Vision 2023: Turkish National Technology Foresight Exercise

Vision 2023 context

Turkey's technology policy-making history started in the 1960s with the introduction of the first national development plan covering the years between 1963 and 1967. 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 these earlier attempts there was a lack of participatory policy-making culture. Most decisions in the government and government agencies were based on extremely short term necessities and piecemeal policies.

The first detailed S&T policy document was prepared in 1983 with the contribution of over 300 experts under the coordination of the Ministry of State. This document, entitled "Turkish Science Policy: 1983-2003", explicitly recognised the role of technology in development, and suggested priority areas of technology. Although this was not a Foresight exercise, the technology areas were broadly defined. It can, therefore, be regarded as the first attempt at defining "critical technologies" in Turkey. This document led to the creation of a new institution in 1983, the Supreme Council for Science and Technology (SCST), which is the country's highest S&T policymaking body and is chaired by the Prime Minister or his deputy. The SCST enabled S&T policies to be designed with the participation of S&T related ministers, high level bureaucrats, technocrats and representatives of non-Governmental organisations (NGOs) involved in the management of economic and social life.

The SCST only held its first operational meeting 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, reacting swiftly to worldwide developments.

In its second meeting in 1993, the SCST approved a document entitled "Turkish Science and Technology Policy: 1993-2003". This document paved the way for new policy initiatives, such as R&D support programmes, in the 1990s. This was a turning point in the S&T policy era in Turkey, as there was a paradigm shift from "building a modern R&D infrastructure" to "innovation oriented" national policies. The policy formulated in this document was further elaborated in 1995 with "The Project for Impetus in Science and Technology", which formed the S&T chapter of the Seventh Five Year Economic Development Plan [1996-2000].

Reasons for using Foresight in Vision 2023

TUBITAK began preparing long-term science and technology (S&T) strategy documents in the 1960s using desk-based methods. These were of very limited use, however, due to the lack of participation and ownership, and their fragmentation and

isolation from other policies. In order to avoid this situation, it was decided that the new strategy document should be based on technology Foresight, which makes use of participatory techniques.

Therefore, despite attempts to develop long term technology policy, there was little success in realising concerted actions of the rather fragmented S&T actors around the priority areas. The assessment of the S&T policy measures has shown that it was not the policy measures themselves to blame. The implementation of S&T policies had always been problematic in Turkey, as a result of:

1. The lack of ownership, society involvement, political support and dissemination
2. Isolated S&T policies
3. Fragmentation of researchers and resources

The idea of introducing Foresight was the main lesson learned from the past experience and appeared following discussions in TUBITAK. After reaching a consensus on conducting a Foresight initiative, TUBITAK suggested Foresight to SCST and suggested that Foresight would a useful tool to overcome the problems caused by the lack of participation, isolation and fragmentation in the planning and implementation of S&T policies. Thus, Foresight was seen a useful method for creating commitment among research institutes, public and private organisations, academia and non governmental organisations (NGOs). TUBITAK's decision was approved in December, 2000 by the SCST, which consists of the Prime Minister and a number of other ministries and public bodies. Following a one year preparation period, SCST approved the Foresight programme in December, 2001.

Securing political support in Vision 2023

The success of the Vision 2023 Foresight programme was directly related to the 'political will' behind it. It was known that success would only be possible if the government took the policy proposals seriously in S&T policy making. Therefore, obtaining support from the government was crucial. Support from society was also crucial. The programme aimed for wide participation from society in order to develop a sense of ownership over the policies arrived at. TUBITAK knew that the ownership was the key for a successful implementation of the outcomes of the programme. Thus, both government and society were consulted during the exercises through the meetings, conferences and surveys.

Positioning Vision 2023 in the policy cycle

As an S&T policy-making and funding body, TUBITAK was a part of the S&T policy cycle. The main task of the programme was to produce an S&T policy document for SCST. The appearance that Foresight was being carried out by the policy making

body itself was a unique characteristic of the Vision 2023 programme. Because of this, right from the start the exercise was primarily policy oriented. The responsibility for coming up with policies at the end of the exercise placed a lot of pressure on the panels (see the methodology section below). Consequently, the panels also felt this responsibility on them during the entire policy-making process.

