ERC Working Papers in Economics 06/01
January 2006

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Vision 2023:

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– a contextualist description and analysis

Abstract

This paper describes and analyses Vision 2023 Turkish National Technology Foresight Program. The paper is not about a mere description of the activities undertaken. It analyses the Program from a contextualist perspective, where the Program is considered in its own national and organizational contexts by discussing how the factors in these contexts led to the particular decisions taken and approaches adopted when the exercise was organized, designed and practiced. With the description and analysis of the Vision 2023 Technology Foresight Program, the paper suggests that each Foresight exercise should be considered in its own context. The exercise should be organized, designed and practiced by considering the effects of the external contexts (national, regional and/or corporate) and organizational factors stemming from these different context levels along with the nature of the issue being worked on, which constitute the content of the exercise.

Keywords: Foresight, contextualism, Vision 2023, Turkey, Science and Technology Policy

1. Introduction

As practiced *institutional Foresight* is an outgrowth of a long and historic tradition of *foresight*. Stemming from the unavoidable human trait of *foresight* as a concept, and from *planning* and *forecasting* as a structured activity, institutional Foresight essentially implies some form of "*participative vision-based planning process*" [1, p.15]. Institutional Foresight has been adopted widely in the last couple of decades particularly at national level and has become an activity associated with participative public policy making. In government circles the activity is widely acclaimed for policy-making and scarce resources are allocated based on advises coming from institutional Foresight activities. The exercises have been lengthily organized and carried out by government advisory boards, research councils, national academy of sciences, or government departments.

Initially the main activity area was largely limited to Science and Technology (S&T) issues. This was due to the recognition of the inevitability of long-term research planning in an era of increasing competition at the global level. In recent years the application areas have been widened, since there has been wider acknowledgement of importance of social concerns. Now, the breadth of activities varies from covering the entire spectrum of fields, to a single specific field at a project level. However, it can be said that technology is still a major area of activity of the most Foresight programs.

Referring to the rapid diffusion of Technology Foresight during the 1990s, Martin and Johnston [2] and Martin [3] identify three drivers:

- *Escalation in industrial and economic competition.* Due to the competition in the global economy, innovation and development of new technologies are becoming more crucial for industrialized and industrializing countries. This is where the primary role of Foresight arises as to identify emerging technologies, which are likely to have significant impact on industry, the economy, society and the environment over coming decades, at an early stage
- *Increasing pressure on government spending.* Because of limited government resources, like other areas of public spending, research and technology cannot be fully funded by the government. Foresight is presented as a process to help identification of funding priorities
- *Changing nature of knowledge production.* The identification of emerging technologies and the prioritization of research and technology areas point to the

increasing need for communication, networks, partnerships and collaboration among researchers and between researchers, industry as the performers and users of the research, government and other relevant stakeholders. Foresight offers a means for developing and strengthening those linkages. In this context, Martin and Johnston (ibid.) see Foresight as a useful activity for 'wiring-up' and strengthening National Systems of Innovation[4]

Keenan [4] mentions two further drivers to acknowledge the wide adoption of activities around the globe:

- *Bandwagon effects.* To a considerable extent the diffusion of institutional Foresight is due to the competition between countries. As one country has undertaken a Foresight exercise, 'competitor' countries feel the need to follow this trend
- *Millennium effect.* Governments all over the world initiated exercise to appear to be prepared for the new opportunities and challenges in the twenty-first century

Initiated with these kinds of motivations, Foresight exercises focused mainly on industrial and service sectors with the considerations given on technology-push and market-pull. Participation was mostly limited to experts from academia, industry and government representatives, which were drawn from the scientific bodies of government in the nominated sectors. During the exercises a combination of creative and consultative methods was used (e.g. different combinations of the methods like Delphi, expert panels, brainstorming and scenarios was common). The formal products of such exercises were largely a matter of research priorities and strategies for the different aspects of S&T.

Around the globe, the US and Japan can be considered as the pioneers of institutional Foresight efforts since the 1960s. These initial efforts were followed by the practices of European governments starting from the late 1980s. The Netherlands, Germany, the UK and France are among the first countries in Europe initiated Foresight exercises. All these countries have experienced Foresight in more than once. Rapid diffusion of Foresight activities from developed to developing countries was observed during the second half of the 1990s. In Europe, the activities became more common among many of the new members of the EU and Candidate Countries. Some of these countries have undertaken

[4] How capable the current Foresight practices to fulfil this function is discussed extensively by Saritas (2006a), who introduces the concept of "Systemic Foresight".

full-scale national exercises such as Hungary and Czech Republic, whilst the others were rather modest efforts, which were more about capacity building such as the ones undertaken in Malta, Cyprus, Estonia and Bulgaria. All these exercises have mainly aimed to set priorities and restructure national research systems in preparation for joining the EU.

As one of the Candidate Countries for the EU membership, Turkey has also carried out a national level Foresight exercise, called 'Vision 2023 Turkish National Technology Foresight Program'.[5] Along with the Technology Foresight Program, Vision 2023 involved three more sub-projects (called "R&D Manpower", "Technological Capabilities Inventory" and "National R&D Infrastructure") which aimed at collecting data on the current science, technology and innovation capacity of the country. The main focus of the paper is the Technology Foresight Program.

In the following sections, the Program will be described and discussed from a 'contextualist' perspective. For this purpose first the contextualist perspective will be introduced in the second section. Then, in the third section, the background and rationales of the Vision 2023 Technology Foresight Exercise will be summarized. The context, content and the designed process of the exercise will be specified in the fourth section. Subsequently, the actual process will be summarized and how the context, content and process of the exercise were interacted during the execution phase will be discussed and exemplified from the contextualist perspective. Following the analysis of the outcomes of the exercise in the sixth section, conclusions will be drawn up in the final section.

