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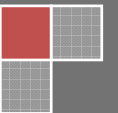
TÜSİAD-Sabancı University Competitiveness Forum

Innovations in Manufacturing  
2006/07  
Executive Summary

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# **Innovations in Manufacturing 2006/07**

## **Executive Summary**

*Innovations in Manufacturing* study has been initiated in 1993 by Fraunhofer Institute for Systems and Innovation Research (**Fraunhofer ISI**) in Karlsruhe, Germany. Initially, the study was limited to the German manufacturing firms and starting in 1993, it was repeated every two years in Germany. After several such rounds, Fraunhofer ISI decided to include other countries in the study on innovations in manufacturing industry. The study was implemented in Austria, Croatia, England, France, Germany, Italy, Slovenia, Switzerland and Turkey in the years 2003-2005. From Turkey, TUSIAD-Sabancı University Competitiveness Forum (**REF**) participated in the study in the years 2004-2005. 135 firms took part in the study. After the completion of the study a workshop was conducted with the firms, which participated in the field study, to share the results and conclusions with them. These results and conclusions were also published by REF on the REF website in the form of 8 Bulletins.

In 2006 and 2007, 4 new countries (Finland, Greece, Netherlands and Spain) joined the group of countries participating in the *Innovations in Manufacturing* study. In this round, Turkey was again represented by REF. Similar to the 2004/05 study, a workshop was conducted with the firms, which participated in the field study, to share the results and conclusions with them. These results and conclusions were also published by REF as a Final Report and its Executive Summary on the REF website. The Executive Summary of the Final Report is presented here. For those questions, which are the same in both questionnaires, the differences between the results of the two studies are also presented.

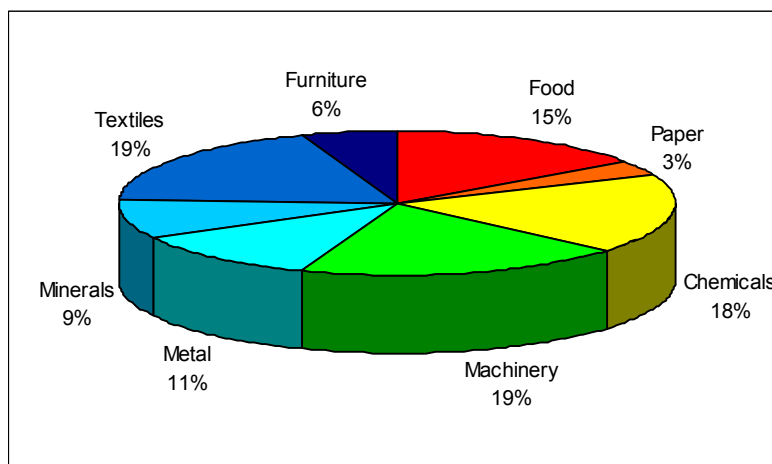
*Innovations in Manufacturing 2006/07* was implemented under the coordination of REF in İstanbul, İzmir, Gaziantep, Kocaeli, and Kayseri provinces, which host a major part of the Turkish manufacturing industry. The firms were selected randomly from the databases of the Chambers of Industry in these provinces following a statistical methodology. The data on technical, organizational and managerial innovations of the selected 124 manufacturing firms was collected.

In December 2005, the questionnaire was translated into Turkish and new questions specific for the Turkish study were added. In January-February 2006, a pilot study was conducted through face-to-face interviews with 8 firms. Following

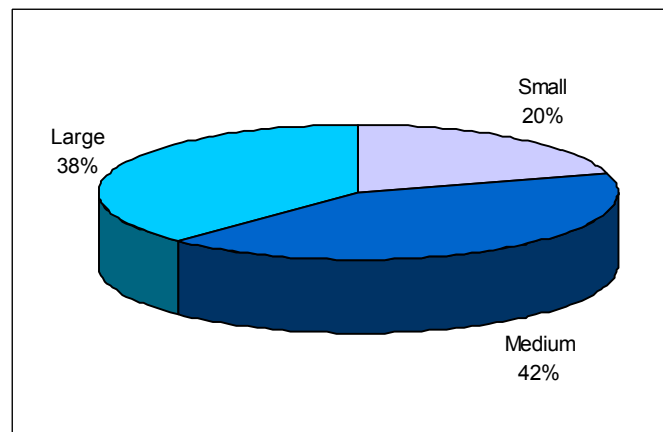
the suggestions from these firms and making use of the experience gathered the questionnaire was finalized. The questionnaire was sent to the academicians, who agreed to conduct field studies in Gaziantep, Kayseri, and İzmir. The field studies started in May 2006 and ended in April 2007. In order to increase the rate of return, the survey was conducted through three different channels: face-to-face interviews, mailing and e-mail. The data was entered to the database in April-June 2007. The analyses were made in July-August 2007 and the writing of the report started in September 2007.

The questionnaire implemented by the countries participating contained 255 information requests organized under 25 main headings. It was extended by REF to include 344 information requests under 45 main headings.

- The breakdown of 124 firms participating in the study according to sectors and size are shown in Figure 1 and Figure 2, respectively.



**Figure 1** Breakdown of the firms participating in the study according to sectors



**Figure 2** Breakdown of the firms participating in the study according to size

- ❑ The breakdown of the firms participating in the study according to size is shown in Table 1. The number of small sized firms participating in the field study is relatively small whereas the numbers of medium sized and large companies are almost equal. The breakdown of the size of firms according to provinces is shown in Table 2.

**Table 1** The breakdown of the sectors of firms according to size

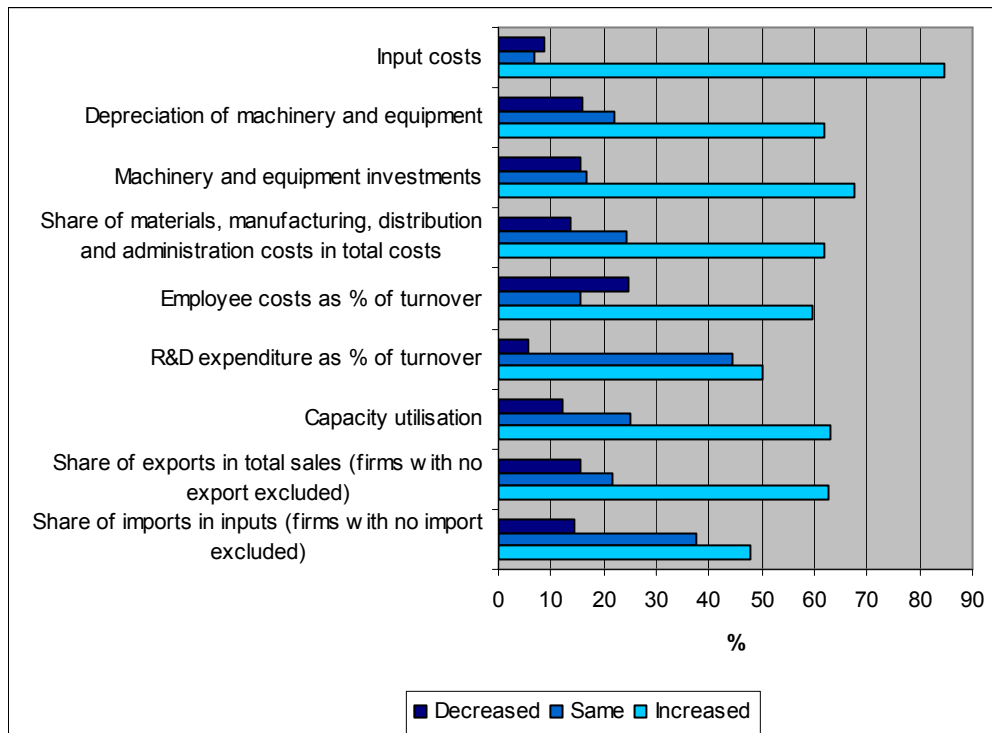
	Food	Paper	Chemicals	Machinery	Metal	Minerals	Textiles	Furniture	TOTAL
<b>Small</b>	4	0	3	9	3	3	3	0	<b>25</b>
<b>Medium</b>	11	3	8	11	8	4	7	0	<b>52</b>
<b>Large</b>	4	1	11	4	3	4	13	7	<b>47</b>
<b>TOTAL</b>	<b>19</b>	<b>4</b>	<b>22</b>	<b>24</b>	<b>14</b>	<b>11</b>	<b>23</b>	<b>7</b>	<b>124</b>

**Table 2** The breakdown of the size of firms according to provinces

	Large	Medium	Small	TOTAL
<b>İstanbul-Tekirdağ-Yalova</b>	11	18	5	<b>34</b>
<b>Adana-Adıyaman-Mersin-Gaziantep</b>	6	11	11	<b>28</b>
<b>Karaman-Kayseri-Konya</b>	17	7	4	<b>28</b>
<b>İzmir-Manisa</b>	8	8	1	<b>17</b>
<b>Kocaeli-Sakarya</b>	4	5	2	<b>11</b>
<b>Ankara-Bursa-Denizli-Eskişehir</b>	1	3	2	<b>6</b>
<b>TOTAL</b>	<b>47</b>	<b>52</b>	<b>25</b>	<b>124</b>