Designing the exercise

Setting the objectives in Vision 2023

Turkey has suffered from low budget allocations for R&D and TUBITAK believed that politicians did not pay enough attention to science and technology research investments. Also the need to focus already insufficient resources on technologies of the future was apparent.

Moreover, motivated by the lack of ownership as well as the isolation and fragmentation in planning and implementing S&T policies, the SCST took the decision, at its sixth meeting in December 2000, that new national S&T policies should be formulated, and priority areas should be set for the next two decades, in order to create an innovative economy and society in 2023, which marks the 100th Anniversary of the foundation of the Turkish Republic. TUBITAK, as the general secretariat of the SCST, has accordingly detailed the project entitled "Vision 2023: Science and Technology Strategies", which was approved by the Council a year later in its seventh meeting in December 2001.

In this context, the SCST stated the aim of the programme as "to implement a long term technological Foresight programme for establishing a strategy, considering scientific, technological, socio-economic and political trends in Europe and in the world and taking into account similar exercises previously conducted as well as using input from other modules of the Strategy Document". The decision taken indicate that the major aim was to support central decision making in the government and as well as in TUBITAK.

The programme was planned to create a commitment among different stakeholders, since it was thought that such commitment could influence politicians' panels within the description of main methods. Thus, Vision 2023 was started in order to:

1. Build a science and technology vision for Turkey
2. Determine strategic technologies and priority areas of R&D
3. Formulate Turkey's science and technology policies for the next 20-year period
4. Get a wide spectrum of stakeholders involved in the process, thus gaining their support
5. Create public awareness of the importance of S&T for socio-economic development

Determining the coverage (focus and scope) in Vision 2023

Vision 2023 was a 'holistic' national level programme covering socio-economic sectors and themes. The main reason for focusing on the socio-economic sectors was because they were seen as the only structured body to learn the demand from S&T in the process of the formulation of policies. Sectors were seen as the main implementers of the S&T policies.

In its first meeting in April 2002, the Steering Committee (consisting of 65 representatives from 27 Governmental institutions, 29 industrial organisations and NGOs, and 9 universities) aimed to select the sectors to be focused on. First of all a long list of sectors was drawn up. Then, the sectors, which were considered not relevant for the country's advancement, were removed. Then, a set of criteria was drawn to prioritise the sectors on the list. The criteria included:

- The sectors in which Turkey has competitive advantages today and will have in the next 20 years.
- Sectors which are technology and policy-relevant. For instance, if the success of a sector is not dependent on S&T policies, but on other policies (e.g. financial policies), it should not be included.

The participants were not choosing the most important sectors, but the most technology and policy-relevant ones. It was also suggested that the ideal number of selected sectors should be around 8-10, which would be a manageable size for the exercise in practical terms.

Following a vote by the members of the Steering Committee, 12 sectors, which were represented as technology Foresight panels, were agreed. 10 of the total of 12 panels were formed on certain socio-economic fields and the remaining two were on cross cutting issues of education/human resources and environment/sustainable development. The panels included:

- Education and Human Resources
- Environment and Sustainable Development
- Information and Communication
- Energy and Natural Resources
- Health and Pharmaceuticals
- Defence, Aeronautics and Space Industries
- Agriculture and Food
- Machinery and Materials
- Transportation and Tourism
- Textiles

- Chemicals
- Construction and Infrastructure

Defining the users in Vision 2023

The major client of the programme was TUBITAK itself as an agency which funds R&D projects and R&D human resources in Turkey. Turkish Technology Development Foundation (TTGV), which also funds R&D projects via World Bank resources, became another client.

Approach to design decisions in Vision 2023

The exercise aimed at a bottom-up approach to participation in the identification and definition of both the sectors to focus on (chosen by the steering committee) and the policy recommendations in order to guarantee representation and ownership of outcomes from different stakeholders within government and society as a whole. In this direction, public participation was ensured through the variety of stakeholders within the steering committee. This contributed to making non-participants aware of the programme.

Setting the time horizon in Vision 2023

The SCST took the decision, in its sixth meeting on December 2000, that new national S&T policies should be formulated, and priority areas should be set for the next two decades, in order to create an innovative economy and society in 2023, which marks the 100th Anniversary of the foundation of the Turkish Republic. TUBITAK, as the general secretariat of the SCST, has accordingly detailed the project entitled "Vision 2023: Science and Technology Strategies". Hence, the time horizon of the project was set to be from 2004 to 2023.

