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TECHNOLOGY FORESIGHT IN THE CZECH REPUBLIC

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ABSTRACT

The paper reports on the first technology foresight exercise conducted in the Czech Republic in the year 2001. Aim of the technology foresight was to identify priorities for the new "National Programme of Oriented Research" (NPOR) and to devise a suitable method of implementing and managing the new Programme. The proposed NRP consists of five thematic programmes, which are divided into 19 sub-programmes, which include 90 key research directions (key technologies or KRDs). The NPOR includes further three cross-cutting programmes which are divided into 19 cross-cutting sub-programmes (systematic measures). The results were achieved through a broad cooperation of several hundreds of leading representatives of research, industry, services, business, financing, state administration and other organisations who worked in panels and expert groups. Panel discussions were complemented by thorough SWOT analyses of key industrial sectors.

KEY WORDS

Key technologies; research priorities; technology foresight

BIOGRAPHICAL NOTES

Karel Klusacek is an MS graduate of the Institute of Chemical Technology in Prague (1973). He received his PhD from the Academy of Sciences in Physical Chemistry (1978) and his MBA from the Business School of the Sheffield Hallam University, UK (1998). After 17 years of research in chemical reaction engineering at the Academy of Sciences he was appointed Director of the Technology Centre AS CR. His main professional experience includes management of international technology transfer projects, research in technology and science policy and innovation strategies. He is President of the Czech Society for Promotion of Technology Transfer, Czech delegate to the Programme Committee "Innovation and SMEs" and Czech delegate to the Scientific and Technical Research Committee (CREST) of the European Commission. In 2001 he was the National Coordinator of the first Czech technology foresight exercise.

1. BACKGROUND

In the previous decade there was a lack of strategically targeted initiatives regarding future technological development in the Czech Republic. Due to the basic restructuring of the whole system, including the industrial base, a turbulent environment of the first half of the 1990s brought about frequent changes in the positions of responsible persons and there were practically no existing strategic policy documents. Most of the initiatives were short term and targeted at coping with urgent problems and preventing high social dissatisfaction.

The situation began to change at the end of the decade, when the Government decided to prepare the National Research and Development Policy (NRDP) of the Czech Republic as a key strategic document defining the relationship of the state to research and development.

2. NATIONAL RESEARCH AND DEVELOPMENT POLICY (NRDP)

A significant part of the NRDP deals with the oriented research – research which is in principle aimed at achieving concrete results, needed for instance for solving a technical problem or improving the quality of life.

Generally, the NRDP defines the following fundamental priorities of the NPOR grouped into five thematic and three cross-cutting programmes:

1. Thematic programmes:
   - Quality of Life
   - Information Society
   - Competitiveness
   - Energy for Economy and Society
   - Social Transformation
2. Cross-cutting programmes:
   - Human Resources for Research and Development
   - Integrated Research and Development
   - Regional and International Co-operation in Research and Development

The NRDP declared the need of early identification of more detailed priorities of oriented research using some of the proven methodologies (or a combination of methodologies) of technology foresight. The accomplishment of this task was the principal objective of the national technology foresight exercise conducted in the Czech Republic in 2001.

3. CZECH TECHNOLOGY FORESIGHT PROJECT

This section describes the first Czech technology foresight project, particularly its objectives and methodology.

3.1 Objectives

Generally, the basic objective of the national foresight exercise was to identify the most important technologies (research priorities) likely to be demanded by the Czech industry and the service sector over the next ten-year period. Research conducted in defined priority areas should contribute to the achievement of strategic goals in the key sectors important for the national wealth creation and for the improvement of the quality of life.

The Czech technology foresight project followed the tasks outlined in the NRDP for the oriented research. The principal objectives of the project may be summarized as follows:

- proposal of priorities (sub-programmes) of the thematic programmes of oriented research defined by the NRDP;
- recommendation of the structure and functions of cross-cutting programmes to ensure favourable conditions for systemic support of thematic programmes and the NPOR as a whole;

- identification of basic principles of the implementation and management of the NPOR.