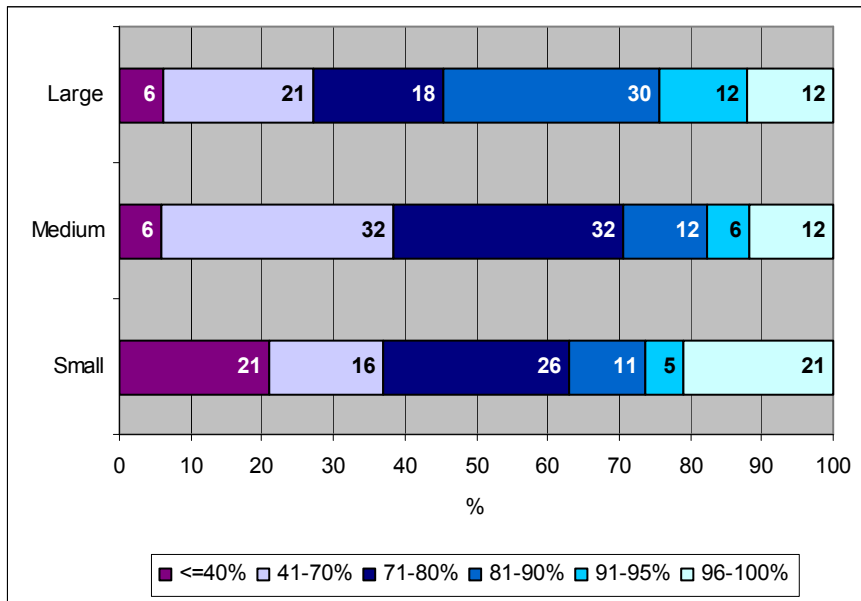
- ❑ The distribution of the responses among the 3 methods of data collection utilized is 58% face-to-face interview, 32% mailing, and 10% e-mail.
- ❑ 18% of the firms participating in the field study have *foreign direct investment*.
- ❑ The results of the question on changes from 2003 to 2005 in some of the financial indicators can be seen in Figure 3. There is a general increase especially in costs. *Input costs (purchased parts, materials and services)* increased from 2003 to 2005 in 85% of the firms. *Research and Development (R&D) expenditure as a percentage of turnover* increased in 50% of the firms. Among the firms exporting part or all of their production 63% stated that *the share of exports in total sales* increased, while 15% declared that it decreased. In 38% of the firms importing

part or all of their inputs *the share of imports in inputs* stayed the same, while it increased in 48% of them.



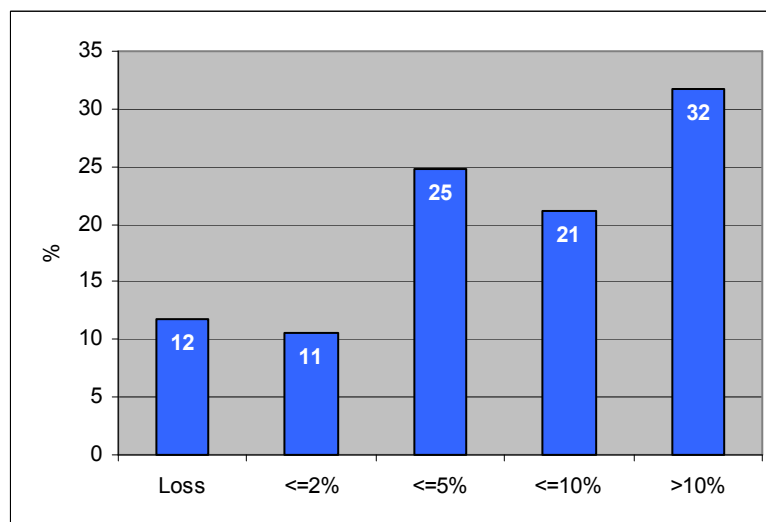
**Figure 3** Changes in some financial indicators from 2003 to 2005

- ❑ 63% of the exporter firms reported that their *share of exports in total sales* has increased. One should note that a large portion of these exports are made to developed countries –particularly to EU countries- with a relatively high quality expectation and strict regulations. This observation among others can be considered an indirect indicator of product quality.
- ❑ A major dilemma of the manufacturing industry in Turkey is that end product manufacturers prefer to use imported parts and components. The practice of increasing the local content over time has become less preferable particularly among exporting firms.



**Figure 4** Capacity utilization

- Among medium sized firms, *capacity utilization* fell mainly into the ranges 41-70% and 71-80% (Figure 4). Among the large sized firms, 30% operated with a *capacity utilization* in the range 81-90% and 21% of them in the range 41-70% *capacity utilization*. It should be noted that the *capacity utilization* of a relatively larger group of small sized firms was less than 40% compared to those of large or medium sized firms. These firms can be expected either to vanish over time or to join in some form with other companies so as to seek a more secure environment.



**Figure 5** Return on sales (before tax, 2005)

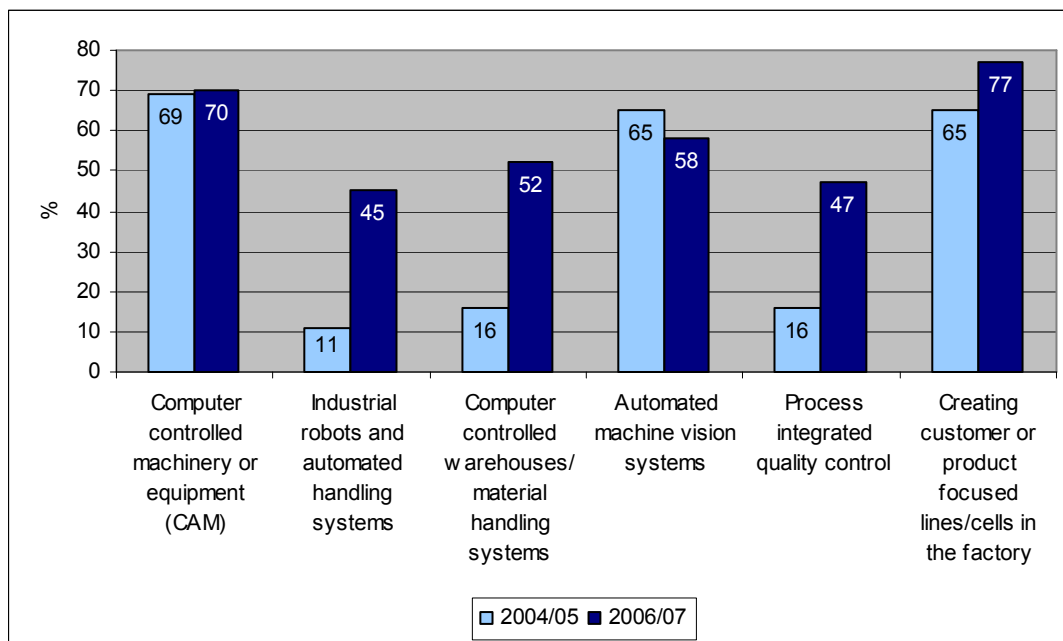
- The responses to the question inquiring about the *return on sales (before tax)* in 2005 show that firms were operated generally at low profits (Figure 5). Only 32%

of the firms operated with a *return on sales* exceeding 10%. 12% of the firms declared that they incurred a loss in 2005.

- It is seen that, the most important reason for foreign direct investment in Turkey as well as for direct investment by Turkish investors abroad is the same: *opening up of new markets* (Table 3). The second important reason for direct investment abroad by Turkish investors is *proximity to important customers*. On the other hand, for foreign direct investment in Turkey, the second important reason is *the labor cost*.

**Table 3** The importance of reasons to invest abroad

Reasons	Foreign direct investment in Turkey	Direct investment by Turkish investors abroad
Opening up of new markets	1 <sup>st</sup>	1 <sup>st</sup>
Proximity to important customers	3 <sup>rd</sup>	2 <sup>nd</sup>
Flexibility, ability to deliver quickly	3 <sup>rd</sup>	3 <sup>rd</sup>
Labor cost	2 <sup>nd</sup>	3 <sup>rd</sup>



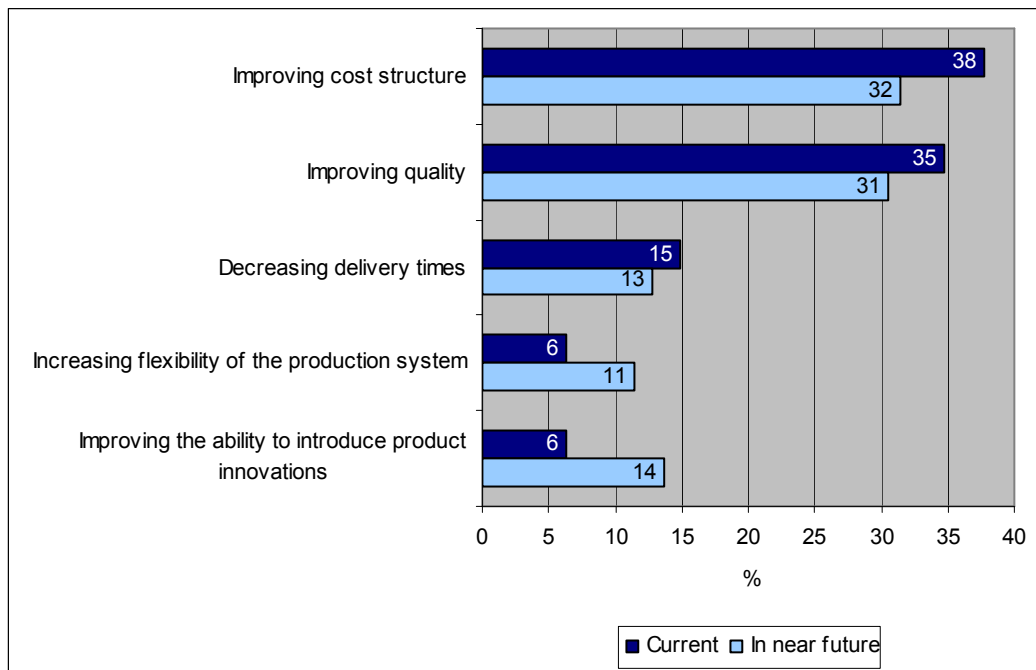
**Figure 6** The change in the implementation of production technologies and production organization applications from 2004/05 to 2006/07

- The comparison of the shares of implementation of various production technologies and production organization applications between *Innovations in Manufacturing 2004/05 and 2006/07* are shown in Figure 6. According to the



results displayed, the share of implementation of all technologies except for the *automated machine vision systems* increased. Especially, the share of the firms, which employed technologies such as *industrial robots and automated handling systems, computer controlled warehouses/material handling systems, and process integrated quality control*, increased from 14% to 45% during the course of two years.