Setting the timeframe in Vision 2023

TUBITAK was the key actor in the technology Foresight initiative. The "Vision 2023" project involves the first-ever Turkish national Foresight exercise, together with three more sub-projects that aim at collecting and evaluating data on the current science, technology and innovation capacity of the country. The project was initially planned

for a 2-year period, and its implementation started in January 2002. The time spread of activities was later modified, and the new plan targeted completion of the sub-projects, preparation of their synthesis in the form of a policy document, and its submission to the SCST early in 2004. Therefore, the duration of the exercise was set to take place from January 2002 to January 2004.

Costs and funding in Vision 2023

The estimated cost of the programme was €200,000. TUBITAK provided 100% of this budget from its own resources.

Skills and competencies in Vision 2023

TUBITAK staff learned about Foresight by attending UNIDO courses. During the preparation phase, two experts attended the courses. Besides internal expertise, external expertise was also mobilised. PREST, University of Manchester, formally cooperated during the phase of preparing Delphi variables. They informed a group of panel members and the project office on the UK Delphi experience.

Assessing previous and existing work in Vision 2023

The work assessed included mainly the strategy documents. Since the 1960s the strategy documents produced by TUBITAK were used to propose science and technology policies to the SCST. Therefore they were reviewed first to identify the problems experienced which prevented the application of the policies proposed such as fragmentation, the lack of ownership and political support. These were also the reasons why it was decided that a Foresight exercise should be carried out. Following this decision a review of Foresight exercises elsewhere in the world was conducted. At the end of this process, TUBITAK produced a report reviewing the Foresight exercises in the world including the Japanese, US, Dutch, German and British programmes.

Vision 2023 project team and organisation of the exercise

- TUBITAK (coordination/management team) – TUBITAK was the coordinator of the Foresight project. The management team of the project was constructed by involving people who have professional competence on project management, research, policy-making, communication skills. In this manner, the core design group of the project consisted of:
    - 1 Mechanical engineer, Associate Chairmen of TUBITAK (Prof. Dr.)
    - 1 Economist, part time consultant to the chairman of TUBITAK (Prof. Dr.)
    - 1 Social scientist, part time chief expert from TUBITAK (Prof. Dr.)
    - 1 Senior researcher, the head of TUBITAK's S&T Policies Department, (Ph.D.)

- Project Office – formed within the S&T Policy Department of TUBITAK. This consisted of six people with engineering or economics backgrounds and a good command of English.The Project Office was responsible for the implementation of the project.
- Executive Committee – chaired by the President of TUBITAK, thus bringing together three representatives of the Steering Committee with administrative officials of TUBITAK. Operational and budgetary decisions were taken by the Executive Committee.
- Panel core groups – appointed by TUBITAK these groups were composed of selected participants (e.g. panel chair, panel secretary and/or a member of the panel) from each panel to provide lateral communication between the panels. These groups were responsible for facilitating dialogue between the Panels.
- External expertise was provided by national and international advisors (e.g. experts from PREST, The University of Manchester, provided consultancy on the preparation of Delphi variables).

Vision 2023 steering committee

A Steering Committee, consisting of 65 representatives from 27 Governmental institutions, 29 industrial organisations and NGOs, and 9 universities was formed as the top-level organisational body of the "Vision 2023" project. The Committee was responsible for guiding the project by taking strategic decisions and approving the reports and policy recommendations. The Steering Committee guided the project by taking the strategic decisions and approving the reports and policy recommendations generated during its implementation. The Steering Committee was the highest governing body. Three Steering Committee meetings were held in the course of the programme to make major decisions and to approve outputs.

Communication strategy in Vision 2023

Communication between different panels in Vision 2023

During the exercise most of the dialogues took place between members of panels. A "panel core group" was constructed to carry on dialogues. However, a major complaint of panel core member groups was that they could not meet sufficiently to facilitate cross-panel communication. Because, the panel core group meetings were used mostly for vertical communication for managerial issues regarding to the conduct of the exercise with the participation of the members of the Project Office.

