

Strategy Document

Abridged version



Health care

*Agriculture
and food*

electro

*building a
Construction*

energy

*media
Graphics*

INTRODUCTION

The Netherlands Organization for Applied Scientific Research (TNO) is one of the largest research organizations in Europe. TNO was established by Dutch law in 1932. Within its fifteen institutes, TNO employs a staff of approximately 4,500 who are actively involved in research and development in a wide variety of fields. Apart from industrial technology in general, TNO applies its talents and expertise to research in the areas of food and food technology, health care, the environment and energy, building and construction, defence and to policy studies.

TNO is an independent contract research organization (CRO) with a distinct market orientation. TNO's mission is to increase the competitiveness of the business community and to support the government in formulating and implementing its policies. In carrying out its mission, TNO conducts strategic exploratory research and contract research, and supplies high-quality products and services.

In 1993, some 75 per cent of TNO's turnover was generated on contract research. This involved a sum amounting to NLG 450 million. A quarter of this was derived from projects for foreign clients. This component of TNO's turnover has increased substantially over the last few years.

The Dutch government contributes to TNO's turnover in two ways. On the one hand as a client, and on the other as the supplier of financial means enabling TNO to maintain its knowledge base and technological potential at a high level. Dual backing of this nature ensures that TNO will continue to be a valuable partner for government and the business community.

One of the facets of the special relationship that exists between TNO and the Dutch government is an agreement requiring TNO to submit a plan describing its long-term policy to the government every four years. The latest edition of this document has recently been published. In this brochure, we intend to provide you with a brief impression of several important elements of the strategy document. The complete document is available in the Dutch language.

Blurred borders

TNO constitutes part of the Dutch knowledge infrastructure. Both the knowledge market and the business community are internationalizing at a rapid rate, and TNO has to expand its activities accordingly. The Organization had been active in the international market for some time, but the past decade has clearly witnessed an acceleration in the process of internationalization. In 1993, 25 per cent of TNO's turnover on contract research originated abroad. And three quarters of this concerned projects for foreign companies and government. The rest involved projects carried out within the framework of various European research programmes. This segment is the most rapidly growing component of TNO's order book. Those areas of TNO's expertise which attract international interest are listed in Table 1.

TABLE 1

TNO IN THE INTERNATIONAL MARKET

Applied geoscience (groundwater, oil, gas)

Biomechanics and traffic safety

Biotechnology (various areas)

Computational mechanics and computer-integrated construction

Environmental technology

The feed-to-food chain

Foundation pile technology

Image generation with parallel processors

Industrial safety

Radar technology

Ship acoustics

Space instrumentation

Toxicology

Internationalization continues

TNO's strategy is based on the assumption that both competition and the need for cooperation are going to increase. Cooperation will be needed in order to cut down the rising costs of technological development, to obtain the high level of financing required for new (combinations of) technologies, and to mobilize knowledge optimally. It will also be needed as a result of the increasing importance of partnership between the public sector and the private sector. Continuing internationalization — apparent from the emergence of international networks and alliances between R&D organizations and technology-driven companies, and in the increasing importance of international research programmes, in particular those of the European Union — is not restricted to the supply side alone.

On the demand side, TNO is also having to deal with internationalizing clients and increasing competition from foreign R&D organizations. In addition, all kinds of social concerns such as those relating to the environment, defence and infrastructure are also acquiring a more supranational character. There is no question that TNO will have to accommodate itself to the internationalization of the knowledge market.

In the years ahead, TNO intends to expand its international position. For example, the Organization is going to make a directed effort to find foreign partners for cooperative research, and intends to invest more money in promoting its corporate profile in selected markets and a number of highly promising countries/regions.