3.2 Methodology

Methodology of the national foresight corresponds to its objectives and conditions imposed by the formulation of the governmental request. The main objective is to identify priorities of oriented research within a relatively short time of one year. Selected research priorities should address the most likely social, economic, environmental and market trends of the next ten years (the time horizon of the study was the year 2010). Selection of priorities should be based on a combination of a supply-driven and a demand-driven approach with the emphasis on the latter one.

Due to the above-mentioned conditions the basic principles for the design of the foresight methodology were as follows:

- There is not sufficient time to perform a large-scale "Delphi survey", which was the backbone of several recent foresight studies abroad (e.g. Japan (STFC, 2001), UK (Loveridge et al., 1995), Germany (Cuhls and Kuwahara, 1994), Hungary[1]).
- Moreover, the Delphi methodology does not appear to be the most suitable tool to accomplish the principal project task - to identify the research priorities.
- The principal objective – identification of priorities of oriented research, may be achieved using a modified method of "key technologies" (critical technologies, strategic technologies) which was successfully applied for instance in France (Ministère de l´Industrie, 1995), USA (White House Review Group, 1995).
- An essential success factor is a consensus building among various stakeholders – government, industry, commerce, academia and political circles.
- Input for the selection process should be collected:
    - From the side of potential "users" of results of oriented research (industry, entrepreneurs, commerce) to identify real needs of the Czech economy and society.
    - From the side of "providers" of research results to evaluate the potential of the national research base to create required results.
    - From the State Departments (Ministries) to compare foresight findings with their respective strategic plans in the area of oriented research.
- Project should combine the "conservative" components – for instance characteristics of relative economic importance of individual business sectors (description of a recent past) and the "creative" components – brainstorming and discussion in panels of experts (future visions).
- Besides a spirited creative discussion in panels of experts an adequately sophisticated quantitative prioritisation procedure should be used to support the credibility of selected research priorities and the transparency of the prioritisation process.

Methodologically, the foresight exercise consisted of several stages depicted in the Figure 1.

[1] The foresight programme was launched in Hungary in 1997, the methodology and results of the first stage are available at http://www.unido.org/doc/381412.htmls