The importance of cross-panel communication became clear during the exercise due to the difference in the technological content of the panels. In the exercise, some panels were to 'propose new technologies' such as IT and Materials panels. On the other hand, the others were 'technology-users' like Transportation and Tourism panel. The updated task definition given to the panels required the construction of

technology road maps. However, 'technology-user' panels faced difficulty. When they thought about the future of their sectors, they needed to know about the availability of technologies in the technology-provider sectors. They knew what their sector would require in the future, but they did not really know which technology to use to meet those requirements. This kind of communication was very limited and mostly informal, since the panel core groups, who were expected to fulfil this function, were busy with more managerial issues.

Communication between panels and stakeholders in Vision 2023

Regarding the communication between the panels and stakeholders, a number of activities were organised including attending fairs and organising conferences. To facilitate wider consultation and dissemination, panels were recommended to organise meetings with stakeholders. Some panels invited mostly recognised figures like the country's ex-president so as to attract the attention of media and thus the public. Most panels in the exercise conducted this type of activity at least once. All the activities were supported financially by TUBITAK. Moreover, the Project Office helped panels to organise the agenda and to invite participants for the activities.

Communication within the panels (internal communications) in Vision 2023

Regarding the internal communications within the panels, the main problem was the panel members' tendency to focus on present problems too much and trying to find solutions to those problems. Because most of the problems were not related with S&T, there was a difficulty of considering S&T-related aspects. Consequently, at least one member of the Project Office was designated to participate to panel meetings and to warn panel members when they start talking about present problems. The member of the Project Office tried to encourage the panel to look into the future without considering any limitations about the present (such as supposing that there was enough money, trained labour force and necessary regulations). During this process some examples from other countries' Foresight exercises were also given.

Designing the methodology (methodological framework) in Vision 2023

Like many others, TUBITAK first analysed Foresight programmes of other countries, including Japan, the US, the Netherlands, Germany and the UK, when they started the design of the methodology. During the reviews of experiences of other countries, they noticed the widespread use of panels and the Delphi.

When the project first started, the use of macro scenarios was also discussed. Some macro scenarios could be built and could be given to the panels prior to their work. Then, it was considered that this would affect the way panels think and it would not be desirable to limit their work with top-down scenarios.

Scenarios were also not used because of the lack of experience. The construction of scenarios was seen more difficult and ambiguous than using the Delphi method, for which the steps are clear cut. It was thought that scenario planning is a methodology, which can be learned from experience. Then, it was found risky to apply scenarios.

They thought that the panels would be useful through its process benefits. Panels were also considered to identify future technologies which needed to be developed (the demand from technology). This was a new function given to panels in this exercise. Then, the Delphi process aimed at addressing the likelihood of achieving the envisaged technological developments as well as testing them against a set of criteria determined by the Steering Committee. Thus, the Delphi was to fulfil the technology the technology supply function asking experts to assess the possibility and feasibility of the demands from technology.

Once the decision was made on the use of panels and the Delphi, how to adopt them to country's culture was discussed. Having considered the conflict and consensus characteristics of people, a very well structured process with clear steps was designed. This point was considered when the Delphi statements were formulated. These had to be as clear as possible to prevent any ambiguity or misunderstandings.

Consequently, the methodology adopted for the technology Foresight project involved panels, a two-round Delphi survey to be executed by the project office in co-ordination with the panels, and a prioritisation scheme:

- On the technology demand side the panels were given the task of building their own visions, sharing these visions with society by wider consultation, listing the underpinning technologies and prioritising these technologies.
- On the technology supply side, the Delphi process aimed at addressing the likelihood of achieving the envisaged technological developments as well as testing them against a set of criteria determined by the Steering Committee.
- To assess the comparative degree of contribution of technologies to Turkey, the prioritisation criteria drawn indicated: (1) Competitive strength, (2) Science and technology innovation capability (3) Environment and energy efficiency, (4) Creation of national value added by local resources, (5) Quality of life.

Role of the panels and problems of execution in Vision 2023

The panels in the exercise were based on socio-economic sectors and they were assigned to evaluate current situation (key drivers, trend analysis, desk research, SWOT) to build a vision (brainstorming) and to prioritise (by voting) technological activity fields, which will help (cross impact analysis) to reach their vision. Panels were asked to identify technology areas that would need to be developed in order to achieve the targets for fields of technology activity (cross impact voting). Additionally,

they were recommended to consult a wider expert group to check on their priorities and policies through the Delphi survey.