2. The "contextualist perspective"

In his "Systemic Foresight" concept, Saritas [1] mentions the interrelatedness of the context, content and process of institutional Foresight exercises. The firm relationships between the context, content and process of change were described by Pepper [5]. From a contextualist perspective Pepper [5] states that an event should be adequately described in its context. In the contextual analysis, the elements of context should be consciously searched for and analyzed; evidence on such elements as history, stakeholder perspectives, infrastructure and informal systems should be collected by reviewing and scanning. These

[5] Among the authors of the current paper, Turgut Tumer was the Coordinator of the Vision 2023 Project and Erol Taymaz acted as the Project Consultant.

ideas have been expanded by Pettigrew [6] and Pettigrew and Wipp [7] and were adapted to organizational settings to manage the change process in organizations.

The core concepts in contextualism are ‘context’, ‘content’ and ‘process’. If the task is the understanding of and intervention in an ever-changing system, this implies the representation of:

1. The context in which the change occurs
2. The content of the change activity
3. The process of change

The main objective of contextual research is to trace their dynamic interaction over time and provide explanations on how they interact and shape each other.

Saritas [1] suggests that any change activity, like institutional Foresight, should be linked to broader contexts. A system’s behavior cannot be understood and improvements in the system cannot be provided by taking it apart from the larger system that it is embedded in, but rather by viewing it as part of a larger system. Thus, institutional Foresight activities should not be worked and described as episodes divorced from the historical, social, political, economic and organizational circumstances from which they emerge.

Pettigrew [6] distinguishes two levels of context where he claims that any change occurs: External (outer) and Internal (inner) contexts. The outer context represents macro-scale environments outside the border of the organization, where organization has limited or no control. Predicted and unpredicted trends, shifts and turbulences lie in the outer context. The inner context includes structural, political and cultural elements within the organization. Similarly, Saritas [1] states that, as a change activity, institutional Foresight is embedded in these two contexts. Social, technological, economic, ecological and political systems represent the external context, where the exercise takes place and thus is influenced by the factors in it. On the other hand, the exercise is expected to improve or change one or more parts of these surrounding systems. Thus the context produces and is then re-produced by the institutional Foresight exercises. Internal context relates to the structures (e.g. internal processes, procedures, equipments, technologies) and behaviors (e.g. culture, politics, social interaction, skills, motivation, power, management styles) within the organization, where institutional Foresight is organized and carried out.

The external and internal contexts are the determinants of the content and process of the exercise. Pettigrew [6] defines the term content as: "*particular areas of transformation under examination*". In terms of institutional Foresight the content refers to subject area(s) taken into consideration and the ideas created related to them during Foresight exercises. The main goal of an exercise is to introduce ideas for change on the content in order to provide improvements in the context of the exercise.

In this respect, a rich understanding of the context and content is the first and foremost requirement for the design of the process of the exercise. Process includes the activities and supporting decisions leading to change [8]. In strategic terms, process is the sequence of events and activities through which "*conversations*" about strategy unfold over time [9]. In the theory of contextualism, which has an underlying process perspective, process is described as "a sequence of individual and collective events, actions and activities unfolding over time in context" [6]. The contextualist perspective implies that:

1. The fit or convergence between context, content and process is crucial to the achievement of change and further improvement via effective decision-making and successful implementation, and
2. The linkages among these constructs are reciprocal and continuous.

Having the firm linkage between the context, content and process of the exercise in mind, the paper first describes the background and development of the S&T policy making in Turkey, which constituted the external context of the exercise. How the drivers to initiate a Foresight exercise arose from this context will be explained. Subsequently, the construction of the content of the exercise captured from the external context as the areas of investigation will be mentioned. Finally, how the design and deployment of the exercise were influenced by the external and internal contexts and content of the exercise will be demonstrated. Thus how the characteristics of the social, economic and political systems in the country and the structural and behavioral aspects of the Foresight organization found their reflections on the design and deployment of the exercise will be emphasized. This will underline the uniqueness of Foresight exercises and the need for a unique approach for the design and deployment of each Foresight exercise.

3. Towards a national Technology Foresight program in Turkey

Understanding the circumstances of the exercise is important for the recognition of the context, under which the content of the Program was determined and the Program was designed and deployed. For this purpose, first, the background of Turkish National S&T policy-making will be outlined briefly. Then, how the idea of using Technology Foresight arose through the evolution of S&T policy-making in Turkey will be discussed.

3.1 Background of Turkish National Science and Technology Policy-making

Although the Turkish Republic has striven to further social, economic and industrial development since its foundation in 1923, the first attempts to formulate S&T policies started with the beginning of the planned economic period with the introduction of the First Five Year National Development Plan in 1963 [10]. The Scientific and Technological Council of Turkey (TUBITAK) was established in the same year for the purpose of:

1. Organizing, coordinating and promoting basic and applied research
2. Directing research activities to the targets of the national development plan
3. Setting research priorities [11]

During the 1960s and 1970s, the S&T policy in Turkey was mainly based on the 'promotion of basic and applied research in natural sciences'. In this early phase, the S&T policies were formulated by TUBITAK without any official policy document through a tacit consensus with the government [10]. In these earlier attempts there was a lack of participatory policy-making culture. Most decisions in the government and government agencies have been based on extremely short term necessities and piecemeal policies. The concept of technology policy and its integration with the industrial, employment and investment policies has been introduced in the Fourth Five Year National Development Plan covering the period 1973-1977.

