation of continuous improvement started in 1970s, it was in the 1990s that the rate of implementation picked up – particularly in the metal and chemical industries.

Continuous improvement has been one of the quality management approaches investigated in EMS 2004 as well, which gives us an opportunity for benchmarking with the other countries participating in the project. The results are displayed in Figure 7. The benchmarking includes from Turkey only the metal sector firms.

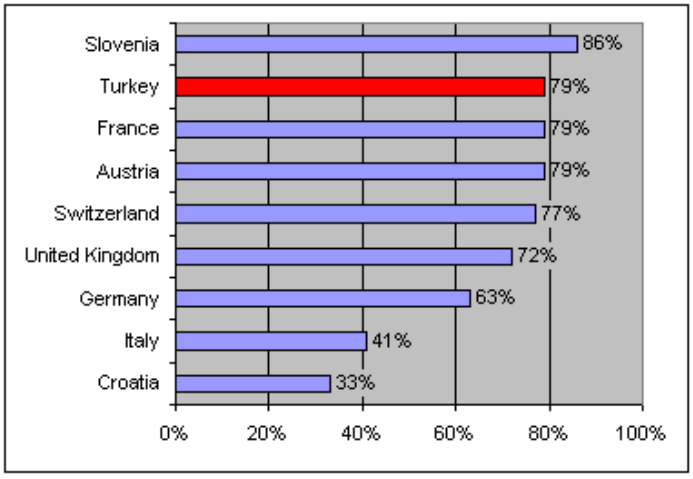

Figure 7. Diffusion of continuous improvement [8]

Zero buffer, just-in-time (JIT) purchasing and JIT production are all operational approaches made possible by the proper application of Total Quality Management (TQM). The increase in the level of product, production process, and service quality leads to a reduction in the variability in production processes, which allows for a decrease in the input, intermediate, and final product inventory levels. Attempts to employ these operational approaches in companies, where TQM has no roots can lead to increase in costs rather than to savings.

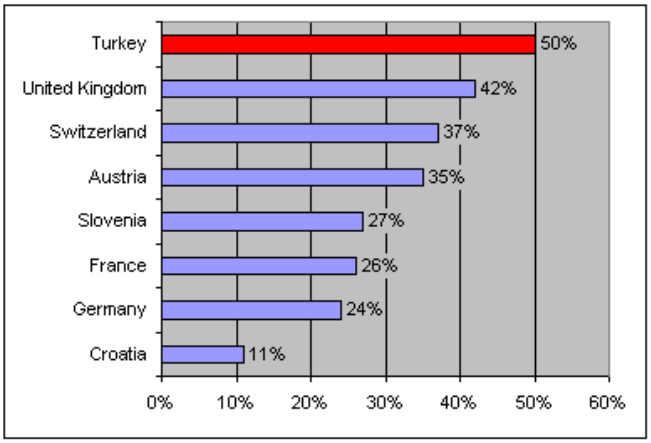

Figure 8. Diffusion rate of JIT purchasing [8]

5.3 Just-In-Time Purchasing

Around 65% of firms declared that they employ JIT purchasing. JIT purchasing appeared to be exercised least commonly by the metal sector firms but the metal firms stated that they plan to adopt it in the next two years. The highest rate of adoption was observed in the years 1995-2000.

In JIT purchasing, firms from Turkey turned out to have the highest diffusion level among the countries participating in EMS 2004 (Figure 8). It is interesting to note that JIT purchasing did not appear to have a high diffusion level in any of the countries involved.

5.4 Just-in-time production

JIT production was observed to be implemented rather extensively in all sectors covered in the study. In EMS 2004, on the other hand, manufacturing firms in Turkey displayed a very good performance (Figure 9). JIT purchasing appeared to be more extensively implemented both in the case of manufacturing firms in Turkey as well in the consortium countries compared to JIT purchasing.