The experiences of panel members and desk-based research provided the first inputs to the exercise. The panels were initially given the task of building their own visions of future, and listing the underpinning technologies. At this stage, around 200 panel meetings and enlarged workshops took place between 3rd of July 2002 and 24th of January 2003. The Deputy Prime Minister in charge of S&T issues announced the completion of preliminary panel reports at a press conference on the 28th of January 2003. The Minister also invited criticisms and contributions to the preliminary panel reports, which were available on the project web site (http//:vizyon2023.tubitak.gov.tr) [in Turkish]. This wider consultation period also involved several activities planned by each panel to disseminate their initial work among the related actors in the field.

Panels were given a standard Task Definition document. This document identified four phases that the panels were expected to go through:

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

The steps needing to be taken in each phase were also given to the panels in the two-page Task Definition document.

The panels were advised to carry out their work in the light of this document. However, they were also allowed to work in different ways and using different methods to achieve the expected outcomes. Thus, panels could follow a different course or to make amendments provided they were able to support their decisions systematically. Consequently, during the work of the panels the processes differed. Some panels used various additional techniques such as workshops, but the others simply applied the systematic process given.

Different approaches arose among the panels during the exercise mainly due to the differences among panelists and their expectations, experiences and personalities. For instance, there were dominant people in some panels who directed panel's working process. Consequently some panels were quite open to the new approaches, but the others were more conservative.

Another problem arose when sectoral and thematic panels decided to use the same approach as the sectoral panels. This highlighted a weakness in the exercise. TUBITAK had anticipated that differences in working processes of the sectoral and thematic panels would emerge due to their different characteristics. But they had not thought

what the difference would be apparent at the beginning of the exercise. Initially, the thematic panels were planned to start their works after the sectoral panels later. This was due to the consideration that the thematic panels would be decided and established based on sectoral panel works.

Once the sectoral panels had built their vision and mission, and identified some technology areas, the thematic areas, which could underpin their future requirements, could be identified. The thematic topics would be defined from the panel demands and then the Steering Committee would decide the topics of the thematic panels. These topics were horizontal and cut across the sectoral panels. They could be either technology based (such as biotechnology and nanotechnology) or thematic (such as education and environment). Then the sectoral panels could analyse these issues from their own perspectives.

However, in spite of the opposition of the Project Office, two thematic panels were established with the pressure from the Steering Committee. These thematic panels started their works at the same time with other panels. Then the question arose: What were the thematic panels going to do? There was no answer for this question. Consequently, the thematic panels were decided to use the same methodology and methods with the sectoral panels. As a consequence, a number of problems were faced related with the works of the thematic panels. For instance, our education and human resources panel did not work. They could not even submit a final report and their preliminary report remained weak and insufficient. However, the environment panel tried apply what the sectoral panels did. Consequently this caused a major change in our initial organisation of panels.

Execution of the Delphi in Vision 2023

The definition of the Delphi statements was seen as the main challenge at the design stage of the exercise and this was overcome by bringing external expertise from PREST to support the expert panels, responsible for this sensitive task.

A joint team comprising the core management team, people from the project office and panel representatives reworked proposed statements. This took more than two months to complete. The Delphi variables were developed by the core management team and the project office in workshops held by participation of expert panel members, using insights from the UK Delphi experience. All variables were finalised at the meeting of the steering committee, the highest decision making body of the programme.

Following the construction of the Delphi, the questionnaires were prepared in two formats (1) paper based and (2) online. Experts from both academia and industry were invited to take a part. The questionnaires were mailed to the experts whose addresses were known. They were informed that they could opt for answering on the

web with login supplied on the form. Those who received postal forms were also free to inform other experts to answer the survey on the web.

The Delphi forms were posted to more than 7000 experts, of different professional standings and expertise, who could reply by filling out either the printed versions of the questionnaires or the on-line electronic versions by using the username and the password provided by the Project Office. Those respondents who have fully expressed their opinion on at least five statements are offered a one-year subscription to one of the monthly popular journals of TUBITAK, "Bilim ve Teknik" (Science and Technique) and "Bilim Çocuk" (Science and the Child). All respondents had access to all of the 11 questionnaires through the on-line survey.