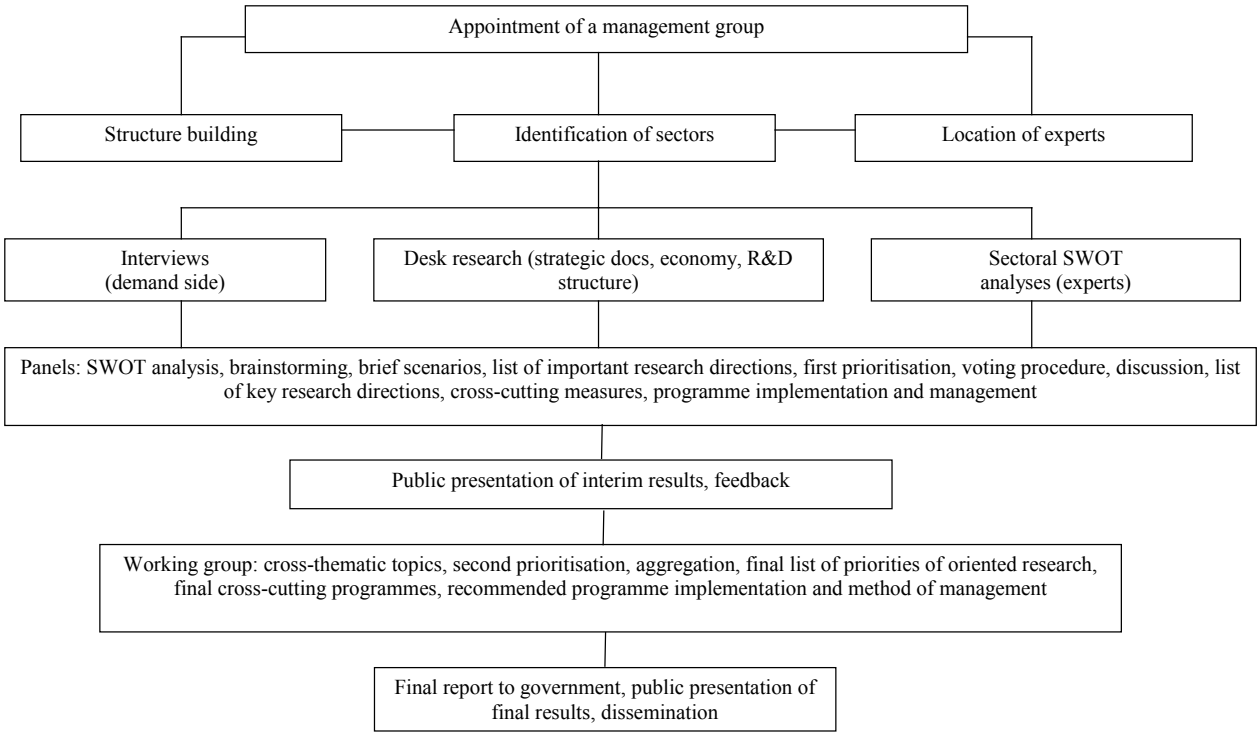

Figure 1 – Individual stages of the Czech technology foresight

3.3 Project structure

The main project objectives may be achieved only through a cooperation within a relatively complex structure in which all the important stakeholders are represented. The basic structural elements of the Czech foresight project are illustrated in the Figure 2. The dashed arrows indicate an advisory role.

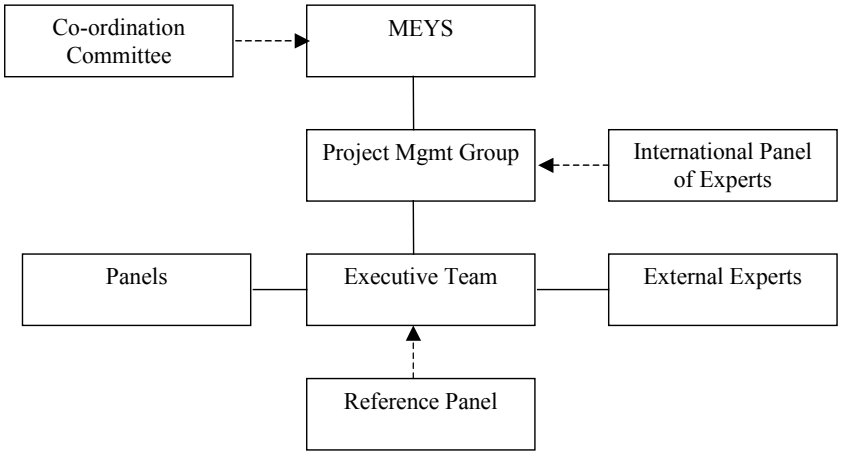

Figure 2 – The structure of the Czech technology foresight project

The Ministry of Education, Youth and Sports (MEYS) was the project principal promoter and sponsor. The Ministry was not directly involved in the project execution but it continuously monitored the project course, approved nominations for the Coordination Committee and Expert Panels. The Ministry nominated permanent representatives to the Coordination Committee including the Committee Chairman and two Secretaries. The Ministry representatives were authorized to participate in the meetings of Expert Panels and meetings of the Project Management Group.

The Co-ordination Committee consisted of top representatives of key stakeholders – Governmental Departments (Ministries), research organizations, industry, political circles, business managers, market and social forecasters etc. The Committee was chaired by the Deputy Minister of the MEYS, the administrative functions were provided by two secretaries in cooperation with the Executive Team. The main task of the Committee was to evaluate the project progress, comment on its results, provide input on project modification and facilitate a broad consensus enabling the implementation of the project results.

The Project Management Group performed the executive management of the project. The Group was formed by representatives of the Technology Centre AS CR (project leading partner) and the Engineering Academy CR (project partner) and was headed by the Project Manager who reported directly to the Ministry. The Group managed the Executive Team and was represented in the Co-ordination Committee.

Expert Panels consisted typically of 15 – 20 leading national experts in a particular field. In each panel experts from research (providers of a new technology) and industry (users of a new technology) were evenly represented. The main panel outcomes were justified proposals of priority areas of oriented research including recommended measures for their implementation. A special panel prepared a proposal of the management system for the NPOR and identified underlying principles for the transfer of ongoing programmes of oriented research into the new NPOR.