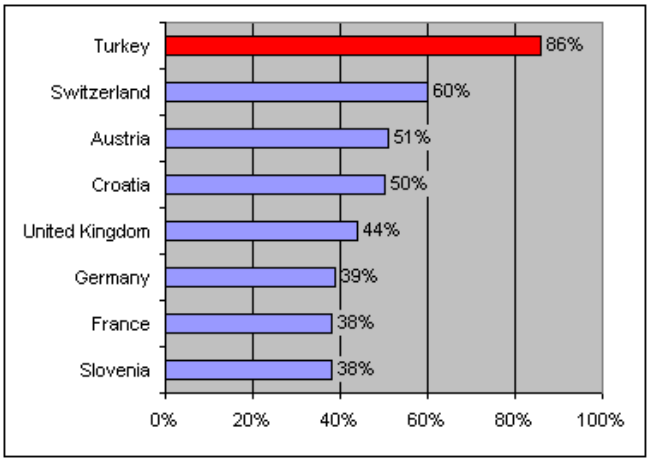

Figure 9. Diffusion rate of JIT production [8]

5.5 Enterprise Resources Planning

Enterprise Resources Planning (ERP) represents a single structure, which integrates business processes covering all functional facets of an enterprise [11]. ERP systems embody all the software and process and procedures aimed at realizing this structure [12]. ERP does not only provide a tool for dealing with all transactions taking place during the daily operations of a firm but at the same time it imposes an enterprise model to the firm involved. Successful implementation of ERP is a must for firms trying to modernize their operations – particularly for those which strive to become part of global supply networks. The firms participating in the study started to implement ERP in the 1990s. The early adopters were in the metal and chemical industries. Initially the diffusion rate of ERP applications was low but it picked up after year 2000. Around 42% of the firms in the chemical industries and around 22% of the firms in the remaining three sectors already implement some form of ERP. During the next two years another 24% of firms in the metal sector, 16% in the textile, %12 in food processing and chemical industries plan to adopt ERP. It was indeed a surprising result to

observe the high percentage of firms indicating that ERP is not applicable in their firms. With the addition of those planning to adopt ERP within the next two years, the percentage of firms implementing ERP can reach acceptable levels but still the high percentage of firms claiming ERP is not applicable in their firms constitute a major problem. This impression by the top management of these firms can be attributed mainly to the lack of information on their part. Considering ERP's positive impact on the fluidity of the supply chain and its being a major component of the infrastructure needed to become part of the global supply chain, diffusion of ERP to all manufacturing firms small or large alike needs to be promoted.

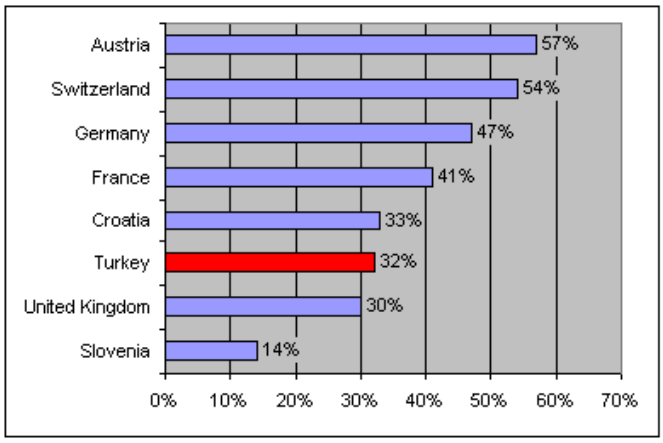

Figure10. Diffusion rate of ERP usage [8]

According to the comparable results in EMS 2004, the use of ERP in the manufacturing firms in Turkey are relatively low compared to the use in the other countries of the consortium (Figure 10). As a base for comparison, we can cite the diffusion rates in Sweden [13] and USA [11] as 74.6% and 44.1%, respectively.

Type of Information	Suppliers having access to the information base of all/some of the manufacturers (%)
Manufacturer's demand forecasts	35
Manufacturer's production	25
Manufacturer's sales data	5
Manufacturer's inventory data	10
Type of Information	Suppliers allowing access to their own information base to all/some of the manufacturers (%)
Supplier's inventory data	20
Supplier's production	20
Supplier's manufacturing cost	15

Table1. Information sharing between manufacturers and suppliers [14]

Strategic partnership involves long term relations based on mutual trust. Information sharing is an important instrument in building trust among the manufacturer and the supplier. Information sharing is essential for the proper coordination of the supply chain, particularly in reducing the uncertainties involved around order levels and schedules. Reduction in uncertainties leads to improvements in the inventory positions of both parties and thus to cost

savings for both parties. According to the results obtained in the *Innovations in Manufacturing Industries in Turkey Study*, information sharing among suppliers and manufacturers in a systematic way started in 1990s. The diffusion level was between 50-60% across all sectors. Around 50% of those having some form of information sharing declared that they have initiated this application in 2004. Thus, information sharing among suppliers and manufacturers is a relatively recent issue. The results reported in Table 1 concerning information sharing are obtained when looking into appliances part and component suppliers in Turkey in 1999 [14]. The figures indicate to a relatively low level of information sharing among suppliers and manufacturers.