TNO views internationalization as a natural process of development. Some of its institutes, such as the TNO Nutrition and Food Research Institute, the TNO Institute of Applied Geoscience, and the TNO Road-Vehicles Research Institute have been players in a market with pronounced international characteristics for some time. They have all had to meet an international demand for knowledge. This demand originates from countries such as Eastern Europe and the Far East, where there is a substantial need for TNO's know-how in areas such as food technology, environmental technology and safety. The significance of the European Union (EU) to TNO is two-fold. European Union programmes offer TNO an opportunity to intensify its investments in technology. The European Union also forms a market for projects commissioned by the European Commission, member states and 'third-party countries' for which the European Union functions as a funding organization. The importance of the European Union for TNO is growing.

The objectives of TNO's EU policy are to:

- contribute to EU policy formulation through organizations such as EACRO (European Association of Contract Research Organizations), FEICRO (Federation of European Industrial Cooperative Research Organizations) and EIRMA (European Industrial Research Management Association);
- increase TNO's share in the Fourth European Community Framework Programme for Research, Technological Development and Demonstration Activities 1994 -1998;
- participate in European support programmes aimed at Central and Eastern Europe and the ACS countries.

Making technology work

'Making technology work' is the slogan which TNO has attached to the strategy document. The slogan refers to TNO's core activities: using technology, making technology productive, and translating technology into products and processes of economic and/or social value. All of this is to support the business community in its efforts to compete successfully, and to benefit society by helping to design the future and solve major social problems. For example, TNO is active in areas related to health care, safety, crime prevention, sustainable development, infrastructure and defence.

TNO's slogan is also a reference to the relationship between technology and employment. Prosperity is becoming increasingly determined by the ability to translate technology into high-quality products. This not only generates high-quality employment opportunities but it also makes a significant contribution to economic growth.

A key issue in the strategy document is the harmonization of supply with demand in relation to the development, and especially the utilization of new technology. What market needs can be expected and what is the potential of the technology concerned? Who are TNO's target groups and in what areas of technology should it invest in order to serve them? How can the knowledge necessary to answer these questions be acquired?

Knowledge transfer on the work floor!

Supporting the business sector, but especially small and medium-sized enterprises (SMEs), is and will remain one of TNO's principal tasks. This requires communication, keen insight into the needs of the sector, low barriers and

a tailored approach and product that suit the client's needs. More so than in the past, TNO is going to have to devote attention to the implementation of new technology. In recent years, it has become clear that this form of 'after-sales service' often determines the success of our R&D efforts. That is why we affirm: 'not alongside companies, but in them'. Knowledge transfer on the work floor!

Clusters show the way

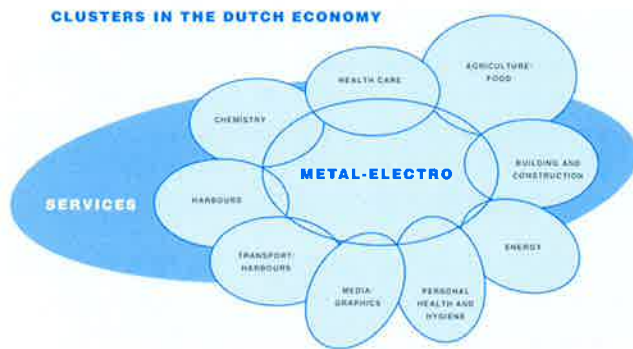
In many respects, the business community is very much a collective concept. Efficient and effective marketing requires classification and the setting of priorities. The strategy document is based on a two-fold classification. On the one hand, classification according to company size, with a distinction being made between multinationals, large national companies and SMEs. And on the other, classification into clusters. Clusters are groups of companies and institutes that display an underlying coherence and that reinforce each other. Company size largely determines the sort of services needed, and cluster classification is of importance when selecting knowledge areas in which TNO should invest and when establishing how to offer this knowledge in an integrated fashion. A salient point is that the crucial knowledge issues which provide openings for an R&D organization such as TNO often arise at the cluster level. Thinking in terms of clusters, more than in terms of branches of industry, is a new element in TNO's strategy.