Processing of Delphi outcomes in Vision 2023

The results of the Delphi process were supplied to the panels for their consideration and evaluation, and at a later stage the whole process and an independent analysis of results was published in the form of a report. Panels have reviewed the results of the two-round Delphi survey and responded to them in their final reports, the first version of which were submitted on the 24th of July 2003 to the Project Office. Although the panels were free to comment on, or even disregard the Delphi results, later versions of the final reports reflected more and more upon the Delphi survey. The aggregate results of the survey were prepared as a report. It was made available to all participants as well as to the public over the Internet. Panels were given templates to prepare technology policy and action road maps. The method for setting priorities was left to panels. They were also recommended to evaluate prioritisation index derived from the Delphi survey. Most of them used structural voting systems in the prioritisation process.

Panels came up with 94 Technological Activity Areas (TAAs), which are envisaged to support their socio-economic objectives. A TAA is a cluster of technological developments, mostly based on the Delphi statements, leading to a new or improved product, service etc. A roadmap was prepared for each TAA in a format prepared by the project office. Each road map included the list of technologies on which competence need to be developed to reach the TAA goals.

Finally, expert panels provided policy recommendations. The Project Office in the Science and Technology Policies Department of TUBITAK worked with the expert panels in the definition of the final recommendations.

Learned lessons from the exercise design in Vision 2023

The main lessons learned were:

- The decision for using Foresight as a means for ensuring participation and ownership of decisions was a lesson learned from past experience, where outcomes were of limited use due to lack of participation and ownership as well as isolation or fragmentation between policies.
- The decision for using Delphi was based on the analysis of Foresight programmes from other countries and Delphi's ease of use in a Foresight exercise because of its systematic, well-defined and understandable steps.
- The lack of satisfactory outcomes in all the panels happened due to a top-down decision making approach by the steering committee in the panels execution.
- The need for communication (dialogue) between the different panels became explicit due to their technological content. Unfortunately such dialogue was limited and mostly informal in the exercise since the responsible for ensuring this communication – core panel groups – were busy with managerial issues.

Running the exercise

Managing the process in Vision 2023

The programme was monitored by TUBITAK internally in a very loose and not in a systematic way. It mostly concentrated on panel meetings and financial matters to ensure the work was completed on-time.

Adaptation of the process in Vision 2023

Because of the increasingly important role played by multidisciplinary research in R&D activities, it has become quite difficult to classify Delphi statements into distinct disciplinary categories. Therefore, an "Individualised Delphi Survey" was developed for the on-line version, where responders to the questionnaire could prepare their own individual surveys using a simple keyword-search interface. Thus, the "Individualised Delphi Survey" enabled respondents to identify the statements that are closely related with their area of expertise without going through all of them. The response rate of the first round of the Delphi process was 32%, with a total of around 45.000 responses received for the 415 statements.

The panels were allowed to work in different ways and use different methods to achieve the expected outcomes outlined by the steering committee (see the section on selecting methods in the design stage) due to their different member composition (e.g. technology background, academia vs. industrial, etc.). Furthermore, for the same

reason mentioned above, some panels were allowed to split into more panel groups as well as there was the need to adapt the exercise to a continuous change in the membership of the panels (turnover of members), as outlined in the section on 'managing relationships'.

Managing time in Vision 2023

Timing became an important issue towards the end of the exercise. Because the practitioners were fairly relaxed at the start of the exercise as it progressed they found themselves running short of time. Therefore, planning the time was seen as an important point for the timely completion of the exercise. The Project office created some 'magical' pieces of work in the last minute within a very limited time (e.g. construction of road maps and production of final reports). It was felt that the time planning could have been more realistic.

Managing relationships in Vision 2023

When the exercise started it was seen that the relationships within panels could be crucial to the conduct of the project. When the panels started working, several problems emerged in some panels. For instance, one of the expert panels broke into two separate ones. The Chemistry and Textiles panel split following background tensions, and possibly conflicting interests among panelists. For similar reasons another panel, the Health and Pharmaceutical panel, worked in practice as three separate panels for health, pharmaceuticals, medical equipment. The representatives of expert panels reported tensions, mostly due to different backgrounds of the academics at panel meetings.

Any imbalance in the representation of academics and industrialists on the panel could affect how it works. For instance 70-80% of Textiles panel participants were private-sector industrialists. However 90% of the Agriculture panelists were academics. These factors were more influential than the panels' being the Textiles or the Agriculture panel.

