Technology for Industry Foresight - Kocaeli 2012

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Sponsors:	Gebze High Technology Institute & Kocaeli Chamber of Industry
Type:	A Regional Foresight exercise for the industry located in Kocaeli
Organizer:	Gebze High Technology Institute
	Kocaeli Chamber of Industry
Duration:	2001-2002 **Budget:** None allocated **Time Horizon:** 10 years

Purpose

Kocaeli is one of the leading industrial cities in Turkey. Technology Foresight exercise for industry in Kocaeli aimed at shaping the future of the region through university-industry collaboration by anticipating changes, developments and advancements in manufacturing technologies and increasing the effectiveness and competitiveness of the industry in the region.

Foresight for an Advanced Technology-based Industry

Kocaeli is a heavily industrial city located in the north-west quarter of Turkey, right next to Istanbul, which is the financial capital of the country. Hosting most of the leading industries of the economy including chemicals, automotive, petroleum and electronics, Kocaeli has 12% share in the total production of manufacturing industry in Turkey. Considering the foreign trade volume, Kocaeli's share is 11% of total exports of the country. As a result of these high production figures, Kocaeli achieves nearly US$10,000 Gross Domestic Product per capita and thus is one of the highest wealth-creating cities in Turkey.

However, research on the technology and R&D intensity of the industry in the region indicated that only 30% of the Kocaeli industry used advanced technology, which was obtained mainly through know-how and licensing. The proportion of R&D expenditures in the total revenues of companies amounted 0.6% in average. Moreover, the proportion of the number of R&D personnel to total number of employees in companies was below 1%.

In spite of the economic success, these negative indicators in manufacturing sectors pushed the industrialists and academics in the region to think about the long-term future in order to develop new investment and production models to increase the competitiveness of the industry and to raise industrial value-added.

The idea of initiating a Foresight exercise in Kocaeli came to the agenda with the proposal of the Gebze High Technology Institute (GYTE) and the positive response of Kocaeli Chamber of Industry (KSO) in April 2001.

Following the meeting of GYTE Senate in June 2001, a working group was established at GYTE. The group was responsible to conduct the Foresight exercise and to produce final reports in cooperation with KSO.

The exercise started in September 2001 and ended in November 2002. There was no budget allocated for this exercise.

Assessing Socio-economic Issues and Technology Trends in the Region

Following the clarification of the rationales of the Foresight programme, common foresight methods and experiences of other countries were reviewed and presented to the participants in the first meeting of the exercise in July 2001.

The methodology designed and the methods used were inspired by the practices of other countries. In order to identify the expectations of the industry and the future developments in technology, a combination of brainstorming, survey/interview, SWOT and Delphi techniques were used. Thus, the methodology designed for all sectors included four phases:

PHASE I: The identification of areas of investigation for each sector through the
- Identification of global and national mega trends
- Detection of trends, issues and drivers
- Discussion on socio-economic issues related to that particular sector such as increasing population, the education level of the population, economic conditions and entry to the EU
- Discussion on technology-related issues such as the developments in transportation, communication and manufacturing technologies, the requirements and expectations of customers, the attitude of employees against technical and technologic developments
- Identification of the critical technology areas

PHASE II: SWOT analysis for each of the following points:
- The state of the manufacturing resources including employment and production; human resource; physical resources; information sources; capital sources; infrastructure; relationships with suppliers
- The state of demand including sales, customers and distributors
- The structure and intensity of competition: fundamental areas of competition; technology and manufacturing; distribution and marketing; specialisation and managerial skills

PHASE III: The identification of future technologic and scientific inventions, developments and advancements; and the discussion of their potential importance and impacts by considering:
- The technology areas to be investigated
- The technologies to be focused on production activities
- The necessity of product, process and service innovation required in the technology areas identified
- The focus and format of R&D activities

PHASE IV: A Delphi survey for the assessment of technological developments and advancements through the following questions:
- The degree of the social and economic benefits
- Time of realisation
- Steps of realisation
- Turkey's competitiveness versus other countries
- The obstacles for realisation
- Proposals and comments on the technological developments and advancements

Academia and Industry Take the Lead for the Future of Kocaeli

The project team established for the technology foresight exercise consisted of 73 members including 38 academicians, who were mainly from GYTE, and 35 top-level managers and businessmen from the region. 10 members of the Project Team, including the President of GYTE and the President of KSO, constituted the Steering Committee. The members of each working group were identified by considering the equal representation of academia and industry. The working groups met once a month. They applied the designed methodology described above.

High-technology and Skilled Labour to Modernize Manufacturing Technologies

In the second meeting of the technology foresight exercise in September 2001, current social, technological and economic conditions of the region were discussed; main issues were identified; and expectations from the future were clarified. Based on this work, one of the most important outcomes of the meeting was the establishment of 11 working groups, which were named with corresponding sectors and themes, including:
- Societal and economic needs
- Environment
- Energy
- Advanced Materials and Nanotechnology
- Electric and Electronics
- Information and Communication Technologies and Media
- Chemicals
- Biotechnology, Genetics and Health
- Food
- Machinery and Automation
- Automotive and Transportation

The findings of each working group were brought together in 11 reports, which were authored by the chairs and reporters of each group.