TNO has carried out an analysis of the dominant structures of the Dutch economy. This analysis has revealed a number of industrial clusters, of which two immediately catch the eye because of their links with each of the other clusters: the metal-electrical technology cluster and the services cluster. Based on this fact, and the need for optimal use of the limited means at its disposal, TNO has defined nine clusters that are to serve as the focus of TNO's activities in the years ahead. These are (see also Figure 1):

- Manufacturing, comprised of the metal-electrical technology industry, the plastics processing industry and the textile (finishing) industry;
- Multimedia, a cluster in the making, which can be considered to include office and consumer electronics, telecommunications, the audio-visual and amusement industry, as well as the graphics industry and related activities in the paper and cardboard industries;
- Chemistry;
- Energy;

- Building and Construction;
- Agriculture/Food;
- Health Care;
- Transport/Harbours;
- Commercial Services, including financial services, professional services (such as firms of organizational and engineering consultants) and trade.

FIGURE 1



TNO holds a strong position in some of these clusters. The Building and Construction and Agriculture/Food clusters for example. Many of TNO's institutes are active within the Manufacturing cluster. TNO's position will be considerably reinforced with respect to this cluster. To this end, a clear point of access will be created within the Organization for the business community. TNO is seeking greater representation in the Multimedia and Transport/Harbours clusters.

This analysis forms the basis for a number of initiatives that TNO plans to take:

- A business centre will be created in the Multimedia cluster for the purposes of marketing TNO's knowledge and expertise.
- The traffic and transport research coordinating centre will be instrumental in reinforcing TNO's primary role in the area of traffic, transport and infrastructure with respect to the Transport/Harbours cluster. Additional investment will be required in this area in order to build up the Organization's knowledge base.
- TNO's potential that is of value to the Manufacturing cluster will be bundled into a single institute with the following areas of interest: product development, production technology and materials research.

Taking company size into account

In order to formulate an optimal strategy, TNO must not only consider the cluster in which a company is operating, but also its size and technological needs.

Multinationals and SMEs differ when it comes to the need for external suppliers of knowledge. The strategy document provides an outline of the approach to be taken with respect to both large national companies and SMEs with which TNO has maintained an intensive and variegated relationship for a long time.

Large national companies rely on the national knowledge infrastructure to a greater extent than multinationals do. Consequently, expectations are that large national companies will be contracting out more of their R&D activities. Competence, independence and flexibility will determine the extent to which TNO will be able to take advantage of this. Strengthening the Organization's links with this category of companies is of great importance. The experience gained in this way will also benefit the SMEs of a particular cluster or production chain. As far as TNO is concerned, collaboration with such companies is of the utmost importance for reinforcing its technological and market position. Over the next four years, TNO will be seeking to double its turnover on contract research in this market segment. In order to achieve this goal, priorities in TNO's research programme will have to be closely examined to ensure that it caters to the current and future needs of this category of companies.

A 'national effort' for the SMEs

The Dutch economy is borne by a relatively large number of SMEs which generate a considerable number of job opportunities. A healthy and competitive SME sector is therefore of prime importance in a country such as the Netherlands. Current developments, including the rise of new industrial countries, technological innovations and the blurring of national borders, demand additional input from all parties able to contribute to a more competitive SME sector. This concept is referred to as a 'national effort' in the strategy document. TNO maintains close ties with this sector and is, as such, firmly resolved to meet the challenges presently facing the Dutch economy. A number of measures intended to reinforce the position of SMEs are contained in the strategy document.

More than a contract research organization

TNO is predominantly a contract research organization (CRO) i.e an R&D organization which earns a substantial share of its income by carrying out assignments and marketing knowledge products. But TNO is much more

than just a CRO; the Organization also feels much involved in solving problems that concern society at large. One of its areas of concern is to provide sorely needed support to SMEs. Other examples can be found in the areas of health care, sustainable development, safety, defence, infrastructure, and the like. The Organization's dealings with the various Dutch Ministries is of primary importance in these areas. In most cases, TNO maintains a strategic relationship with them in the form of long-term programme-related financing aimed at building up strategic knowledge and conducting research. For exploratory research of a more risky nature, TNO also receives basic financing from the Dutch Ministry of Education, Cultural Affairs and Science. This unique relationship with the government has enabled TNO to pinpoint a number of areas of work that will be requiring extra attention in the future. These areas include sustainable development, traffic, transport and infrastructure, human ageing, occupational health

and health care, as well as crime prevention and safety. Furthermore, TNO will continue to serve as the major laboratory for the Ministry of Defence.