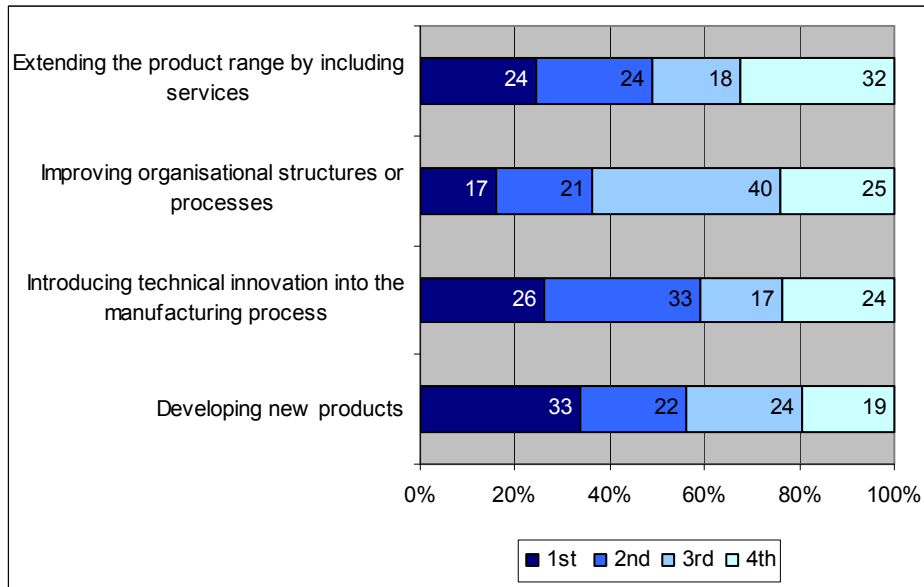
- The productivity in the manufacturing industry in Turkey has steadily increased during the period of both Innovations in Manufacturing studies without an appreciable increase in employment. The increase in automation detected in this study might provide an explanation for this observation.



**Figure 7** The ranking of the manufacturing objectives

- *Improving cost structure* and *improving quality* are ranked by the firms as the 1<sup>st</sup> and the 2<sup>nd</sup> currently most important manufacturing objectives, respectively (Figure 7). For the near future, the first two objectives are ranked in the same order but there is a decrease in their weights. The 3<sup>rd</sup> currently most important manufacturing objective is *decreasing delivery times*. Considering the expectations for the near future, *improving the ability to produce product innovations* and *increasing flexibility of production systems* appear to become

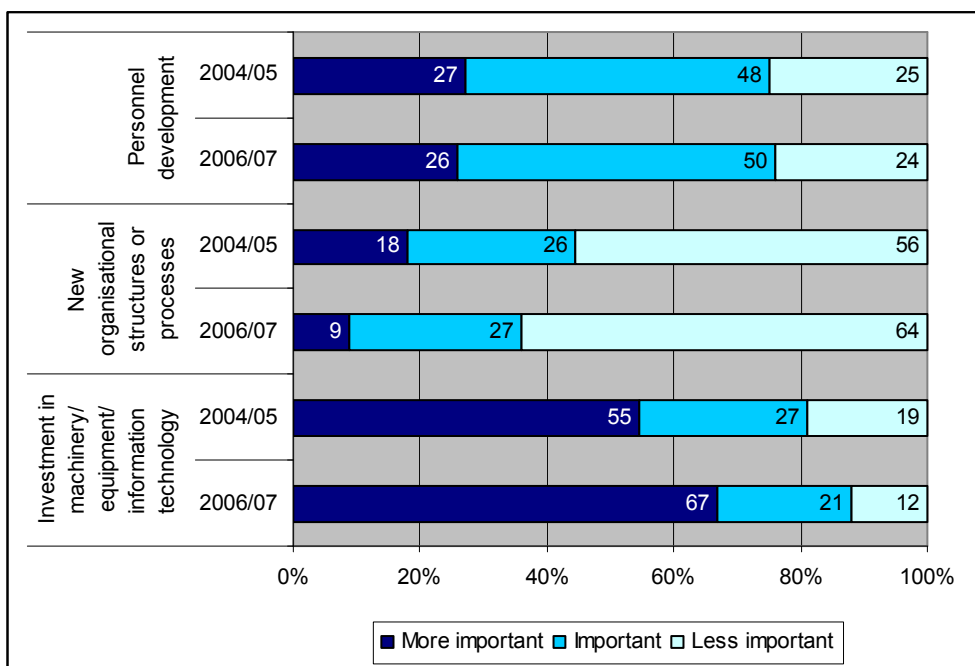
important manufacturing objectives. This result is a supporting evidence of the current trends in the manufacturing industry in Turkey.



**Figure 8** The ranking of the improvement activities in manufacturing

- The responses to the question in which we requested the ranking of the four most important manufacturing improvement activities reveal that *developing new products<sup>1</sup>* is the improvement activity with the highest priority (Figure 8). *Introducing technical innovations into the manufacturing processes* is ranked as the second highest priority improvement activity. The improvement activity with the lowest priority is *improving organizational structures*. It can be argued that both the difficulty and the low frequency of the realization of this activity have played a role in this result.
- It appears that the most important strategy for the improvement of manufacturing is *investment in machinery/equipment/information technology* (Figure 9). This strategy is followed by *personnel development* and *new organizational structures or processes*. The responses to this question are very close to the responses to the same question in the *2004/05* study. It is seen that in the course of the last 2 years, although the ranking of the strategies for the improvement of manufacturing has not changed, still a major shift in importance from the *new organizational structures or processes* to the *investment in machinery/equipment/information technology* is observed.

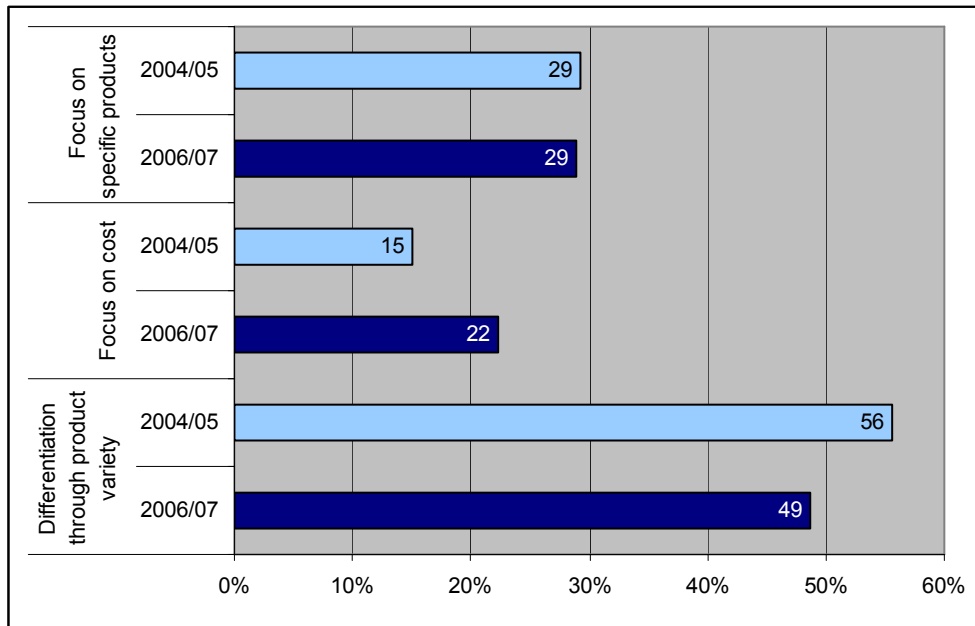
<sup>1</sup> Completely new products or products with major technological improvements (excluding the changes of solely aesthetic nature) under 3 years of age are called here new products.



**Figure 9** Importance of different strategies for the improvement of production

■ The firms were questioned concerning their dominant product strategy with the options being differentiation through product variety, focus on cost, and focus on specific products. The distribution of the firms with respect to the dominant product strategy implemented is similar to the distribution in Innovations in Manufacturing 2004/05 study (Figure 10). Differentiation through product variety is again the dominant product strategy employed by the majority of the firms. This is in line with the result that developing new products is rated as the most preferred improvement activity in manufacturing (Figure 8).

For the firms, which have more than 5% return on sales, the most preferred product strategy is *focus on specific products* or *differentiation through product variety*. On the other hand, the most preferred product strategy of the firms with 5% or less return on sales is *focus on specific products* or *focus on cost*. Hence, it can be suggested that *differentiation through product variety* strategy pays off.