The Executive Team organized and supported the activities of Expert Panels, performed in-depth interviews of industrial managers and completed the quantitative analysis of significance of individual business sectors to the Czech economy. The Team was led by the Project Manager and it cooperated with external experts.

External experts were the leading national professionals from particular business sectors. They were invited to prepare a SWOT analysis of their sector and suggest the priority fields of oriented research to match the needs identified in the analysis.

International Panel of Experts was a group of prominent international experts in the area of technology foresight. They provided their opinions on the project methodology and their views on the analysis and the interpretation of the results.

Reference Panel was created from representatives of research institutions, industrial companies, associations of entrepreneurs and other organizations. The panel included several dozens of people who were electronically contacted about their opinion on interim project results. The opinion of the panel was considered in the formulation of final versions of project documents.

3.4 Identification of application sectors

National economies comprise a large number of various economic activities based on different technologies and results of oriented research. Identification of application (business)

sectors is a product of projection of economic activities into groups with similar technological needs and requests for oriented research.

Identification of application sectors is based on the definition of five thematic programmes by the National Research and Development Policy (NRDP) described in Section 2 of this paper. The number of sectors should be reasonable. Too many sectors would result into an inoperable project, too low number of sectors may lead to a non-targeted generalizing approach as the sectors corresponded to the Expert Panels in the later stages of the project.

The classification of national economy sectors of the Czech Statistical Office and strategic plans of individual State Departments (Ministries) were used as a source material. After consultations with experts the following **13 application sectors** were defined:

1. Agriculture and Food
2. Environment
3. Health Care and Pharmaceutics
4. Information Society
5. Building Industry, Urbanism and Housing
6. Materials and Technology of Their Production
7. Discrete Manufacturing
8. Instruments and Devices
9. Machinery and Equipment
10. Chemical Products and Processes
11. Transport Systems
12. Energy and Raw Materials
13. Social Transformation

3.5 Location of experts

In order to conduct the foresight project several hundreds of national experts were needed to participate in the panels and to perform independent analyses of application sectors. In the first phase of the project key national research institutions, universities, industrial companies, professional associations and other stakeholders were invited by MEYS to nominate experts for the foresight project. More than 500 names were submitted, often accompanied by a detailed description of reasons why the respective experts were recommended.

In the second step the nominees received a questionnaire with a brief description of the project objectives. The questionnaire was designed to elicit full contact details of respondents, their main areas of their professional involvement and a level of expertise in selected application sectors. The respondents were also asked to recommend other experts suitable for participation in the project. The new nominees were requested to repeat the whole procedure[2]. Finally, names and characteristics of more than 800 candidates were collected. A database of people eligible to become panel members or to be consulted as external experts was the outcome of this stage of the project.

3.6 Preparatory phase

Expert panels constituted a “creative backbone” of the project. The structure of panels, the methodology of their work and outputs are described in detail in Sections 3.7 - 8. The panels were provided with input information as a background for their efficient work from the beginning. The information consisted of three major components (cf. Figure 1) :

[2] Similar approach was used in the UK Foresight Programme (co-nomination procedure).

- *Results of interviews of the application sphere*. In-depth interviews (the demand side) of a representative sample of key companies from each application sector (286 companies in total) were conducted to identify the demand of users for results of oriented research[3]. A structured questionnaire was designed for this purpose. In-depth interviews were performed during face-to-face meetings with company managers responsible for the R&D strategy. To ensure fully professional communication external experts were appointed to collect the data.
- *Results of desk research.* A thorough desk research was performed by the Executive Team to collect basic economic data and public research expenses in individual application sectors. The information was completed by abridged versions of sectoral strategic conceptions as prepared by individual ministries.
- *Sectoral SWOT analyses*. Analyses were prepared by leading national experts for particular application sectors. Analyses included expected trends (scenarios) in the next ten years.

3.7 Panels

Panels consisted typically of 15 – 20 leading national experts in a particular field. A chairman assisted by a panel secretary, who was also an expert in the particular field, chaired each panel. One of the basic prerequisites for an efficient work of panels was to bring together people with different backgrounds and experience to combine professionals from the "supply" and the "demand side".