New technological challenges

In the strategy document, TNO has identified a number of technologies considered to be of strategic importance to the Dutch economy as a whole, and of specific importance to the clusters mentioned. This is the result of an extensive analysis of a series of technological surveys carried out recently within the Netherlands itself and abroad. Table 2 indicates the significance of the various technologies with respect to the nine clusters.

TNO expects that of the knowledge it intends to invest in these clusters, 20 per cent will relate to telematics and information technology. Areas of technology such as man-machine interfaces, vision and image processing will

TABLE 2

AREAS OF TECHNOLOGY CONSIDERED TO BE OF PARAMOUNT IMPORTANCE FOR THE VARIOUS CLUSTERS

	MANUFACTURING INDUSTRY	MULTIMEDIA	CHEMISTRY	ENERGY	BUILDING AND CONSTRUCTION	AGRICULTURE/FOOD	HEALTH CARE	TRANSPORT/ HARBOURS	COMMERCIAL SERVICES
Telematics and information technology	•	•					•	•	•
Man-made interfaces, vision and image processing		•					•		•
VLSI-design for signal processing systems		•							
Computer modelling and simulation				•	•			•	•
Microsystems technology							•		
Production technology	•		•		•	•			
Design and engineering (computer aided)					•				•
Biotechnology						•	•		
Functional materials			•						
Catalysis			•						
Environmental technology			•		•				
Technologies for generating, saving and storing energy				•					
Traffic, transport and infrastructure					•			•	•

be of particular importance to the Multimedia and Commercial Services clusters. Very large-scale integration (VLSI) will be developed further by TNO for the benefit of application in the Multimedia cluster. Computer modelling and simulation are of equal importance to all the clusters. At TNO, microsystems technology will be largely directed at the Health Care cluster. As far as TNO is concerned, computer-aided design and engineering will be of prime importance in increasing flexibility in the production processes within the Building Construction and Commercial Services clusters. In the area of biotechnology, TNO will invest heavily in structural and functional research, bioprocessing technology and environmental biotechnology. With respect to the Chemistry cluster, functional materials, particularly functional polymers, will be increasingly applied under new and, for plastics, relatively extreme conditions. TNO will link catalysis principally to the environmental applications sector. In the energy field, TNO will emphasize both the improvement and upgrading of industrial processes, forms of road transport and hydrocarbon extraction. Finally, the Transport and Traffic clusters will concentrate on optimizing logistics processes.

In determining priorities and principal areas of focus for the purposes of building up knowledge and formulating policy with respect to science and technology at a national level, TNO considers up-to-date information relating to society's need for knowledge and trends in science and technology to be of strategic importance. Therefore, TNO will focus more attention on medium and long-term exploratory research, as well as short-term exploration (technology watch) in the area of technology. It will also continue to explore issues relating to policy (policy watch), and markets and clusters in the business sector.

THE FIFTEEN INSTITUTES OF TNO

TNO Product Centre
 TNO Metals Research Institute
 TNO Plastics and Rubber Research Institute
 TNO Institute of Applied Physics
 TNO Road-Vehicles Research Institute
 TNO Building and Construction Research
 TNO Institute of Applied Geoscience
 TNO Nutrition and Food Research Institute
 TNO Prevention and Health
 TNO Physics and Electronics Laboratory
 TNO Prins Maurits Laboratory
 TNO Human Factors Research Institute
 TNO Institute of Environmental and Energy Technology
 TNO Institute of Environmental Sciences
 TNO Institute for Policy Studies

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