The first detailed S&T policy document in Turkey entitled, "Turkish Science Policy: 1983-2003", was prepared in 1983. Over 300 experts contributed to the document under the coordination of the Ministry of State. This was the first time the role of technology for development was explicitly recognized and priority areas of technology were suggested. Although this study was not a Foresight exercise, the technology areas were broadly identified. Therefore, according to Pak *et al.* [10], it can be regarded as the first attempt towards defining "critical technologies" in Turkey. Subsequently, the Supreme Council for

Science and Technology (SCST) was established. As the highest S&T policy-making body, the SCST enabled designing S&T policies with the participation of the actors which take part in the management of economic and social life in Turkey. [6]

The SCST had its first operational meeting only in 1989. In the mid-1990s, the SCST started to play an active role in formulating the national S&T policy as the central component of the National Innovation System. In its second meeting in 1993, the SCST approved the document entitled "Turkish Science and Technology Policy: 1993-2003". This document paved the way for new policy initiatives, such as R&D support programs in the 1990s. This was a turning point in the history of S&T policy-making in Turkey as there was a paradigm shift from "building a modern R&D infrastructure" to "innovation oriented national S&T policies". The policies formulated in this document was further elaborated in 1995 with "A Project for Impetus in Science and Technology", which formed the S&T chapter of the Seventh Five Year National Development Plan for the period of 1996-2000.

In its sixth meeting on December 13, 2000, the SCST underlined the fact that superiority in S&T is the determinant factor in relocation of world's resources and in increasing the welfare of the society. Along these guidelines, the SCST decided that new S&T policies should be formulated, and priority areas should be set for the time period covering 2002-2023[7]. As the general secretariat of the SCST, TUBITAK detailed the project accordingly and named it "Vision 2023: Science and Technology Strategies". The project was approved by the SCST a year later in its seventh meeting on December 24, 2001 [10]. The implementation of the project started in January 2002, and the project was planned to be completed in December 2003.

3.2 Rationales for using Technology Foresight in Vision 2023

Starting from the 1960s, TUBITAK prepared long term S&T policy documents by using desk-based methods. However, all these documents were of very limited use. In spite of the attempts to develop long term technology policy, there was little success in realizing

[6] Chaired by the Prime Minister or his deputy the SCST consists of the Ministers of State; Education; Finance; Defence; Industry and Commerce; Health; Energy and Natural Resources; Agriculture, Forestry and Environment; and Undersecretaries in charge of State Planning Organisation, Tresuary and Foresign Trade, as well as the Presidents of Higher Education Council, TUBITAK, Turkish Atomic Energy Commission, two leading universities, Turkish Broadcasting Corporation and the Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey [11].

[7] The year 2023 marks the 100th Anniversary of the foundation of the Turkish Republic

concerted actions. Analyzing the policies and strategies in the development plans from a systems thinking perspective, Oner and Saritas [12] attempt to answer the question "*why did the development plans fail to meet their targets in Turkey?*". Oner and Saritas [12] extract the sectoral policies and strategies and analyze them by using their "*Integrated Development Management Model*". However, the assessment of S&T policy documents indicates that the S&T policy measures cannot be blamed merely because of their limitations. In Turkey, the implementation of the S&T policies has also been problematic due to [13] [14]:

1. The lack of long-term and strategic approach to S&T issues
2. The lack of ownership of the R&D agenda by stakeholders and society
3. The lack of political support
4. A low level of dissemination
5. Isolated S&T policies
6. The fragmentation of researchers and resources

As a solution, TUBITAK introduced the idea of initiating an institutional Foresight exercise. The SCST was suggested that Foresight would be a useful tool to overcome the problems related to the lack of participation, isolation and fragmentation in the formulation and implementation of the S&T policies. The implementation was only possible through ownership that could only be provided through the extensive involvement of the society. The involvement of wider society could bring political support together. In addition, the integration of S&T policies and other sectoral policies would be possible in a Foresight exercise with the involvement of sectors in the economy as the initiators and implementers of these policies.

In line with the above-mentioned rationales, Vision 2023 Technology Foresight Program started in order to:

1. Build an S&T vision for Turkey
2. Determine strategic technologies and priority areas of R&D
3. Formulate S&T policies of Turkey for the next 20-year period
4. Get a wide spectrum of stakeholders involved in the process, thus to gain their support
5. Create public awareness on the importance of S&T for socio-economic development [15]

4. The context, content and process of the exercise

Following the description of the way to initiate a Foresight exercise, next three sections will specify the context, content and process of the exercise respectively. The clarification of context, content and process with a contextualist perspective will help to identify the factors which affect the actual Foresight process and have influence on the outputs and outcomes produced, thus on the success and benefits of the exercise.

4.1 The context of the exercise

The exercise aimed to identify the areas for the improvement of the S&T systems. The economic sectors were seen as the area to focus on to scan the signals in order to identify S&T areas for the future. While doing that it was considered that it would also be useful to focus on some social themes which could be inherent in S&T and economic systems. Thus the external context of the exercise consists of mainly S&T and economic systems with considerations given on the social system.

Regarding the internal context, the host and also the main sponsor, client and organizer of the exercise was TUBITAK. This was a unique aspect of the exercise where a national public institution initiated a Foresight program by using its own resources for the development of its own policies. Besides monetary resources, human resources and expertise were also provided by TUBITAK as the coordinator of the Program. A Management Team was constructed in TUBITAK. The Management Team involved people who had professional competence in project management, research, policy-making and communication skills. Then a Project Office was formed within the S&T Policy Department of TUBITAK. The Project Office was responsible for the implementation of the project.

The Steering Committee was the highest ruling body in the Program. When the Steering Committee was constructed, it was tried to be inclusive. Therefore it was consisted of 65 members, including 27 representatives from the governmental institutions, 29 from industrial organizations and NGOs, and 9 from the universities. The Steering Committee guided the project by taking the strategic decisions and approving the reports and policy recommendations generated during the implementation of the Program. Operational and budgetary decisions were taken by the Executive Committee. Chaired by the president of

TUBITAK, the Executive Committee brought together the three representatives of the Steering Committee with the related administrative officials of TUBITAK.

Besides internal expertise, external expertise was also mobilized in the Program. The Department of Policy Research in Engineering, Science and Technology (PREST) in the University of Manchester informed a group of panel members and the Project Office on the UK Technology Foresight experience. PREST also formally cooperated during the phase of preparing the Delphi variables for the assessment of the Delphi topic statements.