After complex discussions with representatives of MEYS (project sponsor), Coordination Committee and other key stakeholders, 17 panels were established:

- thirteen thematic panels (identical with the application sectors defined in Section 3.4):
    1. Agriculture and Food
    2. Environment
    3. Health Care and Pharmaceutics
    4. Information Society
    5. Building Industry, Urbanism and Housing
    6. Materials and Technology of Their Production
    7. Discrete Manufacturing
    8. Instruments and Devices
    9. Machinery and Equipment
    10. Chemical Products and Processes
    11. Transport Systems
    12. Energy and Raw Materials
    13. Social Transformation
- three cross-cutting panels:
    14. Human Resources for Research and Development
    15. Integrated Research and Development
    16. Regional and International Cooperation in Research and Development
- one systemic panel:
    17. Management and Implementation of the NPOR

[3] Interviews were one of the basic tools used in the Dutch project: RAND Europe and Coopers and Lybrand (1998), Technology Radar, Methodology, Delft, The Netherlands.

The first very important step in the procedure of setting up the panels was the appointment of panel chairmen. A good panel chairman should be a recognized expert ("a strategic thinker"), preferably with a varied experience in research, industrial management and having basic knowledge of methods used in state administration. The nomination of chairmen was extensively discussed with leading national personalities, professional associations and confederations and with representatives of the sponsor (MEYS). After the identification of eligible individuals each candidate was approached, informed about the project objectives, methodology, timing and conditions of participation in panels. If agreement was reached a formal nomination was made (including the CV of the candidate) to the sponsor. The Deputy Minister for Research and Higher Education of the MEYS performed the official nomination of the chairmen.

Each nominated chairman was asked to appoint a panel secretary. Panel members were identified in cooperation with chairmen using database of national experts developed in the first project phase (see Section 3.5 – Location of Experts). If a chairman suggested additional names not included in the database the expertise of such nominees was assessed using the identical questionnaire as in the previous stages of identification of experts for the foresight project.

The prime objective in setting up the panels was to ensure that top experts, covering sometimes quite a broad scope of a panel, are appointed. Further, the panel members were coming from various types of institutions, companies and organisations with a particular emphasis on a balanced representation of "users" and "producers" of new technologies – "demand" and "supply" side of the oriented research. Representation of different types of institutions is illustrated in Table 1. The demand side (application sector) is represented by users and by research organisations directly controlled by the users, the supply side consists of universities and institutes of the Academy of Sciences. Industrial research organisations may be considered as users as they often use research results of "academic" oriented research as an input for further (often narrowly) oriented development. Table 1 also demonstrates an adequate representation of governmental departments in the panels.

Table 1 – Sectors represented in panels

Sector	Fraction, %
Universities	37
Academy of Sciences	14
Industrial research	17
Application sector	27
Government	5

In total, 296 experts worked on 17 panels with 9.8% of panel members were female 90.2% male. The age structure of panel members is illustrated in Table 2.

Table 2 – Age structure in Panels

Age, years	Fraction, %
< 30	1
30 – 39	6
40 – 49	17
50 – 59	46
60 – 69	26
> 70	4

The typical panel member was a male, aged 50-59, working at a university.

3.8 Panels' work and outputs

Methodology of work was different in thematic and cross-cutting panels, a specific methodology was also used in the systemic panel.

Thematic panels. Firstly, the panels performed SWOT analyses of their respective application sectors. The results of the SWOT analyses were compared with the analyses previously elaborated by external experts (Section 3.6). Panels were asked to identify *important research directions (IRDs)* using brainstorming followed by a repetitive discussion in each panel. The IRDs were assumed to have a potential to support an exploitation of the opportunities or to suppress the threats identified in SWOT analyses for each application sector with a maximum use of strengths of the corresponding research base and/or the relevant industry.

The number of IRDs identified by each panel varied from 15 to 64. In total, 612 IRDs were identified across the thirteen thematic panels using this approach. As the foresight exercise aimed at determining a rather narrow list of national research priorities, further reduction of IRDs was the next task for thematic panels.

The first reduction was made during discussions on the suggested 612 IRDs in panels. After formal rearrangements and elimination of IRDs with a very limited support by panels there were still almost six hundred of IRDs. Further reduction was carried out using a prioritisation procedure developed especially for the purpose of this foresight project. The procedure followed the approach used by the Australian CSIRO (Commonwealth Scientific & Industrial Research Organisation) (Loveridge, 1999).