**Figure 10** Product strategy

- 47% of the firms indicated that they use the strategy of *entering new markets with new products* as the overwhelmingly used new product/market strategy (Table 4). This strategy is in general the one with the highest risk involved.

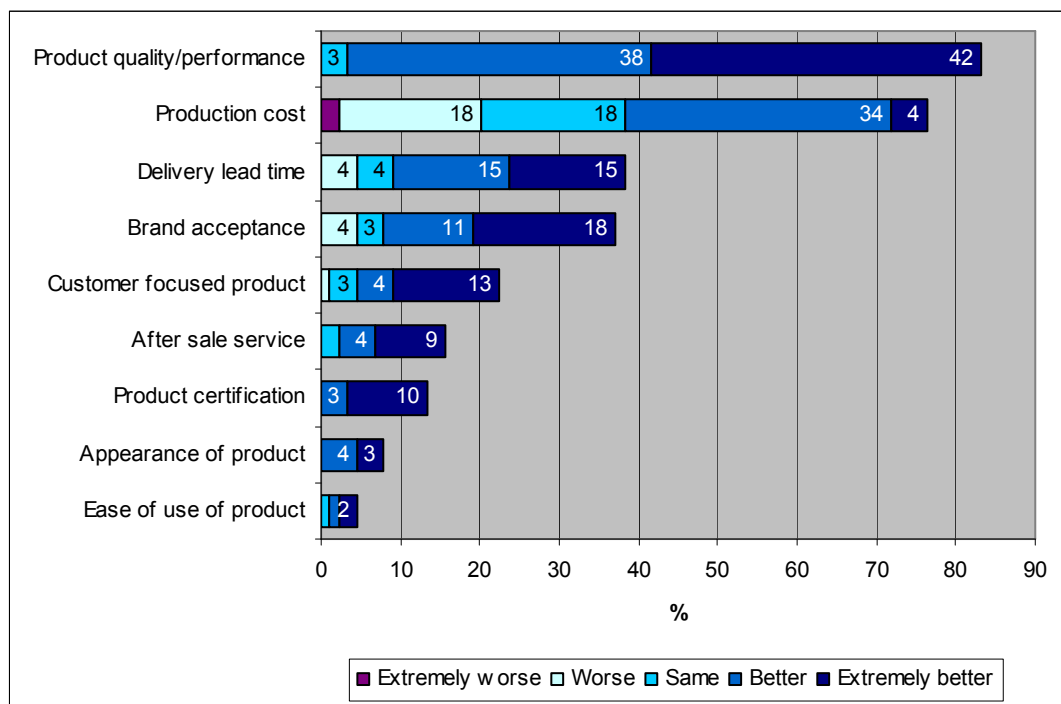
**Table 4** New product/market strategy

		Market	
		Existing	New
Product	Existing		%26
	New	%27	%47

- The firms, which have adopted *entering new markets with new products* as their new product/market strategy have higher *added value/turnover ratio* than the other firms.
- The results displayed in Figure 11 show the answers to the question on the three most important determinants of competitiveness in the sector to which the firm belongs to. According to these results, *product quality/performance* and *production cost* were ranked as the 1<sup>st</sup> and the 2<sup>nd</sup> most important determinants of competitiveness, respectively. The same result was obtained in the 2004/05 study. The 3<sup>rd</sup> and 4<sup>th</sup> most important determinants were stated to be *delivery lead time* and *brand acceptance*, respectively, again as in the 2004/05 study. It is

worth noting that in the 2006/07 study, the percentage of *brand acceptance* has increased considerably.

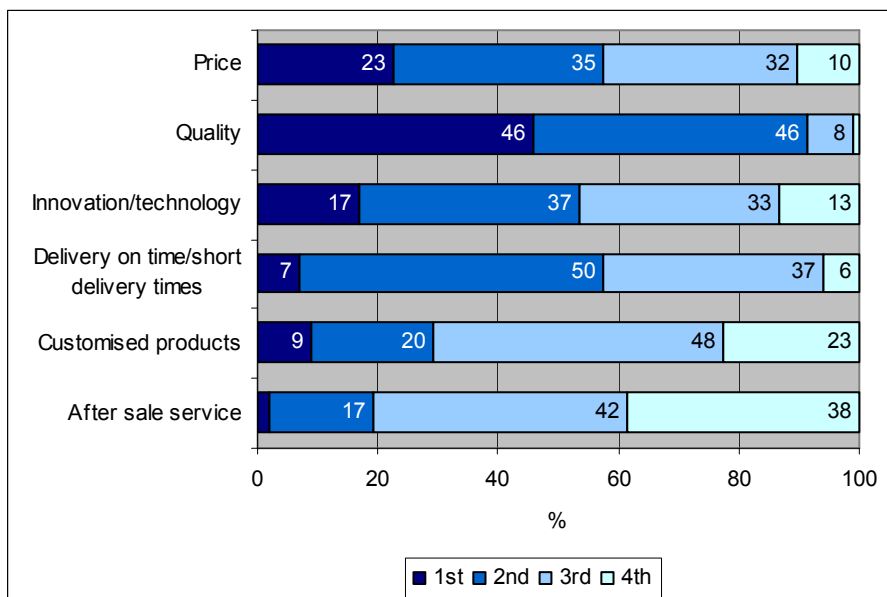
In this question, we also requested the firms to rank themselves against their leading competitors considering these determinants. Generally, the firms indicated that they were 'better' or 'extremely better' than their competitors. However, it is interesting to note that there exist many firms, which stated that their *production cost* is 'worse' or 'extremely worse' than their leading competitors'. These firms assessed themselves not to be competitive in *production cost*. This result is in line with the answers to other questions as well as the same question asked in the 2004/05 study.



**Figure 11** The determinants of competitiveness and the relative positioning of the firms against their leading competitor

- In general, if a firm considered itself to be better than its leading competitors regarding the determinants of competitiveness, *return on sales* of that firm was found to be higher than those firms, which indicated that they were the 'same' or 'worse' than their leading competitors.
- In general, if a firm considered itself to be better than its leading competitors regarding the determinants of competitiveness, *percentage of delivery on time* of the firm turned out to be higher than those firms, which indicated that they were 'same' or 'worse' than their leading competitors.

□ The answers to the question in which the competitive priorities of the firms were asked, were similar to the answers of the 2004/05 study. The most important competitive priority turned out to be again *quality*<sup>2</sup> (Figure 12). In the second place, *price* preserved its rank. In the 2006/07 study, the importance of *innovation/technology* increased and it took the 3<sup>rd</sup> rank. In the same question of the 2004/05 study, *delivery on time/short delivery times* was the 3<sup>rd</sup> highest ranking competitive priority. *After sale service* maintained its position as the lowest ranking competitive priority in both studies.

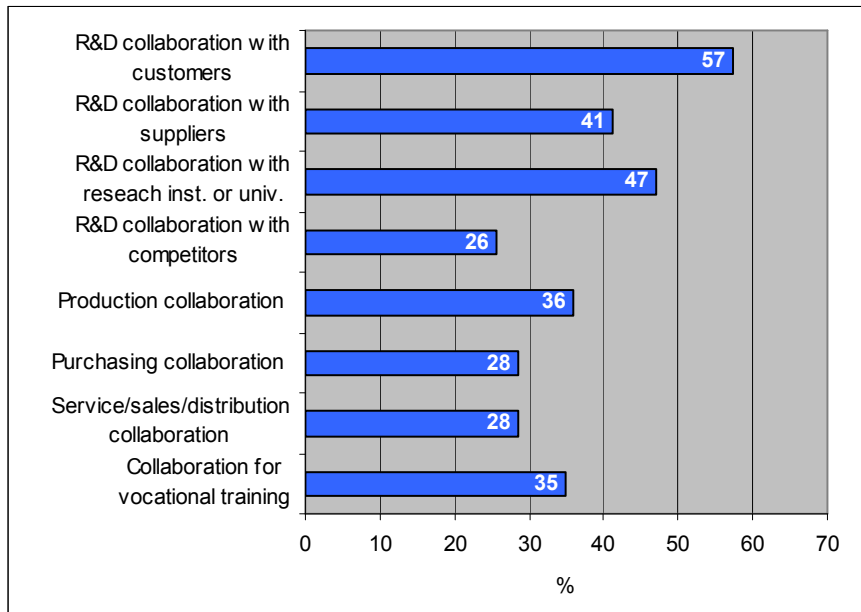


**Figure 12** The ranking of competitive priorities

□ The information sources used to monitor the competitors are ranked as below, where “1” designates the most frequently employed information source:

1. Products of the competitors,
2. Markets entered by the competitors,
3. Fairs, exhibitions, open information sources,
4. Manufacturing technologies of competitors.