4.2 The content of the exercise

The Program was decided to be holistic, which meant that all the "important" sectors in the economy were covered. The main reason for focusing on the economic sectors was because they were seen as the only structured (i.e. very clearly defined and distinct) body to learn the demands from S&T in the policy formulation process. It was considered that successful S&T policies should consider the demands from the sectors.

In its first meeting in April 2002, the Steering Committee aimed to select the sectors to be focused upon. First a broad list of sectors suggested by the members of the Steering Committee was created. Then a cluster analysis was applied to aggregate those sectors that are considered to be 'related' for the purpose of the Program. Subsequently, as set of criteria were drawn up to prioritize the sectors in the list. The exercise was considered to cover:

1. The sectors in which Turkey has competitive advantages today and will likely to have in the next 20 years.
2. The sectors which are technology and policy relevant. For instance, if the success of a sector is not dependant on S&T policies, but to other policies (e.g. financial policies), it was considered to be outside the list.

The members of the Steering Committee were also suggested that the ideal number of selected sectors should be around 8-10, which would be a manageable size for the exercise.

Following a voting session, the Steering Committee members prioritized and selected nine technology and policy relevant sectors which underpin the competitiveness and economic development in the country including:

1. Information and Communication

2. Energy and Natural Resources
3. Health and Pharmaceuticals
4. Defense, Aeronautics and Space Industries
5. Agriculture and Food
6. Manufacturing and Materials
7. Transportation and Tourism
8. Chemicals and Textiles
9. Construction and Infrastructure

Besides nine economic sectors, two cross-cutting thematic areas were covered in the Program including:

1. Education and Human Resources
2. Environment and Sustainable Development

All these 11 areas identified constituted the content of the exercise.

4.3 The designed process of the exercise

This was the first attempt by Turkey to run a Foresight exercise at the national level. With the personal efforts of several staff members, who had learned about Foresight in an international training program, TUBITAK proposed the use of Foresight for S&T policy making in an SCST meeting. Foresight was seen as a widespread practice in many EU and Candidate Countries in a 'fashionable' way. It was considered to be a useful policy-making tool for Turkey, where the formulation and implementation of S&T policies had always been problematic.

As a first step of the process design, TUBITAK analyzed the Foresight programs of other countries (e.g. British, Czech, Dutch, German, Hungarian, Japanese and Korean national programs and the work in the US). During the analyses they noticed the widespread use of various methods including expert panels, scenarios, and the Delphi as the backbones of many national Foresight exercises. Following the discussions on the methods, a combination of expert panels and the Delphi method were selected. The use of macro scenarios was also discussed. A few macro scenarios could be built and given to the panels prior to their works. Then, it was considered that the pre-determined scenarios would affect the way panels think and create ideas. It would not be desirable to limit the panel work with top-down scenarios.

Scenarios were also not preferred because of the lack of experience. The construction of scenarios was seen more difficult and ambiguous compared to the Delphi, which has clear and systematic steps.[8] Considering the capabilities of the organization the application of the scenario method was seen risky. This situation can be considered as an example to demonstrate how a factor in the internal context (organizational capabilities) was influential on the methodological decisions taken in the process of the exercise.

The methodology designed for the Technology Foresight Program involved expert panels, a two-round Delphi survey to be executed by the project office in coordination with the panels, and a prioritization scheme. Representing the technology demand side, the panels were given the task of building their own visions and setting socio-economic targets; sharing these visions and targets with the society by wider consultation; and listing underpinning technologies and prioritizing them. The Delphi process, which represented the technology supply side, aimed at addressing the likelihood of achieving technological developments as well as testing them against a set of criteria determined by the Steering Committee. With the aim of assessing the comparative degree of contribution of technologies to Turkey a set of prioritization criteria was drawn.

A standard 'task definition' document was prepared and distributed to all the Panels in order to guide them on how to carry out project tasks. There were four main tasks in the document:

1. Vision building
2. Dissemination
3. Delphi survey
4. Policy proposals

The steps necessary to be taken in each phase were described under these headings in a two-page document. The given tasks were common for all the Panels in the exercise. Through the task definition document, the panels were assigned [17]:

- To evaluate current state of their sectors via the analysis of trends and drivers, desk-based research and SWOT analysis,

[8] The Delphi method has its own pitfalls, though. For a discussion on the shortcomings of the Delphi method, see [16].

- To build a vision with brainstorming sessions
- To set socio-economic targets and determine technology activity areas necessary to reach these targets
- To prioritize technology activity areas by voting
- To consult a wider expert group through a Delphi survey for their opinions on prioritization
- To propose policies on prioritized areas with the evaluation of the previous work

Having these tasks assigned, the panels were also given some leeway to carry out their tasks. They were allowed to work in different ways and to use different methods to achieve the expected outputs.

5. The practice of Vision 2023

Following the description of the context, content and the designed process of the exercise from a contextualist perspective, the attention is now turned to the actual process of the exercise, where the program-as-designed is put into practice. In this manner first how the program was executed is presented. Subsequently, the interactions between the context, content and process during the execution of the program are discussed.

5.1 The execution of the exercise

The panels initially built their vision and listed underpinning technologies. For this purpose around 200 panel meetings and enlarged workshops took place from the first panel meeting on July 3, 2002 to January 24, 2003. This phase ended with the completion of the preliminary reports. The Deputy Prime Minister in charge of S&T issues announced the completion of the reports at a press conference on January 28, 2003. The Minister also invited criticisms and contributions to the preliminary panel reports, which were available on the project web site. This wider consultation period also involved several activities planned by each panel for disseminating their initial works among the related actors in the field.