During the prioritisation procedure the panel members evaluated each of the IRDs suggested in their panel against two parameters – *"importance"* and *"feasibility"*. Both parameters were obtained through assessment of individual IRDs against a set of 35 criteria listed in Table 3. The original set of criteria suggested by the Management Group was much shorter with an intention to reduce it even further. However, there had been much debate, with little room for compromise, particularly in the Coordination Committee. Criteria were grouped into six clusters, which were, in turn, aggregated into two parameters (coordinates) *"importance"* and *"feasibility"*. Due to a high number of criteria and IRDs and the number of voting panel members, a set of almost 300 thousand data was produced. The only feasible way of managing and evaluating such an amount of data was by using an electronic "voting procedure" developed specifically for this project and accessible to panel members (through a personal password) via internet on the website dedicated to this national foresight project. The opportunity to vote was open for about one month.

Firstly, the panel members self-evaluated themselves choosing one of five categories (ranking from "only superficial knowledge" to an "expert in given area") corresponding best to their expertise in a particular research direction (technology) evaluated. Secondly, for that research direction the panel members assigned a mark between one and five to each of 35 criteria summarised in Table 3. Marks in each column were averaged to produce final values of "importance" and "feasibility". Since the panel members self-evaluated their level of expertise, higher weights were assigned to results of voting received from panel members with a higher level of expertise for a given research direction. However, it has been found that results are very robust and different weights have not influenced the overall panel results significantly. Therefore, equal weights were used for all panel members and all research directions evaluated. After five weeks, the voting procedure was closed. A remarkable

number of panel members (91%) voted. The resulting data was electronically processed and used for the first identification of reduced lists of IRDs. The obtained lists were further refined after a thorough discussion of voting results in each panel.

A typical result of voting is illustrated in Figure 3 (coordinates normalised into interval 0-1, panel Information Society). Individual points correspond to the particular IRDs. The upper right-hand corner includes "key research directions" (KRDs). In a few individual cases panels were allowed to change the standing of some IRDs, however, in such a case, the project management required a detailed justification.

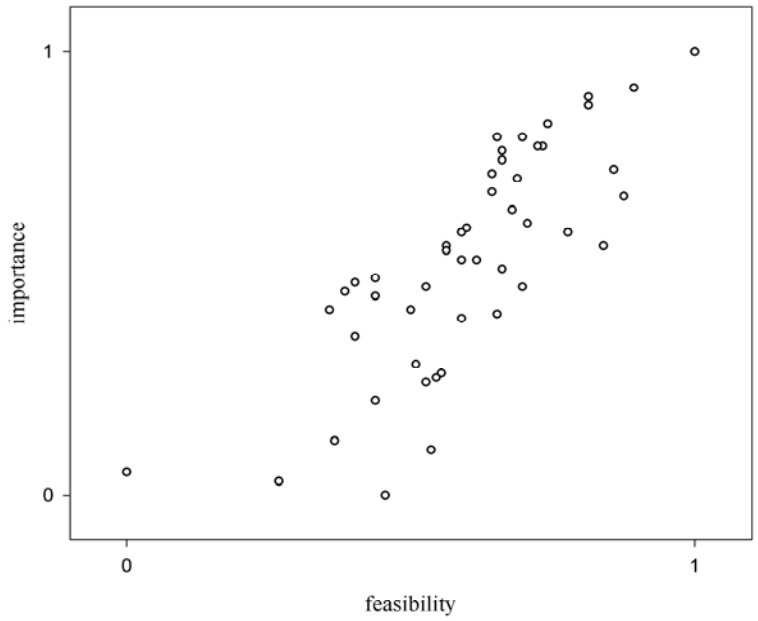

Figure 3 – Results of voting – panel Information Society

There was no strict rule "how large should the upper right corner be", i.e. which of the IRDs should be considered as KRDs. It was always the panel´s responsibility to identify the dividing line and to decide what IRDs would be selected. In any cases, panels justified their selection in detail in their final reports.