Achieving a balanced distribution of different stakeholders was a factor that was taken into account when the exercise started. However, it could not always be achieved, as some experts contacted before the project started were unable or unwilling to participate. Some were too busy and others did not see the usefulness of the project. However, after a while a number of complaints were received from people who wanted to take a part in the exercise. As the programme was announced and mentioned, particularly in media, the number of people wanting to participate increased.

Another reason, which created obstacles to the communication and the relationships, was turnover among panel members. Some panelists left the project because they

lost their motivation. On the other hand, new panelists even joined during the final stages of the exercise. Since it was considered as a dynamic and living process, the turnover of panelists was considered natural.

The relationship between the Project Office and panels also played important role. Although the vertical communication between the Project Office and panels worked well, the pressures and additional demands (e.g. new tasks) coming from the Project Office made panels feel frustrated. There were also frequent changes in the plans during the process. When all these pressures were enhanced with the time constraints, the members of the panels grew tired at the end of the process.

Participants

Identifying and selecting participants in Vision 2023

After the decision on setting the expert panels by steering committee, a core group, which was appointed by TUBITAK, proposed the names of experts for each panel. Also government, universities, NGO's and industry were asked to nominate names with the expert nomination forms sent. Thus, co-nomination was the main method used in identifying and selecting participants. The process worked mainly through e-mails sent to the members of the Steering Committee. They were asked to provide further names of the experts who could take part in the exercise as panel members.

After collecting the names the TUBITAK administration chose the panel members from among them in a balanced way to provide equal representation of academia, private sector, public bodies and NGOs. Around 25 experts were selected for each panel.

For the identification of the participants for the Delphi survey, the databases of TUBITAK and TTGV (The Technology Development Foundation of Turkey) were used. Databases of NGOs (e.g. chambers, associations and unions) were also drawn upon. These experts in these databases were invited. The experts were told that they were free to invite other people to take part in the electronic online version of the questionnaire.

Motivating and keeping participants involved in Vision 2023

The Delphi forms were posted to more than 7000 experts, of different professional standings and expertise, who could reply by filling out either the printed versions of the questionnaires or the on-line electronic versions by using the username and the password provided by the Project Office. Those respondents who have fully expressed their opinion on at least five statements are offered a one-year subscription to one of the monthly popular journals of TUBITAK, "Bilim ve Teknik"

(Science and Technique) and "Bilim Çocuk" (Science and the Child). All respondents had access to all of the 11 questionnaires through the on-line survey.

Promoting Vision 2023

The progress of the exercise and its outputs were disseminated via the Vision 2023 web site.

Main challenges in running Vision 2023

Communication between participants, especially those on different panels, was one of the main challenges while running the Foresight exercise. In this direction, the management of the relationships both within and between panels became a very sensitive task (see 'communication' and 'managing relationships' sections). Finally, a key challenge faced by the Project Office was to keep a balanced representation of academics and industrialists within the panels, especially due to the constant turnover in their membership (see the 'managing relationships' section).

Lessons learned while running Vision 2023

The main lessons learned at this phase were:

- The need for participative decision making when defining how the panels work: One of the two thematic panels (education and human resources) did not achieve a satisfactory outcome since the thematic panels (or cross cutting issues) worked at the same time as the sectoral panels (rather than beforehand). This was a decision taken by the steering committee which was not backed up by the Project Office.
- The need for more emphasis and expertise in the management of relationships since the different backgrounds of panel members lead to groups splitting up.
- The changes in plans from the Project Office together with the time constraints lead to de-motivation and made panel members frustrated. This was possibly one of the reasons for the constant change in the panels' membership.

Tangible outcomes of Vision 2023

Panels came up with 94 Technological Activity Areas (TAAs), which are envisaged to support their socio-economic objectives. A TAA is a cluster of technological developments, mostly based on the Delphi statements, leading to a new or improved product, service, etc. A roadmap was prepared for each TAA in a format prepared by the project office. Each road map included the list of technologies on which competence need to be developed to reach the TAA goals. Finally, expert panels provided policy recommendations. The Project Office in the Science and Technology

Policies Department of TUBITAK worked with the expert panels in the definition of the final recommendations.