With the addition of Chemicals and Textiles separated as two independent panels, the preliminary reports of the 12 Foresight panels were presented in a common format and addressed the following points with regards to their areas of interest:

- Trends and issues, which are likely to affect the world and Turkey

- Assessment of Turkey's current standing (SWOT analysis)
- Turkey's 2023 vision for each sector
- Socio-economic objectives to be achieved in order to realize those visions
- S&T competencies and underpinning technologies needed to achieve the socio-economic objectives

Following the publication of the preliminary reports the Delphi process started. As stated earlier, the Delphi survey aimed at addressing the likelihood of achieving the envisaged technological developments as well as testing them against a set of criteria (variables/questions) determined by the Steering Committee. [9] The technological developments were assessed by considering their effects on: (1) Competitive strength, (2) S&T innovation capability, (3) Environment and energy efficiency, (4) Creation of national value added by using domestic resources, and (5) Quality of life.

All the panels except the Education and Human Resources Panel) prepared more than 1200 statements that were likely to play an important role in realizing their visions for 2023. The Project Office, in close co-operation with the panels, carefully examined all the statements for the clarity of expression, technology and policy relevance, and double postings. The final list included 413 unique statements (grouped in 11 questionnaires), 104 of which appeared in more than one questionnaire. The first round of the Delphi process was commenced on May 12, 2003, and was completed around mid-June 2003.

The Delphi survey forms were posted to more than 7000 people of different professional standings and expertise. The respondents were able to fill out either the printed version or the on-line version of the questionnaire by using the username and password provided by the Project Office. Those respondents who have fully expressed their opinion on at least five statements were offered a one-year subscription to one of the two monthly popular journals of TUBITAK, "Bilim ve Teknik" (Science and Technique) and "Bilim Cocuk" (Science and the Kid).

[9] The identified variables in the Delphi survey were asked in the following order: the level of expertise, Turkey's current position, the scientific/technological stage to start with, policy tools to be used, expected realisation time, and expected impact on competitiveness, scientific and technological capacity, environment, national value added, and the quality of life. The 'realisation time' here refers to the expected realisation of each Delphi statement in Turkey conditional on the implementation of appropriate policies.

Because of the increasingly important role played by multidisciplinary research in R&D activities, it was quite difficult to classify Delphi statements into different categories. Therefore, an "individualized Delphi survey" was developed for the on-line version, where the respondents could create their own individual surveys by using a simple keyword-search interface. The individualized Delphi survey enabled respondents to identify the statements that are closely related with their area of expertise without going through all the statements.

The response rate of the first round of the Delphi process was 32%, with a total of around 45,000 responses received for all 413 statements. The results of the Delphi survey were provided to the panels for their consideration and evaluation. At a later stage of the project, the whole process, the results and their analysis were published in the form of a report.

The panels reviewed the results of the two-round Delphi survey and responded to them in their final reports, the first versions of which were submitted to the Project Office on July 24, 2003. Although the panels were free to comment on, or even disregard the Delphi results, later versions of the final reports reflected more upon the Delphi survey.

In their final reports, the Panels came up with 94 Technological Activity Areas (TAAs). A TAA is a cluster of technological developments, mostly based on the Delphi statements and leading, for instance, to a new or improved product and/or service. The TAAs were envisaged to support their socio-economic objectives. A roadmap was prepared for each TAA in a format prepared by the Project Office. Each roadmap included the list of technologies on which competence needed to be developed to reach the TAA goals.

Following the submission of the final reports, the Project Office critically analyzed them and came up with a synthesis report, which included the review of the process, a summary of each panel report in a coherent format, as well as the analysis of findings and recommendations of the panels. The study carried out by the Project Office amalgamated the 94 TAAs proposed by the panels and classified them under four categories by considering their relations to "Competitive Advantage", "Quality of Life", "Sustainable Development" and "Information Society".

Subsequently, a workshop was held to identify the “strategic technology fields” underpinning the four categories of TAAs. The Project Office classified the strategic technology fields under eight categories including “Information and Communication Technologies”, “Biotechnology and Genetic Engineering”, “Nanotechnology”, “Mechatronics”, “Production Processes and Technologies”, “Materials Technologies”, “Energy and Environmental Technologies” and “Design and Development Tools”. During the period from May to July 2004, expert groups, called “Strategic Technology Groups”, carried out a detailed technical study in order to set the strategies in the form of a 20-year roadmap for each strategic technology fields.

5.2 Interactions between the context, content and process of the exercise

In spite of the common systematic process designed for all panels in the Program, various changes and deviations emerged during the project process. Saritas [1] states that the deviations from the originally designed process and the occurrence of different practices among the panels are due to the interactions between the context (external and internal), content and process of the exercise. To be able to demonstrate some of the deviations and differences and to investigate their reasons the initially designed process will be presented along with the actual processes of two panels. The differences between the three representations will exhibit the difference between the Program-as-designed and the Program-as- practiced. Figure.1 exhibits the initially designed process. Subsequently, Figure.2 and 3 exhibit the deployment of the designed process in the Construction and Infrastructure Panel and the Information and Communication Technologies (ICT) Panel.

***Figure.1: Initially designed process for the Program**

****Figure.2: The actual process of the Construction and Infrastructure Panel**

*****Figure.3: The actual process of the ICT Panel**

In the figures the white boxes show the components in the initial design (Figure 1) and the activities practiced as specified in the initial design (Figure 2 and 3). The grey and black color scheme used in Figure 2 and 3 helps to distinguish the deviations from the initial design in the processes of the Construction and Infrastructure Panel and the ICT panel. The black boxes alone illustrate the differences between the processes of the two panels.

The figures illustrate that different outputs emerged as a result of the differences in the process of the two panels. For instance, the output of the Construction and Infrastructure Panel included the list of priority areas and a 'who/what' list which clarified the distribution of the initiatives needed among stakeholders, whilst the output of the IT panel included explicit policy proposals.

According to the contextualist perspective of Saritas [1] mentioned earlier, the differences between the original design of the institutional Foresight programs and the actual process practiced are due to the interactions between the context (external and internal), content and process of the exercise. A number of implications can be mentioned as a result of this interaction. In the following paragraphs some examples will be given.