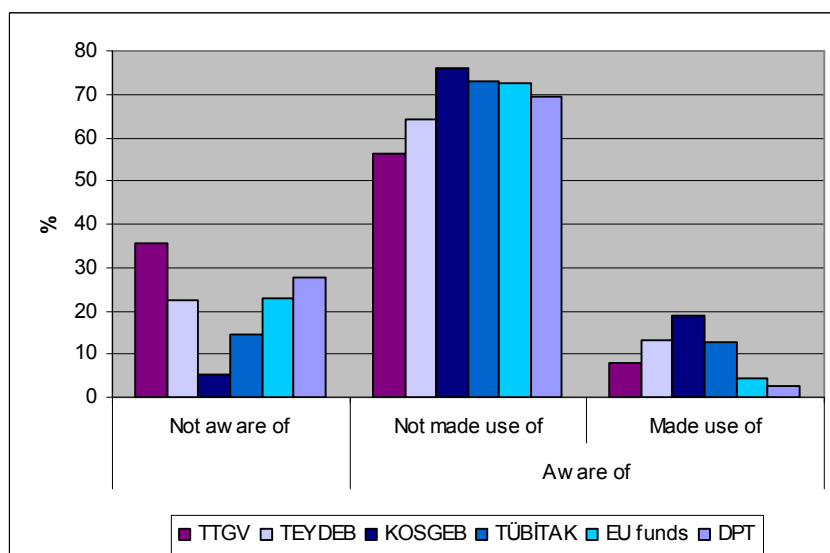
<sup>2</sup> The competitive priorities are to be ranked from “1 to 6” with “1” indicating the one with the highest importance. For ease of reporting a “1 to 4” scale is adopted, where “2” represents “2 and 3” and “3” represents “4 and 5” of the 6-point scale combined.



**Figure 13** The level of use of modes of collaboration by the firms

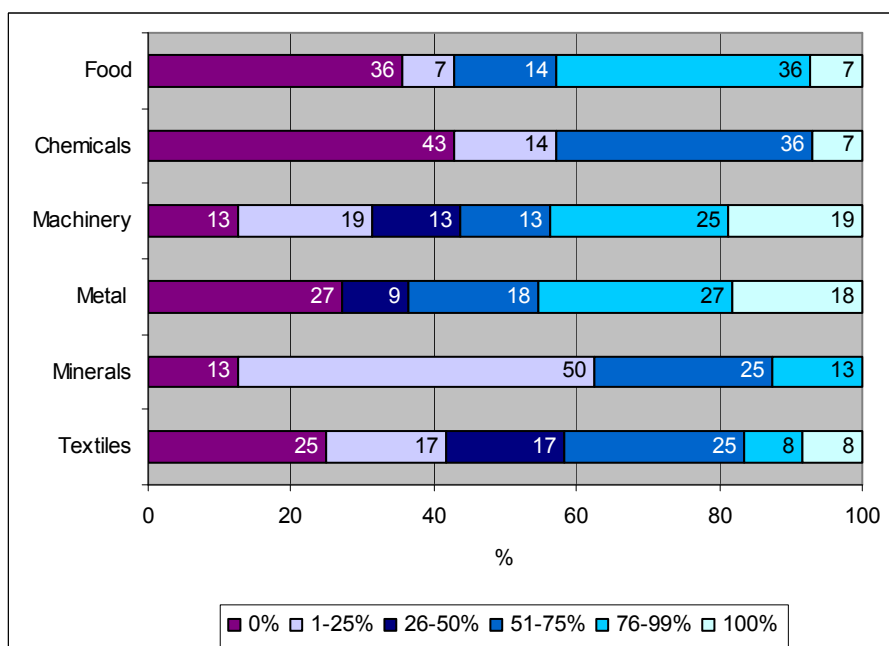
- ❑ The percentages of firms, which stated to make *R&D collaboration with research institutes or universities* and *R&D collaboration with competitors*, increased remarkably in the *2006/07* study in comparison with the *2004/05* study (Figure 13).
- ❑ 28% of firms, which have some level of R&D activity, use public incentives, subsidies, or tax benefits for R&D activities they perform. The sector, which exploited these financial supports most extensively, was the machinery sector. If we analyze the financial supports according to the organizations extending these supports, we see that the financial support schemes provided by KOSGEB<sup>3</sup> were the ones mostly preferred (Figure 14). 19% of the firms made use of the financial support schemes provided by KOSGEB and 95% of the firms were informed about these schemes. The financial support programs by TTGV on R&D and innovation were the least known financial support programs. 36% of the firms did not know about TTGV's financial support programs.

<sup>3</sup> TTGV: The Turkish Technological Development Foundation; TEYDEB: The Directorate for the Technology and Innovation Funding Programs; KOSGEB: The Directorate for the Development and Promotion of Small and Medium Enterprises; TÜBİTAK: The Scientific and Technological Research Council of Turkey; DPT: State Planning Organization.



**Figure 14** Awareness of financial support programs for R&D and innovation

- In the analysis among the firms older than 10 years, it was observed that in all sectors covered more than half of the firms produced at least 1 product for more than 10 years (Figure 15). The ratio was the highest in machinery and minerals sectors (87%) and was the least in the chemicals sector (57%). It was also determined that, in machinery and metal sectors, the turnovers of nearly 20% of the firms were composed of these products (Figure 15).

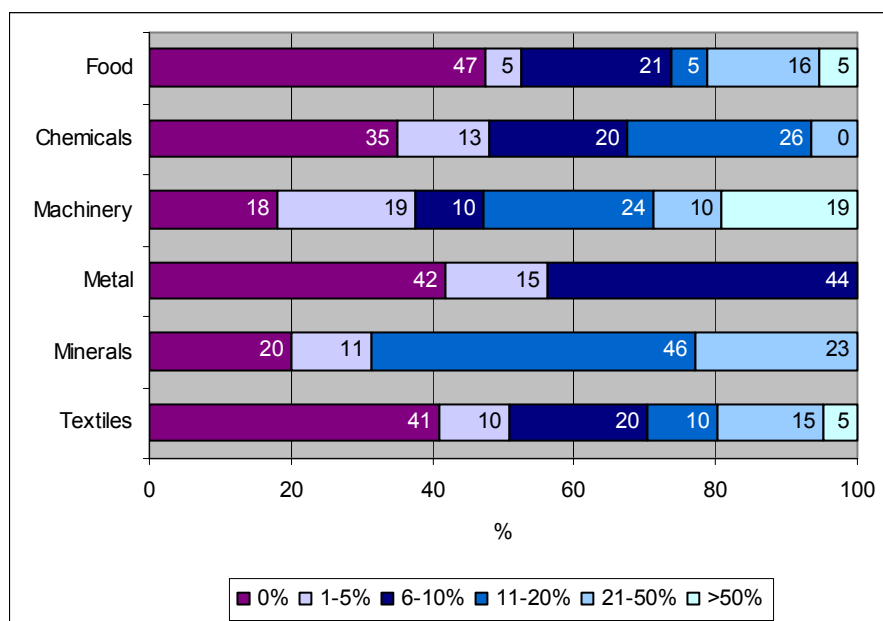


**Figure 15** The share of turnover generated by products more than 10 years old



■ The percentages of firms, which introduced new products to the market in the last 3 years, are shown in Figure 16. For example, 65% of firms in the chemicals sector introduced at least 1 new product to the market during the course of the last 3 years. According to these results, the percentage of the *firms which introduced new products to the market in the last 3 years* was the highest in the machinery and minerals sectors (82% and 80%, respectively). Food industry had the firms with the least rate (53%) of introducing at least 1 new product to the market. The most frequent answer regarding the number of new products introduced in the last 3 years was in the range of 1-5.

*The share of new products in turnover* changes according to the sectors (Figure 16). In food, metal and textiles industries, the share of 3 years or younger products in turnover fell mostly into the 6-10% interval. There were no firms in the metal industry with a share of 3 years or younger products in turnover of more than 10%. In machinery industry, on the other hand, the share of 3 years or younger products in turnover was more than 50% in 19% of the firms. In the *Innovations in Manufacturing 2004/05* study, more than half of the firms, which introduced new products, had 1-20% share of new products in turnover. Also, in every sector, there were firms, which had more than 60% share of new products in turnover.

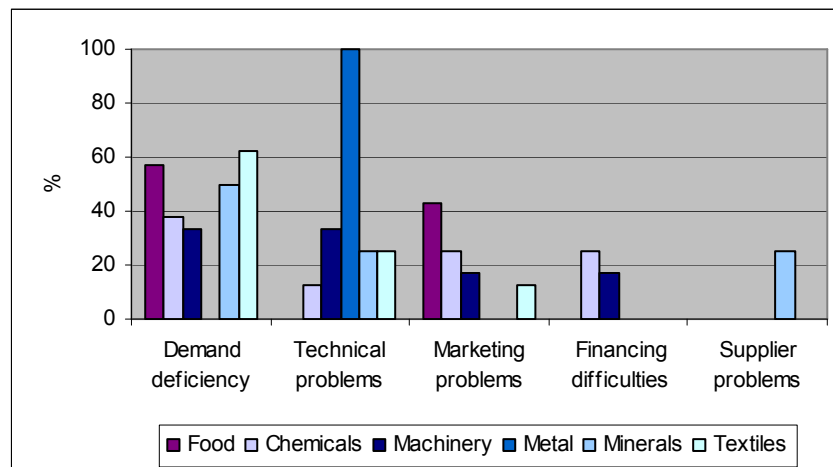


**Figure 16** The share of turnover generated by products 3 years or younger

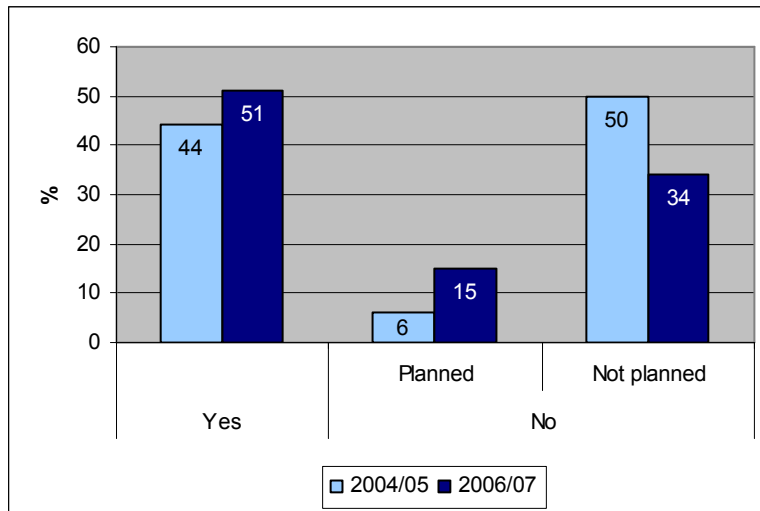
- Among the firms that introduced *new products to the market in the last 3 years*, 42% of those indicated that they had at least 1 product failure. The rate of firms with at least 1 product *failure* was found to be 46% among the large firms, 48% among the medium sized firms, and 17% among the small firms.