6 CONCLUSIONS

Experience from several sector studies on competitive strategies conducted earlier are used to put the innovation studies into context [9]. A major conclusion drawn is that, in general, the manufacturing sector in Turkey is increasing the weight of the *product differentiation strategy* against *low cost strategy* within their *mixed strategy*. Quality has preserved its rank as the number one competitive priority through the last 10 years. The same holds true for TQM as the most widely employed action plan in the firms. These observations explain the results the Turkish manufacturing firms have attained in EMS 2004. They have performed extremely well under headings like "continuous improvement process", "JIT delivery", "JIT purchasing". It is interesting to note though that emphasis innovation and particularly new product development is steadily increasing. The dominant new product strategy has evolved over the last 7 years from "follower in the market" to "first in the market". The product strategy, on the other hand, has evolved over the last 7 years from "focus on cost" to "focus on differentiation through product variety". Results on share of new products in total sales, number of new products introduced into the market in the last 3 years, success rate of new product introductions, reasons for new products not being successful, and markets for new products are provided. Innovativeness, which has been ranked as the factor affecting least the recent success of the company among cost, quality, timeliness, and flexibility as recent as 4 years ago, is now being considered as a major means for survival. Further information is shared concerning the production technology and operations management practices.

7 REFERENCES

[1] Porter, M, 1980 *Competitive strategy: Techniques for analyzing industries and competitors*, Free Press, New York.

[2] Miller, J. G, DeMeyer, A and Nakane, J, 1993 *Benchmarking global manufacturing*, Business One - Irwin, Homewood, Illinois.

[3] DeMeyer, A and Pycke, B, 1996 Separating the fads from the facts: trends in manufacturing action programmes and competitive priorities from 1986 till 1996, Working Paper 96/21/TM, INSEAD.

[4] Whybark, D. C and Vastag, G (ed) 1993 *Global manufacturing practices*, Elsevier, Amsterdam.

[5] Voss, C, Hanson, P, Blackmon, K and Oak, B, 1995 The competitiveness of European manufacturing – a four country study, *Business Strategy Review*, 6, 1, 1-25.

[6] Cagliano, R, Acur, N and Boer, H, 2003 Manufacturing strategy configurations: stability and trends of change, presented at EUROMA 2003, Como, Italy.

[7] OECD, 2002 *The measurement of scientific and technological activities. Frascati manual 2002*, Paris.

[8] Armbruster, H, Kinkel, S, Lay, G and Maloca, S, 2005 Techno-organizational innovation in the European manufacturing industry, European Manufacturing Survey, Bulletin 1, Fraunhofer Institute for Systems and Innovation Research, Karlsruhe.
[9] Ulusoy, G, 2000 *Moving forward. Assessment of competitive strategies and business excellence in the Turkish manufacturing industry: a benchmarking study*, TUSIAD Competitive Strategies Series – 6, Istanbul.
[10] Juran, J.M, 1988 Managing for quality, *Journal for Quality and Participation*, 11,1, 8.
[11] Mabert, V.A, Soni, A, and Venkataraman, M.A, 2000 Enterprise resource planning survey of US manufacturing firms, *Production and Inventory Management*, 41, 2, 52-58.
[12] Jacobs, F.R, and Bendoly, E, 2003 Enterprise resource planning: developments and directions for operations management research, *European Journal of Operational Research*, 146, 233-240.
[13] Olhager, J and Selldin, E, 2003 Enterprise resource planning survey of Swedish manufacturing firms, *European Journal of Operational Research*, 146, 365-373.
[14] Ulusoy, G, 2003 An assessment of supply chain and innovation management practices in the manufacturing industries in Turkey, *International Journal of Production Economics*, 86, 3, 251-270.