Regarding the impact of the external context on the process, the effects of economic fluctuations in the country on the Program can be given as an example. When the Foresight Program started in 2002 the country was experiencing a major economic crisis. In this turmoil, people in the country were very pessimistic and lacked motivation to think about the long term future. The economic problems in the country had morale implications on the panel members, whose hopes were diminished for a better future and thus tended to focus on current problems of the country and their sectors. The Project Office tried to encourage the panel members to think future oriented without being stuck on the current problems.

Covering mainly the structural and behavioral factors in the organization of the exercise, internal context was significantly influential on the project process. Some of the differences occurred between the designed process and the actual process can be attributed to the differences among panelists in terms of their different expectations, experiences and personalities. For instance, there were dominant members in some panels and these members directed the work of the panel. Because of the strong impact of organizational and human behaviors on the process Loveridge and Saritas [18] characterize Foresight as a "methodologically pedestrian" activity. The role of behavioral influences is rarely discussed in Foresight exercises, though Saritas [1] demonstrates that they have implications on the exercises in many respects.

In the Vision 2023 Foresight Program, the Project Office noticed differences between the attitudes of industrialists and academicians during the panel activities. These differences became more visible in the panels where there was an uneven representation of stakeholders. As a result, in some cases the views either industrialists or academicians were dominant in the panels. For instance, the Chemistry and Textiles Panel was broken into two separate panels. Initially, the Chemistry and Textiles sectors were considered together in order to keep the number of panels low. However, the panel topics were "*divorced*", as stated by the Project Office, following the tensions of the background and possibly the interests of panelists, who wanted to lead to the panel. Besides the behavioral factors, the factors stemming from the content of the fields due to the different natures of the Chemistry and Textiles sectors stimulated this separation. Another panel, the Health and Pharmaceutical, worked like three separate panels as "health", "pharmaceuticals" and "medical equipment" due to similar reasons.

Another reason which created obstacles to the communication and interaction within the panels was the turnover of the panel members. Some panelists left the exercise, because they lost their motivation. On the other hand, new panelists came in even in the final stages of the exercise. Since the Program was considered as a dynamic and living process, the turnover of the participants was considered to be natural.

The factors stemming from the nature and characteristics of the issue at hand are also influential on the practices. This amounts to the relationship between the content and process of the exercise, which was liable from some of the deviations from the initial project process and the differences in the panel process in the Vision 2023 Foresight Program. One of the first and the most notable examples was related to the processes of the thematic panels in the exercise.

Initially the thematic panels were planned to start their works after the sectoral panels. This was due to the consideration that the thematic topics would arise from the work of the sectoral panels. Once sectoral panels built their vision and mission and identify technology areas, the thematic areas, which could underpin their common future requirements, would be identified. These topics would be horizontal between the sectoral panels. They could be either technology based such as biotechnology and nanotechnology or social such as education and environment. However, because of the pressures from the Steering

Committee, two thematic panels were established on Education and Human Resources, and Environment and Sustainable Development when the Program began. Thus, the thematic panels started their works together with the sectoral panels. Then the question arose: What would the thematic panels do? There was no answer for this question. Consequently the thematic panels were decided to use the same methodology as the sectoral panels as described in the task definition document. Thus a weakness of the program became existent. As a consequence a number of problems were faced related with the works of the thematic panels. The Education and Human Resources Panel did not work properly in accordance with the outline set for panels. They submitted their final report long after the whole process is over. The Environment and Sustainable Development Panel tried to apply what the sectoral panels did and carried out their work in the same format, which did not fit well with the topic.

Another factor related to the content that led to differences in panel work was the technological intensity of the sectors. Some sectoral panels in the exercise such as the IT and the Manufacturing and Materials panels were proposing new technologies for the future. On the other hand, there was another group of panels such as the Transportation and Tourism and the Construction and Infrastructure panels, which were mainly technology users. When the panels in both groups were asked to produce roadmaps, the technology user panels could not properly respond, because they were not fully informed about the future availability of the technologies for their use.

Another deviation from the initial project process was observed in the case of the assessment of the Delphi statements for the prioritization of TAAs and Technology Fields (TFs). Although the Project Office envisaged the use of quantitative methods for all Delphi statements in the final prioritization process, in the actual project process this was regarded to be difficult and unduly constraining panel’s work. The Project Office calculated the feasibility and attractiveness scores for all Delphi statements on the basis of the Delphi survey and provided these to all Panels. The Panels were, then, free to use any method for prioritization.

6. Outcome of Vision 2023

The Vision 2023 project involved the first-ever national Foresight Program of Turkey. The Program focused mainly on determining the priority areas of technology. The estimated cost of the Program was 200,000 Euro. TUBITAK allocated the 100% of this amount from its own resources. The tangible outputs of the project included 24 reports, specifically, 12 panel reports, 1 Delphi report, 3 synthesis reports, and the reports of the 8 Strategic Technology Groups. These reports, together with the reports of the other three sub-projects of the Vision 2023, have been produced with the hope they would be utilized at the public, academic and corporate level in developing S&T policies of the governmental bodies, research institutions, academia, companies and NGOs.

So far there have been two developments in this regard. First, the resolutions of the "2004 Turkish Economy Congress" organized by the State Planning Organization[10] have adopted the S&T Policies Working Group Report, which was exclusively based on the findings and recommendations outlined in the synthesis reports.

Secondly, as the Vision 2023 Project was initially launched with the purpose of preparing a science and technology strategy document for a 20-year period, TUBITAK formed a Strategy Group with the mandate of preparing such a document based on the findings and recommendations of the reports. In August 2004, the Strategy Group submitted the draft entitled "National Science and Technology Policies: 2003-2023 Strategy Document". The proposed strategy has three essential elements:

1. Focusing on strategic (priority) areas of technology (In this context, three generic and emerging areas of technology, and 42 specific technology fields were proposed, all based on the two-year long consultation period of the Foresight exercise)
2. Increasing R&D expenditure (with specific targets for both public and private sector share)
3. Development of R&D manpower (with specific targets)

The strategy document proposed that a "National R&D Fund" be established and managed, and the following mechanisms be adopted, with which a Turkish Research Area would be established around the priority areas:

1. National Programs
2. Public Procurement

[10] State Planning Organisation (SPO) is an undersecretary reporting directly to the Prime Minister and responsible for five-year development plans of Turkey.