The reasons for failure with respect to each sector are shown in Figure 17. In food industry, *demand deficiency* and *marketing problems* appeared to be the reasons of failure. Firms in the chemicals and machinery industries experienced *financing difficulties*. *Supplier problems* were only experienced in the minerals industry. Like in the 2004/05 study, *technical problems* were most frequently encountered in the metal industry. There was no failure reported to result from *after sale service difficulties*.

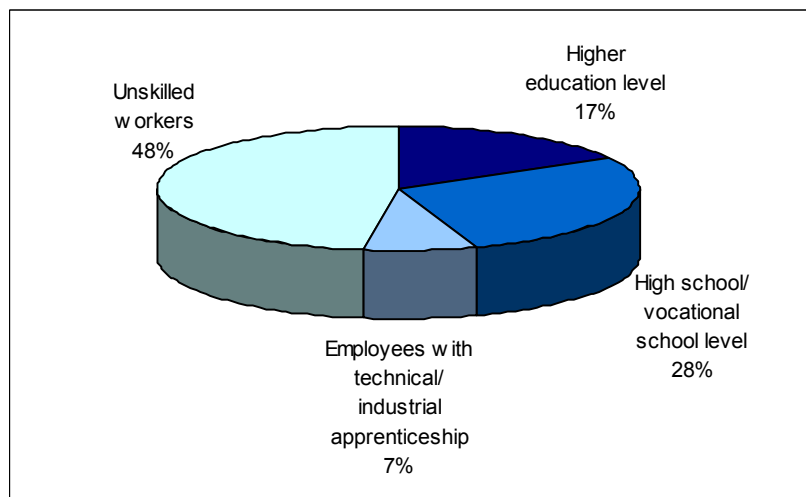
- The management of new product development process is one of the important factors of new product success. During new product development process, one of the current best practices is *concurrent engineering*. The change in the use of concurrent engineering from 2004/05 to 2006/07 is shown in Figure 18. As seen in the figure, there was an increase in both the current use of *concurrent engineering* and the number of firms, which plan to implement *it* in the following two years.



**Figure 17** Reasons of new product failure



**Figure 18** Change in the share of firms implementing concurrent engineering

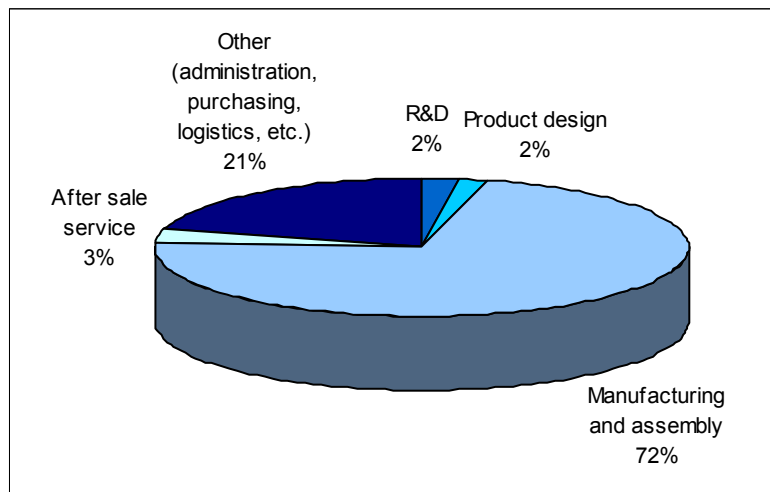


**Figure 19** Education levels of human resources

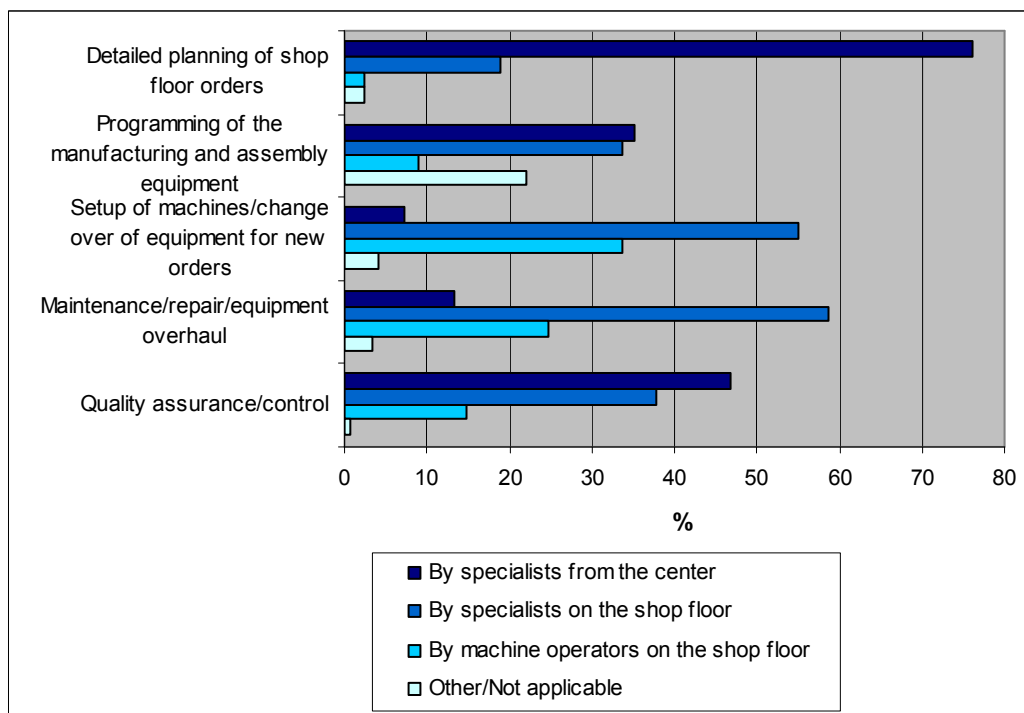
- When we analyze the distribution of all employees of the firms participating in the field study, the high share of *unskilled workers* (48%) draws attention (Figure 19). With 28%, the share of personnel with *high school or vocational school level* education followed the share of *unskilled workers*. Employees, who were graduates of a *higher education* program constituted 17% of all employees.
- The high level of unskilled workers is striking. These workers are employed to a large extent by SMEs. The number of those unskilled workers is bound to decrease over time due to several reasons. The firms do not employ any new unskilled workers for manufacturing jobs. A large portion of these unskilled workers are relatively older and leave their firms either through retirement or lay

off. Also the diffusion of automation has an impact on the reduction of unskilled workers.

- The distribution of all employees of the firms participating in the field study among different functions is shown in Figure 20. 72% of all employees were employed in *manufacturing and assembly* and 21% in support functions such as *administration, purchasing, and logistics*. In *R&D* and *product design* functions 2% of all employees each were employed.