Some of the noteworthy areas of investigation raised by the working groups include:

Manufacturing technologies: Introduction of "*rapid manufacturing systems*" was seen as a must for the industry. The most important shortage in Kocaeli (and in Turkey in general) was seen as the lack of qualified workforce. It was foreseen that this issue will be more crucial by 2007. The use

of CAD/CAM programs were seen also crucial. Although Turkey's current position of using these programs was seen comparable to other developed countries, it was considered that development of CAD/CAM software in line with the requirements of the industry in Kocaeli would be important in the next five years.

Nano-materials: Surface technologies and nanotechnologies were seen potentially beneficial for the manufacturing industry in Kocaeli. Instead of changing the characteristics of the complete structure of the material, the technologies, which would help to modify only the surface of the material, such as filming, would revolutionise the manufacturing process and products by preventing deterioration and corrosion of mould and manufactured product in a significantly economic way.

Energy production and use: Three points were seen important for the production and use of energy:
- *The security of supply*: to make sure that the risks on the society and industry in terms of energy supply is minimised
- *Openness to competition*: in order to provide low cost energy for producers and consumers
- *Environmental protection*: to ensure the protection of the ecologic and geo-physic balance of the nature in the production and use of energy.

Food production and storage: Some of the remarkable technologies identified as important for the industry included:
- *Halogen heating systems:* The food will be heated up faster than current microwave technologies by preserving its quality, colour and taste better
- *E-nose:* This electronic nose will be used when it is risky or impossible to analyse the quality of food by smelling.
- *Smart packaging*: Through these technologies it will be possible to process foods minimally. Smart packages will

breathe and thus will provide the best conditions for the protection of foods.

Concerted Efforts of All Actors Required

The technology foresight exercise for Kocaeli industry concluded that for the application of these and other advanced technologies necessary conditions should be created at the following points through collaborative actions between national and regional governments, academia and industry:
- *Education and employment*: The industry needs skilled labour force immediately. It is suggested that the number of schools delivering technical and vocational training should be increased with appropriate curriculum. The possibility of bringing skilled labour force outside the region is seen as one of the quickest solutions for this problem in the short term
- *Infrastructure*: Particularly as a result of the destructive earthquake in 1999 some infrastructural problems emerged in the region. Therefore, it is suggested that investments should be done for the improvement of basic infrastructure such as energy, transportation and communication.
- *R&D support*: The amount of R&D support should be encouraging enough for the industry to initiate such activities. The ties between the university, industry and national government are considered to be strong enough for the creation and mobilisation of funds.
- *Competitiveness and support*: The economic problems in past years damaged the demand and competitiveness of the industry. It is suggested that the firms, especially the exporting ones, should be supported by easing the bureaucratic process of transferring funds and credits. Reduction in taxes is seen another measure to be taken by the national government.

Model for a 'Techno-City'

Technology foresight for Kocaeli industry was one of the first regional Foresight initiatives in Turkey. The project produced a number of innovative ideas and projects, which were then disseminated widely in the region for the realisation of the region's future vision.

Being the first of its kind, the exercise was expected to contribute to the technology development progress of Turkey. The exercise provided a very important input to the creation of 'Turkish National System of Innovation', which was given weight in the Eighth National Development Plan covering the term between 2000 and 2005. While the process of the establishment of legal frameworks for 'Organised Industrial Zones, a 'Techno-park', 'Technology Zones' and 'Industrial Zones' was ongoing at the national level, Kocaeli had already

taken the lead and had indicated a model of 'Techno-City' in Turkey.

The technology foresight exercise created valuable networking opportunities between the academics and industrialists in the region. Although the academics were aware of the present and potentially useful new future technologies, they did not know much about the industry in Kocaeli. Meanwhile, the industrialists in Kocaeli were well aware of the current production technologies and they did not sufficiently know the technologies, which would constitute the dynamics of the manufacturing in the future. Thus, the biggest outcome of the exercise was that it facilitated the mutual recognition between the academia and industry in Kocaeli and created a future-oriented knowledge sharing platform between them. As a result the exercise exhibited a very explicit example of the desired collaboration between the academia and industry.

Although the Foresight exercise in Kocaeli was not without any problems as many other foresight exercises due to such as the lack of experience, the reluctance of corporations to share the information, and limited participation to the Delphi survey; it was, however, an invaluable experience for the region, where there is a consensus on the continuity of the Foresight activities.

Technology foresight exercise for Kocaeli industry created inspiration for other cities in Turkey and encouraged them to think long-term at the regional and local levels. Such vision building activities have been carried out in the other cities in Turkey. One example - 'Trademark city Gaziantep' started in 2003.

Sources and References

- Gebze High Technology Institute and Kocaeli Chamber of Industry (2002). "***Technology Foresight for Kocaeli Industry***", final report of the Technology Foresight exercise, Gebze.
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- Trademark city Gaziantep web site: http://www.trademarkcity.org/