3. Targeted Projects (from public bodies and sector organizations along with their own strategic plans).

The document emphasized the importance of public awareness and commitment of Governments to science and technology issues, and proposed initiation of five national programs in selected priority areas in 2005. Finally, the need for systematic monitoring and evaluation of the steps taken, as well as continuous Foresight was underlined.

The draft strategy document was brought to the agenda of the 10th meeting of the SCST held in 8 September 2004. The SCST decided that a final strategy document and a five-year action plan would be prepared by TUBITAK after all the SCST member organizations express their views on the draft document. The SCST endorsed, in its 11th meeting in March 2005, 14 TAAs and 8 strategic TFs as “priority” areas as suggested by the Vision 2023 Strategy Document, which was produced by TUBITAK. The SCST asked all public institutions including public universities to take into consideration these technological areas in their R&D activities, R&D funding, and graduate education and research programs. TUBITAK itself declared both officially and in a meeting with the European Commission during the accession screening process that these TAAs and TFs constitute its priority research topics. However, the “National Defense Research Program” and the “National Space Research Program” (announced in the 11th SCST meeting in March 2005) as well as the “Public Research Programs” on Agriculture, Health and Energy (announced in the 12th SCST meeting in September 2005) remained incompatible with the basic philosophy of the Vision 2023 project. Curiously enough, the “Science and Technology Action Policy Action Plan”, which was adopted at the 11th SCST meeting, called for “setting priorities for science and technology”, although a decision on S&T priorities, in line with the Vision 2023 Strategy Document, was taken in the very same meeting. Concisely, after two years of its completion the findings and recommendations of the Vision 2023 Program have not been fully incorporated into the actual S&T policy making of Turkey, and the country still lacks a well defined S&T strategy supported by structural reforms deemed necessary since the beginning of the process.

Vision 2023 process has mobilized a considerable number of people from industry, academia and public bodies. It also attracted the attention of mass media to a certain extent. In this way some intangible outcome of the exercise, such as raising awareness and increasing commitment to science and technology issues have been achieved during the process of implementing the exercise. However, this momentum was by no means sustainable, in that the current attitude of the stakeholders to S&T issues is not any different from the past.

These observations constitute yet another example of the interrelatedness of context and the process of change. The fact that Turkey has been mainly a technology user rather than a technology producer has made the process susceptible to changing priorities and attitude of decision makers. This has been influential in declining importance attached to the S&T issues in general, and the exercise itself in particular.

Although the initially envisaged outcome of the Vision 2023 project could not be fully realized, the process itself was instrumental for the accumulation of knowledge and capabilities regarding S&T policy making in Turkey. A part of knowledge and capabilities was codified in the form of, for example, the Delphi software and lists of strategic technology fields. Moreover, two on-line databases, one on the researchers in Turkey and the other on the research infrastructure, were prepared as a result of the project.[11] These two databases now provide information necessary for any further study on S&T policy. Thanks to the capabilities accumulated during the Vision 2023 process, TUBITAK was involved actively in the organization of UNIDO-led Foresight training programs.

Finally, the Vision 2023 project in general, and the Technology Foresight Program in particular constituted an important step towards harmonization of Turkish S&T system with that of the European Union. First of all, with this project Turkey responded to the call for Foresight in the High-Level Expert Group Report "Thinking, debating and shaping the future: Foresight in Europe" which stated that:
"*Starting from a science & technology perspective, Foresight activities contribute to the development of the European knowledge-base and propose visions for the future of European society*" [19].

Secondly, Turkey has actively taken part in the joint initiative of 15 countries (11 EU Member States, 3 Candidate Countries and one associated country) to coordinate their national Foresight programs, with a view to increase their national and European impact

[11] These databases are available at http://arabis.tubitak.gov.tr and http://tarabis.tubitak.gov.tr .

and to implement joint programs. The coordination activities envisaged in this networking initiative called the "ForSociety" also aim to provide effective support to European scientific and technological integration along with the spirit of the ERA, especially in view of the enlarged EU and operational implementation of Article 169. [12]

A systematic evaluation of the process and its impacts is yet to be done. The impact of the whole process would be better evaluated, if decision makers clarified their long term S&T vision and objectives, as well as their policy on the future of Foresight activities in Turkey.

7. Conclusions

Considering the unique requirements, it was believed that Foresight was a necessity for Turkey, where there were a lack of ownership and political support for the S&T policies, fragmentation of researchers and resources, and isolation from the other industrial policies. For this purpose a systematic prioritization process was designed. Learning from the experiences of other countries, the methodology drawn for the Program was built mainly on the use of expert panels and the Delphi method. Throughout the article, it was discussed that the systematically designed process was changed during the execution of the exercise and different practices emerged among different sectoral panels. The contextual perspective adopted was helpful to acknowledge this situation.

The description and analysis of the process from a contextualist perspective has demonstrated that Foresight is embedded in other systems, which were described as external and internal contexts. Foresight is integrated into these contexts. The activity receives inputs from these contexts and strives to improve or change them. During this process the Foresight activity entails a socially interactive process, where there is a considerable role and impact of organizational and individual behaviors.

The descriptions and analyses of the Vision 2023 Turkish National Technology Foresight Program have revealed that the process design is a key to a successful Foresight exercise. The methodology designed and the participants engaged should be fit-for-purpose. This first requires the specification of the contexts where institutional Foresight is embedded in and is expected to improve or change. Then the content of the exercise is built from the

[12] See http://www.era-net.forsociety.net

context by determining the major areas for investigation. Subsequently, the process of the exercise is designed to tailor the uniqueness of the context of the exercise and the nature of the issue at hand in the content of the exercise.