**Figure 20** Distribution of employees among different functions (over all sectors)

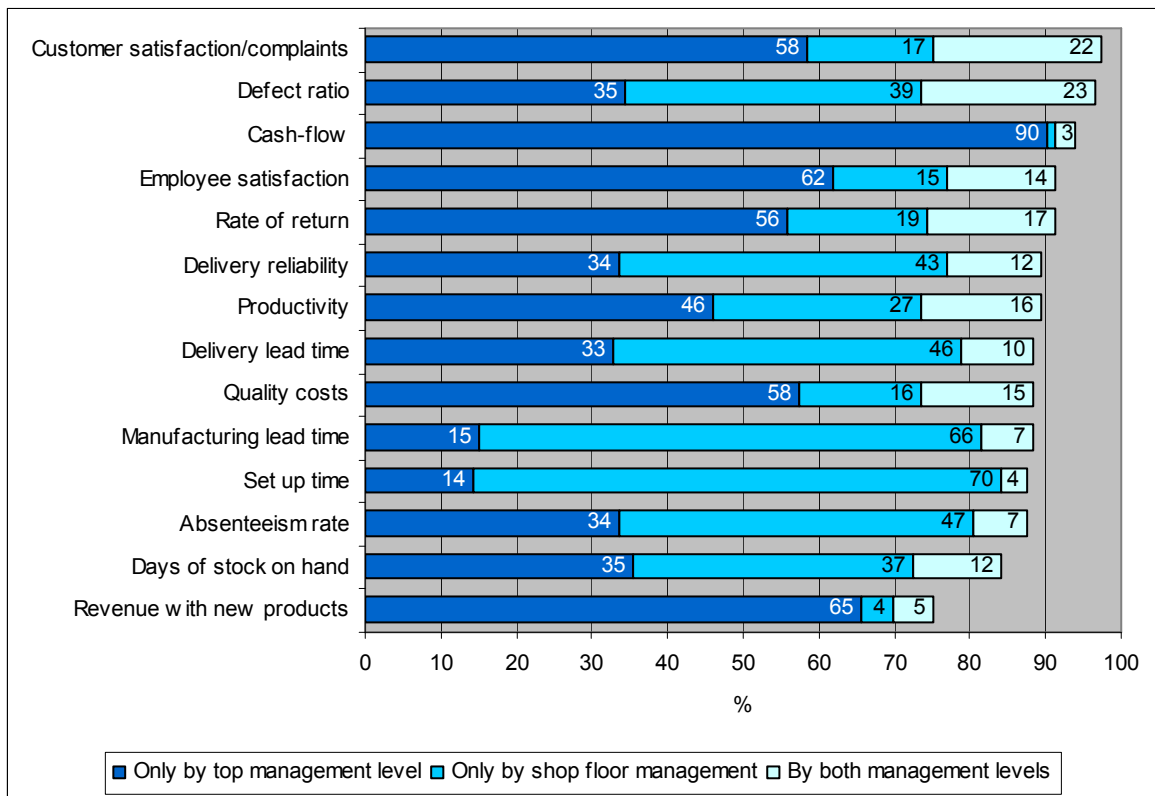


**Figure 21** Delegation of some shop floor tasks

- In the questionnaire, a question was included in order to assess the level of delegation concerning 5 different shop floor tasks between shop floor personnel and a central unit. The responses are displayed in Figure 21. It is found that *detailed planning of shop floor orders* were generally (76%) carried out by specialists from the center. This corresponding finding in *Innovations in Manufacturing 2004/05* study was 68%.

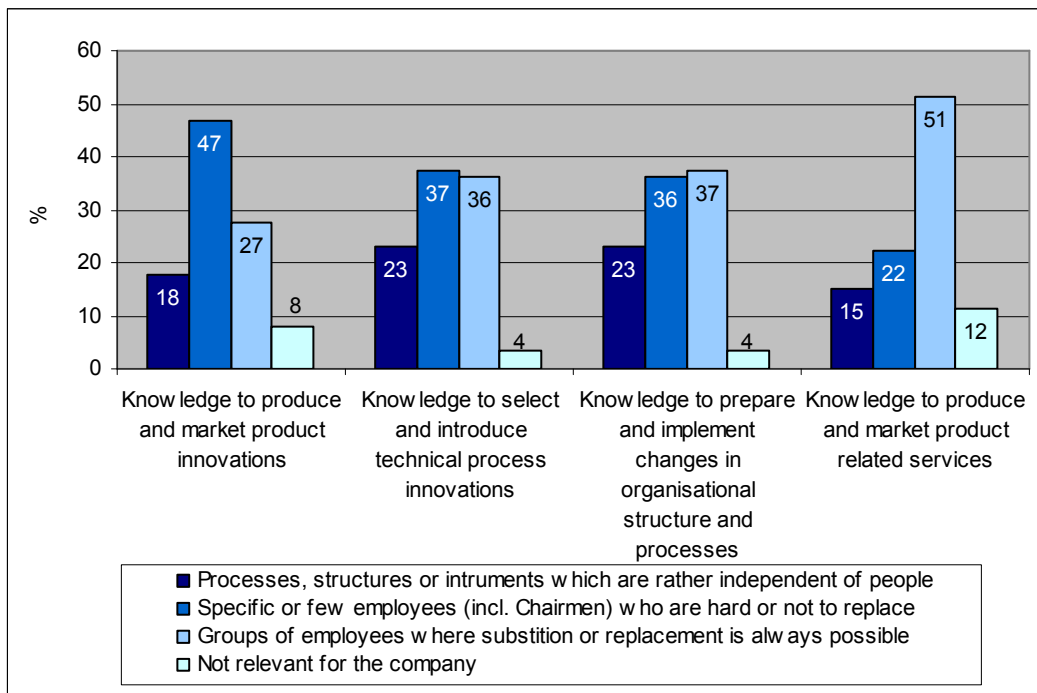
*Programming of the manufacturing and assembly equipment* and *quality assurance/control* tasks were generally carried out either by specialists from the center or by specialists on the shop floor with close implementation preferences. In the *2004/05* study, *programming of the manufacturing and assembly equipment* was carried out mostly by specialists from the center. On the other hand, results concerning *quality assurance/control* were similar to the *2006/07* study. Total Quality Management best practices indicate that *quality assurance and control* should be carried out as much as possible by machine operators themselves. These results reported here indicate that the current practice does not conform to a large extent with what Total Quality Management suggests.

*Setup of machines/change over of equipment for new orders* and *maintenance/repair/equipment overhaul* tasks were mostly carried out on the shop floor either by specialists (around 55%) or by machine operators (around 30%). These results are similar to the results of the *Innovation in Manufacturing 2004/05* study.



**Figure 22** Performance measures used for internal monitoring

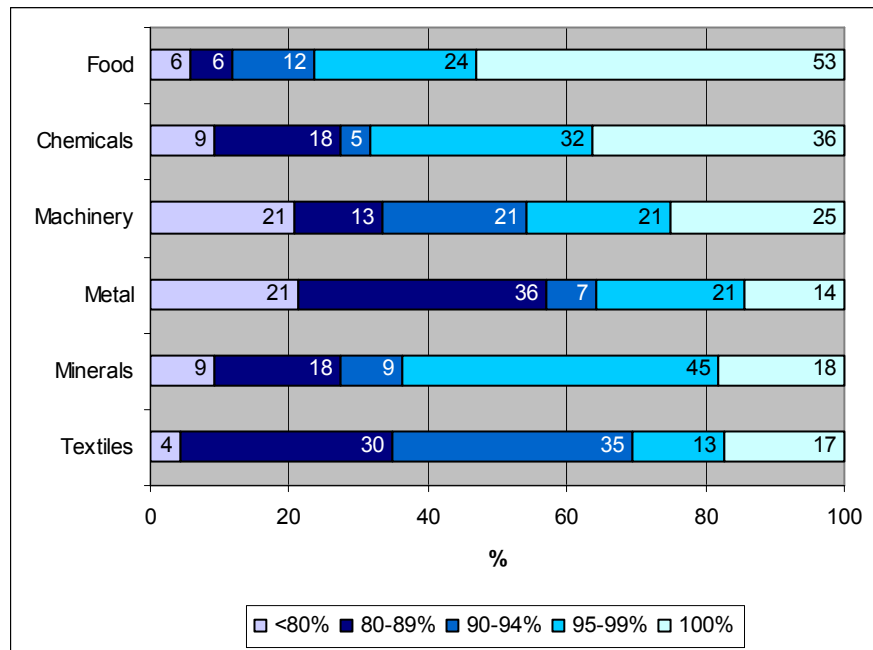
- Figure 22 displays the responses to the questions inquiring about the performance measures used for internal monitoring by top management and/or by shop floor management in order to control the firm. Those performance measures, which were used by more than 90% of the firms, were ranked as *customer satisfaction/complaints*, *defect ratio* and *cash-flow* in decreasing order of preference. The performance measures almost solely monitored by the top management level were the *cash-flow* (90%) and the *revenue with new products* (65%). The relatively low percentage associated with the *revenue with new products* is not surprising, since this performance measure was the least employed one by the firms (74%) - apparently because the new product development/introduction activity was not at a level of importance justifying the use of a separate performance measure for monitoring. Note that the *revenue with new products* is one of the most employed performance measures in evaluating a firms' innovativeness. *Manufacturing lead time* and *set up time* were monitored only by the shop floor management in 68% of the firms.



**Figure 23** Sustainability of firm competencies

- To secure sustainable competitiveness a firm's competencies and their sustainability should to a large extent be independent of the individuals and be more institutionalized. In order to analyze this factor, the firms participating in the field study were asked how flexible they were with respect to human resources competency in sustaining some of the firm competencies. According to the answers, the least flexible the competency (i.e., which depends most on the individuals) is the *knowledge to produce and to market product innovations* (Figure 23). *Knowledge to produce and to market product related services* was the most flexible competency and more than half of the firms indicated that easily replaceable working groups could *produce and market product related services*.
- *The rate of orders delivered on time* is an important performance indicator of both customer satisfaction and operational performance. Food industry had the highest rate of orders delivered on time (confirmed delivery date) (Figure 24). In food industry, 53% of the firms indicated that all the products were delivered on time, while 24% of them indicated that they delivered 95-99% of their orders on time. The perishable nature of food products could be one of the reasons leading to this result. Chemicals, machinery, minerals, textiles and metal sectors followed food industry in the order of decreasing values of *rate of orders delivered on time*.