Therefore, the tangible outputs of the Technology Foresight exercise included 24 reports, specifically:

- 12 panel reports
- 1 Delphi report
- 3 synthesis reports
- 8 Strategic Technology Groups reports

For the final reports, a standard template was given to all the panels. The template included the following sections: visions, current situation, SWOT, trend analysis, prioritisation of technology activity fields and enabling technology areas, technology policy and action road maps, policy recommendations.

Alongside the preliminary panel reports and final panel reports, the following documents were planned at the start:

- Aggregate Delphi report
- Enabling technologies strategy reports
- Vision 2023 Strategic Technologies Document

In addition to the report originally planned, it was later decided that a synthesis report should be produced. This aimed to bring together the outputs of all the panels and their lists of priorities.

To produce the synthesis report, the Project Office critically analysed the panels' final reports. The report includes the review of the process, a summary (15-20 page) 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 Technological Activity Areas proposed by the panels in 69 headings classified under four categories related to Competitive Advantage, Quality of Life, Sustainable Development, and Information Society.

A workshop was then held to help identify the Strategic Technology Fields (TF) underpinning the above four groups of Technology Application Areas (TAA). The Project Office classified the strategic technology fields under eight categories; namely, 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-July 2004, groups of experts, called the Strategic Technology Groups, carried out a detailed technical study in order to set the strategies in the form of a 20-year road map, in each of these technology areas.

Finally, considering the main purpose of preparing a science and technology strategy document for a 20-year period, TUBITAK formed a Strategy Group following the completion of the programme. The mandate of the Strategy Group was to prepare a strategy 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".

Intangible outcomes in Vision 2023

The Vision 2023 process has mobilised a considerable number of people from industry, academia and public bodies. It also attracted the attention of the mass media to a certain extent. In this way some intangible outputs of the exercise, such as raising awareness and increasing commitment to science and technology issues, have been achieved. Moreover, the exercise also enhanced networking between actors from industry and academia.

Implementation and follow-up

Vision 2023 diffusion and dissemination

Merely producing a strategy document to support certain industrial sectors would not be compatible with the basic philosophy of the Vision 2023 project. The project was planned and implemented in order to identify strategic areas of technology that various panels (which represent various industrial sectors as well as socio-economic activity areas) demand for the realisation of their visions of future. Moreover, although S&T issues and policies are in close interaction with industrial issues and policies, science and technology affects almost every dimension of life, industry being only one of them.

The Vision 2023 project produced a science and technology document for a 20-year period and submitted the report to the government. Partial and final results were disseminated and made available to the public through the report produced and presentations at the meetings organised. The outcomes were also shared with wider public over the programme website.

Thus, the preliminary and final results were disseminated and made available to the public using the internet as a main channel.

Vision 2023 evaluation

Although a systematic evaluation of the process has not yet been undertaken, there are indications that it contributed to networking among actors from industry and academia, and has increased awareness of S&T issues. The impact of the whole process will be better evaluated after the detailed allocation of the increased public

funds for research is announced, and the policy on future rounds of Foresight activities is clarified.

Diffusing Foresight practice through Vision 2023

TUBITAK has organised a conference where the aim was to ask each panel to present their work and then to raise new questions and open new discussions. The advantages and disadvantages of the programme were discussed and ideas developed for future exercises (see the 'lessons learned' section below).

Vision 2023 impacts

The Government has already taken the first steps towards realising the S&T vision formulated during the technology Foresight process. This has included allocating a portion of the 2005 funds to promoting science and technology in society and industry; and to support human resource development is also emphasised by all the panel reports and in the draft strategy document.

The resolutions of the "2004 Turkish Economy Congress", which was organised by the State Planning Organisation, were adopted in the S&T Policies Working Group Report. This report was exclusively based on the findings and recommendations outlined in the synthesis reports developed in the Vision 2023 project.

In addition, in line with the essential recommendations of the strategy document developed in the Vision 2023 project, the government has recently announced a decision on Turkey's R&D expenditure (GERD). It was announced that Turkey's GERD will be increased from 0.64% to 2% by the year 2010, and an additional 275 million USD public funding be reserved in 2005 for supporting human resource development and to promote science and technology in the society and industry.

Finally, the Vision 2023 programme has increased the public awareness on Foresight.

Source : http://forlearn.jrc.ec.europa.eu/guide/6_examples/turkey2023.htm#Methodology