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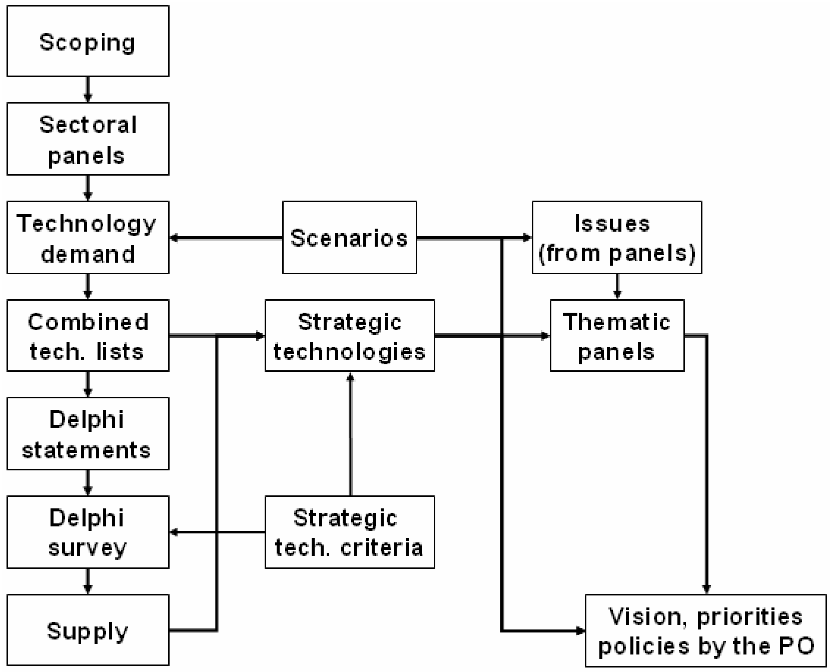

Figure.1: Initially designed process for the Program

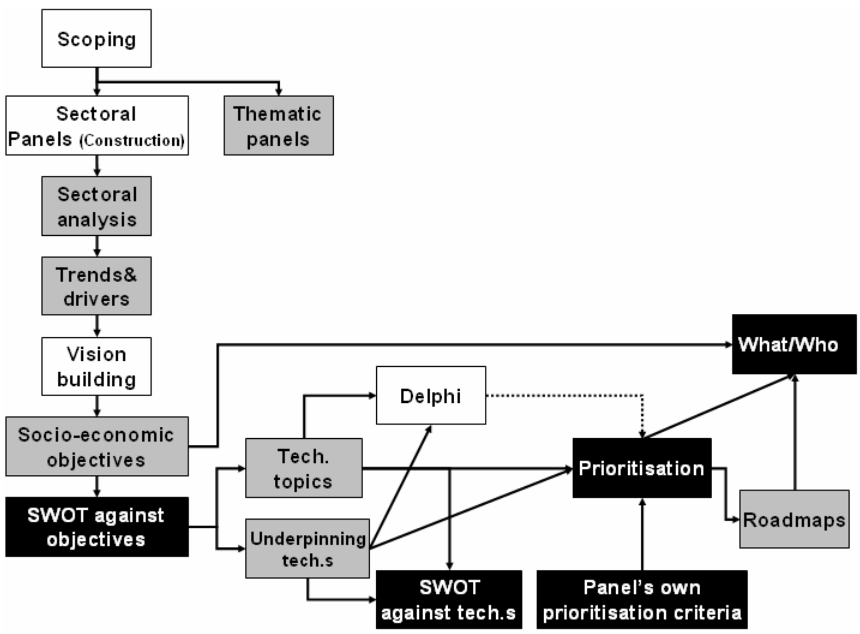

Figure.2: The actual process of the Construction and Infrastructure Panel

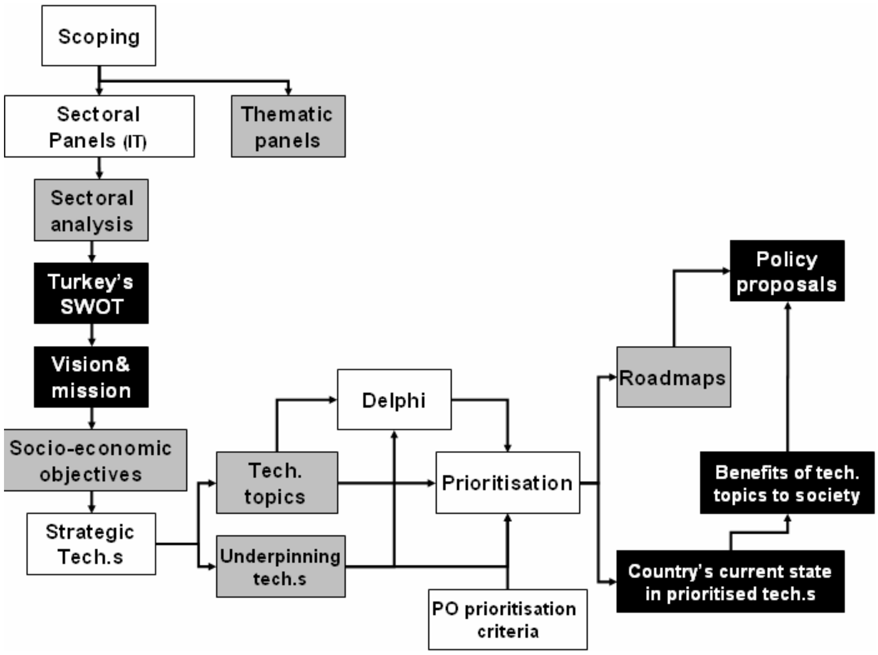

Figure.3: The actual process of the ICT Panel