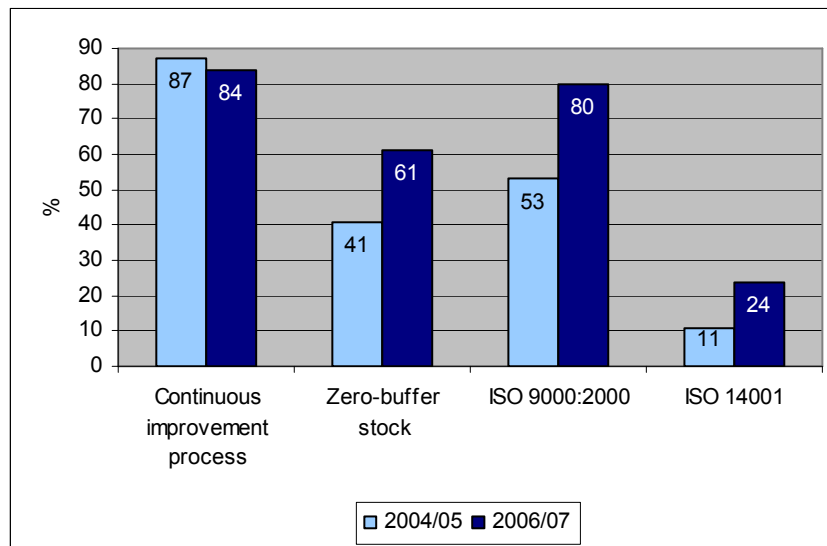
According to the results of *Innovations in Manufacturing 2004/05*, again food industry had the highest *rate of orders delivered on time*. The percentage of food industry firms, which delivered all of the products on time, was 61%. In *2004/05* study, chemicals, metal and textiles industries followed food industry in the order of decreasing values of *rate of orders delivered on time*.



**Figure 24** Rate of orders delivered on time

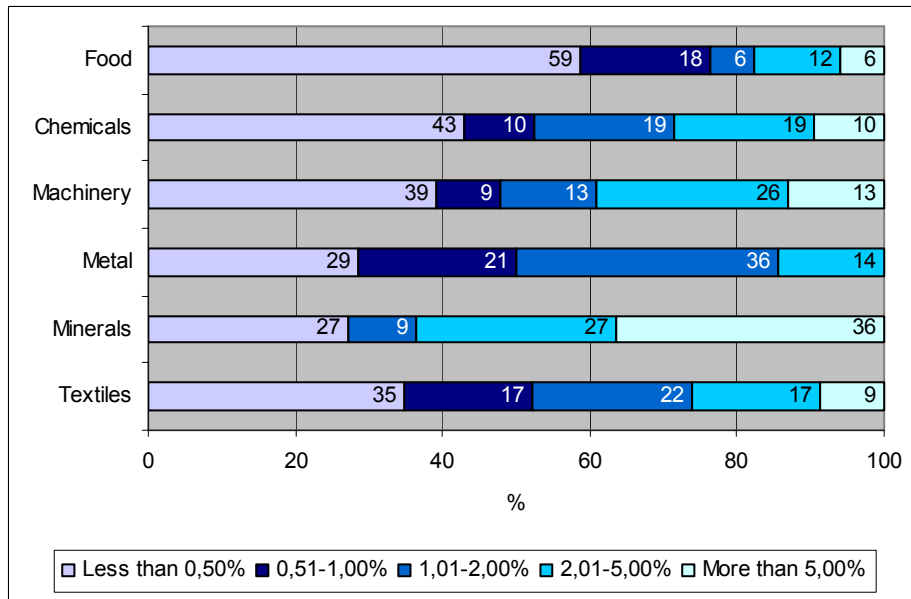
- The changes in the prevalence of quality management applications and quality certificates from *Innovations in Manufacturing 2004/05* to *2006/07* are shown in Figure 25. The level of implementation increased in all fields except for the *continuous improvement process*, which has already reached a high level. Although the prevalence of *ISO 14001* certificates increased considerably in this 2-year period, still only 24% of the firms stated that they owned this certificate. We expect that this percentage will increase in following years, especially in the course of European Union accession negotiations.



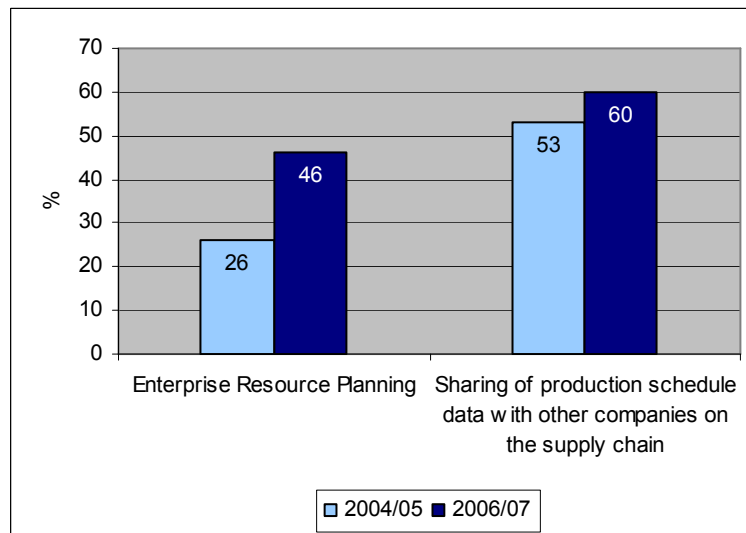


**Figure 25** Changes in the level of implementation of quality management applications and quality certificates from 2004/05 to 2006/07

- *Rework and scrap rates* of the firms are shown in Figure 26. Accordingly, food industry firms were found to produce their products with the least number of defects. 59% of food industry firms' *rework and scrap rate* was 5%. The opposite of this result could be observed in the minerals industry. For 36% of the firms in the minerals industry *rework and scrap rate* is 5%. In the *Innovations in Manufacturing 2004/05* study, food industry was again the sector with the lowest *rework and scrap rate*.
- *Enterprise Resource Planning (ERP) implementation and sharing of production schedule data with other companies in the supply chain* issues related to the *supply chain management* were analyzed in both *Innovations in Manufacturing 2004/05* and *2006/07* studies. The changes in these issues in the course of the last 2 years are shown in Figure 27. The very low rate of ERP implementation observed in the *2004/05* results increased substantially from 26% to 46% in the following 2-year period. The usage of this software was considered still to be low and its possible implementation being described as "not applicable" by some firms was assessed as an indication of the lack of knowledge in this area.



**Figure 26** Rework and scrap rates



**Figure 27** Changes in the prevalence of supply chain management tools and technologies from 2004/05 to 2006/07

*Sharing of production schedule data with other companies on the supply chain* has increased slightly in two years. The widespread use of this application is important for all of the firms on the supply chain because this application increases flexibility for both companies upstream and downstream of the company sharing production schedule data. The increase in flexibility is expected to lower the manufacturing cost for the supplier and hence, the procurement cost of the company downstream by easing both suppliers' effective production planning and suppliers' and main producers' effective supply planning.

## Conclusion

When one looks closer to the developments in manufacturing industry in Turkey, two observations among others can be made which complement each other: The manufacturing firms, particularly SMEs, have difficulty in growing and their profit levels are relatively low. It appears that increasing profit for renewal, growth and sometimes for mere survival will be the top agenda item for the manufacturing firms in Turkey in the coming years. This can be achieved through two channels: By decreasing manufacturing cost and by increasing price/cost ratio, ie., by increasing the added value. Increasing added value, on the other hand, requires both a determined strive for operational excellence and emphasis on innovativeness. The results of *Innovations in Manufacturing 2004/05* and *2006/07* reveal that in the manufacturing industry in Turkey, in general, there are encouraging developments in both avenues.

Concerning operations excellence, we should note that not only during the period of both *Innovations in Manufacturing* studies but for more than a decade *quality* has been the top competitive priority for the manufacturing firms in Turkey with *cost* ranked as the second competitive priority. Several studies including *Innovations in Manufacturing* have shown that recently the third ranked competitive priority is changing. It has been *delivery on time* until recently but now it appears *innovativeness* is replacing *delivery on time* as the third ranked competitive priority. The results reported here concerning the ranking of manufacturing objectives provide also a similar picture. *Improving the ability to introduce product innovations* is expected to become in the near future the 3<sup>rd</sup> most important manufacturing objective. Although *improving cost structure* and *improving quality* are expected to preserve their ranks as the first two manufacturing objectives, *increasing the flexibility of the production system* is expected to attract more attention as a manufacturing objective in near future. Flexibility indeed is considered as the highest ranked competitive advantage against manufacturers based abroad.

As stated above, the change in the mind set of the manufacturing industry in Turkey in the last decade continues with increasing emphasis on innovativeness. Manufacturing firms allocate more funds to R&D and new product development. It is observed that *R&D expenses as a percentage of turnover* has increased in 50% of the firms. The highest ranked improvement activity in manufacturing is

*developing new products* followed by *introducing technical innovations into the manufacturing processes* – two objectives directly related to innovation. This observation is in line with the diffusion of *differentiation through product variety* as the major product strategy.

Considering the priorities attached and the relevant strategies adopted, the allocation of resources and the progress made in recent years, we can state as a conclusion that the manufacturing industry in Turkey is in progress through a transition period from a low cost manufacturer towards a manufacturer of high value added products.

You can reach an electronic version of “**Innovations in Manufacturing 2006/07 Executive Summary**” through REF’s web site at [www.ref.sabanciuniv.edu](http://www.ref.sabanciuniv.edu).

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## **TÜSİAD-Sabancı University Competitiveness Forum**

TÜSİAD-Sabancı University Competitiveness Forum (REF) is a Research Center formed jointly by the Turkish Industrialists' and Businessmen's Association (TÜSİAD) and Sabancı University in March 1, 2003. Our mission is to help improve the competitiveness of the Turkish private sector in international markets by conducting and supporting research on competitiveness, innovation and technology management, and benchmarking. REF's activities can be grouped under three headings: Research, knowledge diffusion, and collaborations. REF shares its activities, views, and developments in the areas related to competitiveness at its web site ([www.ref.sabanciuniv.edu](http://www.ref.sabanciuniv.edu)) and through its electronically distributed periodical REF Bulletin.

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