The voting procedure and its discussion in thematic panels led to 163 *key research directions (KRDs)*, some of which resulted after aggregation of the original IRDs. The aggregation was possible because the original IRDs were very detailed and they sometimes covered only a narrow area of research. The leading principles of aggregation were thematic complementarities and links between IRDs. Some aggregations were made between IRDs suggested by different thematic panels as a result of communication between panels. The

inter-panel communication addressed some cross-cutting issues, however, most of the cross-cutting issues in this foresight exercise were identified in the subsequent work of the Working Group (see Section 3.9). The Working Group also carried out the second prioritisation, i.e. further reduction of the KRDs selected by panels.

The results of panels' work were summarised in their final reports. The reports contain comprehensive SWOT analyses of the particular application sectors, expected trends (brief scenarios) and detailed description of the identification of IRDs and of the following prioritisation procedure. Each panel submitted the most important research directions as a list of KRDs (163 across the 13 panels), which were ranked consistently with their significance to the specific application sector. Additionally, most of the panels identified "emerging technologies" and "market niches" in their area of expertise. Some panels presented additional recommendations for the development of their particular R&D area and/or industry. Panels also prepared "ID sheets" of suggested KRDs which identify their main characteristics, application areas and critical problems to be addressed.

Cross-cutting panels. The first step was the same as in thematic panels – the SWOT analysis. Subsequently, each panel prepared a proposal of systemic measures to minimise threats and to maximise the exploitation of identified opportunities. The final objective was to recommend such a set of systemic measures (programmes) that would ensure optimal functions of the whole NPOR. Representatives of cross-cutting panels regularly participated in meetings of thematic panels to have an authentic information on the project development.

Panel " Management and Implementation of the NPOR". After a thorough review of the available operational and legal principles of publicly funded research programmes in industrial countries the panel prepared several versions of management and implementation of the new NPOR. The panel collaborated with numerous external experts, particularly lawyers. Representatives of this panel permanently participated in meetings of other panels.

3.9 Working group

A Working Group (WG) was established for the final phase of the project. The WG consisted of 17 panel chairpersons (13 for thematic panels, three for cross-cutting panels and one for the panel Management and Implementation of the NPOR). Additionally, one person represented the pharmaceutical part of the panel Health Care and Pharmaceutics. Besides this, each panel nominated one additional person who acted as a deputy of the chairperson if the latter was not available to attend the WG meetings. The main reason for including panel members in the WG was the continuity with the previous stages and findings of the foresight exercise. The WG further included eight members of the Coordination Committee – representatives of the sponsor, the R&D Council of the Czech Government and other key stakeholders. The main rationale for including these members was the recognition that the exercise moved closer to implementation and, consequently, more "political" actors engaged in the project were necessary.

The Project Manager moderated the WG meetings, being on an equal footing with all other participants, two secretaries assisted the moderator. The WG addressed the following major issues:

1. Modification (if necessary) of the names of thematic and cross-cutting programmes defined by the National R&D Policy.
2. Proposal of sub-programmes of the thematic and cross-cutting programmes. Each programme was anticipated to be divided into 4 - 5 sub-programmes.

3. Identification of interdisciplinary (cross-cutting) themes. Some cross-cutting issues were already identified by panels, however, additional themes were likely as the WG analysed the whole group of 163 KRDs suggested by panels.
4. Further selective reduction of the163 KRDs produced by panels. This step was inevitable because NPOR should result in national priorities and the research involved should thus receive a preferential financing. It was estimated that no more than 100 KRDs should constitute the final output of the foresight exercise.
5. Allocation of the final set of KRDs identified in the previous paragraph to the thematic sub-programmes.

4 Results

The results of the Working Group and the reports by individual panels were the basic material for the preparation of the final report of the foresight project. The main results of the project are:

A. Modified names of programmes of the National Programme of Oriented Research.

The modified titles of 5 thematic and 3 cross-cutting programmes are (cf. with programmes defined by the National Research and Development Policy, Section 2):

Thematic Programmes

Quality of Life
Information Society
Competitiveness at Sustainable Growth
Energy for Economy and Society
Modern Society and Its Changes

Cross-Cutting Programmes

Human Resources for R&D
Integrated R&D
Regional and International Cooperation in R&D

B. The sub-programmes of thematic and cross cutting programmes.

In total, 19 thematic and 19 cross-cutting sub-programmes were defined by the WG. Table 4 shows the distribution of sub-programmes across particular programmes:

Table 3 - Structure of thematic and cross-cutting programmes

THEMATIC PROGRAMME	(THEMATIC) SUB-PROGRAMME
Quality of Life	Human Health
	Quality and Safe Nourishment of Population
	Landscape and Settlements of the Future
	Environment and Protection of Natural Resources
Information Society	Intelligent Systems for Decision Making, Management and Diagnostics
	Management of Information and Knowledge
	Communication Infrastructure and Technology
	Computer Modelling and Design of Systems and Processes
Competitiveness at Sustainable Growth	Production Processes and Systems
	Safe and Economical Transport
	Structures and Constructions
	Advanced Materials
	Emerging Technologies
	Exploitation of Natural Resources
Energy for Economy and Society	Safe and Effective Nuclear Power Engineering
	Power- and Non-Power-Producing Utilization of Coal and Carbonaceous Raw Materials
	Rational Use of Energy and Renewable Energy Sources
Modern Society and Its Changes	Performance-Oriented, Safe and European-Integrated Society
	Social Cohesion, Social Differentiation and National Identity
CROSS-CUTTING PROGRAMME	**(CROSS-CUTTING) SUB-PROGRAMME**
Human Resources for R&D	Permanent discussion platform „Human Resources for R&D“
	Public tender in selected thematic fields (research work and labour market, brain drain), Czech science and human resources, grant systems and their influence on human resources, demographic and social structure of Czech R&D
	Support Programme for the Development of Human Resources for R&D (children and youth, young scientists, top managing scientists)
Integrated R&D	Principles of the national innovation policy
	Legal framework for the cooperation of research and industry
	Integration of R&D
	Research centres
	Intellectual property rights
	Partnership of the public and private sectors
	SME participation in innovation processes
	Setting up technologically oriented enterprises
	Research evaluation (R&D indicators)
	Infrastructural measures
Regional and International Cooperation in R&D	Cooperation of weak and strong regions in R&D
	Technology transfer and innovation in weak regions
	Boosting R&D capacities in weak regions
	Integration of Czech R&D into the European Research Area

C. Reduced (final) list of Key Research Directions (KRDs) and their allocation to thematic sub-programmes.

The WG analysed the set of 163 KRDs suggested by panels. After the identification of cross-cutting themes and an extensive debate between representatives of panels the WG further reduced the total number of KRDs to the final 90 KRDs. The KRDs were allocated to individual thematic sub-programmes.

The KRDs and their allocation are not presented in this concise paper, however, they are available at www.foresight.cz .

D. Further results

Besides the results briefly described above the system and rules for management and implementation of the new National Programme of Oriented Research were devised to allow the new programme to begin in 2003.

5 Conclusions

The first national technology foresight in the Czech Republic was completed within one year. Rather limited time, provided by the sponsor for the project completion, permitted only relatively narrow agenda of the exercise. The project was strictly focused on 2 main objectives defined by the sponsor:

- to identify national priorities for the new programme of oriented research (NPOR);
- to devise a suitable method of implementation and management of the new programme.

Both tasks were completed and the final report was presented to the Ministry of Education, Youth and Sports (sponsor) in December 2001. Both thematic (5) and cross-cutting (3) programmes are divided into 19 sub-programmes. Thematic sub-programmes include 90 key research directions selected in two prioritization steps. Key research directions define the national priorities of oriented research in detail.

The results were arrived at a concerted effort of more than 500 experts – panel members and *ad hoc* external experts. Their genuine interest in the project results gives a good chance for the future similar projects to succeed. A permanent foresight programme should be launched after the performed exercise has been thoroughly evaluated and a "foresight strategy" for the Czech Republic has been outlined.

The Ministry of Education and the R&D Council of the Czech Government has been processing the results of the exercise. In May 2002 the Government approved a proposal of the National Programme of Oriented Research based on the results of the foresight project. After preparatory steps in the second half of 2002 the first calls of the new Programme were launched in January 2003.

Acknowledgement

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