

**The Participation of the Nordic Countries in the Early Development  
of OECD Science and Technology Statistics**

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This document has been circulated to a number of Nordic experts on S&T indicators for comment. Responses from several of them are pending and revisions are expected, especially for the section on recent work.

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## Provisional

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#### **Origins**

R&D statistics and other kinds of S&T information were early recognised in the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) as providing important policy tools for the public and private sectors. The climate was also very indicator-friendly following the setting up of a number of national technological policy agencies in the 1960's. The NTNF (The Royal Norwegian Council for Scientific and Industrial Research) had been in place since 1946. The Finnish Science Policy Council was founded in 1963, the Icelandic Research Council (Rannsóknaráad Ríkisins) in 1965 and the Swedish Board for Technical Development (STU) in 1968. These were followed by the Technology Research Council in Denmark (Teknologiraadet) 1973 and a second Finnish agency, the Technology Development Centre (TEKES) in 1983. The fact that several of the national data collection agencies were also themselves primary users of their own information (such as the three Norwegian research councils) facilitated the work. The information collected also served the early OECD reviews of the national S&T policies requested over time by all the Nordic countries - first Sweden in 1963 (OECD 1964) and again in 1986 (OECD 1987a), Norway in 1969 (OECD 1970b), Iceland in 1971 (OECD 1972), Finland in 1986 (OECD 1987b) and Denmark in 1987 (OECD 1988).

#### *Difference in S&T structures between Nordic countries in the early 1960's*

Despite having many common characteristics the Nordic countries, then as now, differed in economic structures and in the pattern of their S&T activities.

Sweden funded solid and R&D-intensive defence programmes and had a large number of internationally well-known industrial enterprises drawing on national inventions and advanced technologies that - already at the time - could be considered as high-tech. In comparison, defence R&D was extremely low or non-existent in the other Nordic countries. Much of the national R&D effort in Norway was undertaken in institutes serving all sectors of the economy; in Denmark most of the R&D was performed in small and medium enterprises, many of which were in the agricultural sector. Industry in Finland was just transforming its production, to a large part established to indemnify the Soviet Union after World War 2, for national consumption and exports and was already becoming engaged in selected niches, such as sophisticated paper production equipment and ship building. At the time, Iceland had one of the lowest GERD/GDP ratios in the whole OECD area and what little R&D was performed took place in favour of the national fisheries and agriculture sectors. In all the Nordic countries the Higher Education sector played an important role in the performance of national R&D.

These differences between countries were reflected in the survey results and revealed a number of conceptual, institutional and functional border-line problems when the first inter-Nordic comparisons were made.

#### *Nordic co-operation*

From the outset, R&D statistics (as also, for example, statistics on education) were the subject of specific efforts to assure inter-Nordic data comparability. Even if, at a first glance, the economic, social, historical, educational, etc structures of the five nations appeared to be very similar, their experience of the first national R&D survey, based on the initial version of the *Frascati Manual* used for the OECD survey held in 1965 (OECD, 1963), showed that, even at this regional level, significant problems of international comparability could occur. And, if this was true for the small and relatively

homogenous group of Nordic countries, then there was every reason to believe that the situation was even worse in the wider OECD context, a view that Nordic experts have been defending forcefully ever since the second meeting at Frascati (Italy) in 1968 to revise the R&D guidelines (OECD, 1967a).

In consequence, the Nordic countries participated very actively from early on in the OECD work on developing methods for the collection and the analysis of R&D statistics and S&T indicators, both individually and as a group.

### **Support from Nordic Organisations**

After the involvement of four of these countries in the first and second Frascati meetings, the Nordic work became coordinated by NORDFORSK (The Nordic Co-operative Organisation for Applied Research) and for the next 25 years the S&T indicator specialists had an institutional framework and financial resources to commission studies and carry out experimental surveys.

NORDFORSK itself had been created as far back as 1947 by the principal Nordic scientific and technical research councils and academies, with a view to initiating, planning, coordinating and promoting Nordic cooperation in a number of areas (including networking, the training of researchers and provision of fellowships). Its activities were essentially financed by the national members. It had a rather flexible administrative set-up with headquarters in Stockholm, an environment research office in Helsinki, a small office dealing with social research in Copenhagen and an information service SCANDOC, the Scandinavian Documentation Centre, in Washington D.C.

During the 1960's and 1970s a number of other topic-oriented Nordic organisations joined NORDFORSK and many of them provided additional financial support, notably the Nordic Council of Ministers and the Nordic Council (both in Copenhagen), the former devoted to cooperation between governments, the latter (founded already in 1952) to cooperation between Parliaments and, from 1973 onwards, the Nordic Industrial Fund (Oslo). In 1982 the Council of Ministers founded the Nordic Research Policy Council in charge of over-viewing developments in the research policies of the five countries and fostering coordination of Nordic resources and their utilisation.

During the first years, NORDFORSK work essentially centred on activities in the natural sciences and engineering (NSE) and, in particular, in the fields of information, documentation and communication technologies where a number of specialised working groups were set up. With the coming of institutions engaged in the social sciences and humanities, the scope of the activities was broadened.

The arrival on the scene in 1984 of the Nordic Industrial Fund, a subsidiary of the Nordic Council of Ministers, created some confusion between activities and the risks for duplication of work with NORDFORSK, especially since the Fund was in a better financial position to support research of common interest to the member countries. Gradually, more and more of the common programmes were transferred to the Fund until, following decisions at the highest Nordic political levels, NORDFORSK and its remaining activities, including the R&D/S&T indicators group, were absorbed by the Nordic Industrial Fund in 1987. The Fund's general purposes remained unchanged: initiating, financing and fostering industrial R&D in the Nordic countries by promoting innovation, competitiveness and internationalisation.

In 2004 the Nordic Industrial Fund was merged with NORDTEST, another inter-Nordic agency (created in 1979 – also under the Nordic Council of Ministers) which was in charge of promoting and expanding Nordic cooperation in all areas related to technological testing and measurements, to fostering solid industrial development and competitiveness and to safeguarding Nordic interests in all areas of international, and notably European, cooperation. The new constellation became known as the Nordic Innovation Centre – NIC (still in Oslo).

Surprisingly enough, some eighteen years after NORDFORSK's merger with the Nordic Industrial Fund another agency (headquarters in Oslo) with the same name was established in January 2005

under the Nordic Council of Ministers for Education and Research. The same policy aims were maintained of strengthening and developing areas in all scientific disciplines where the five Nordic countries are well positioned in international competition. These activities will be undertaken in cooperation with national research councils, academies and other institutions, in coordination with the Nordic Innovation Centre (see above). This new NordForsk also replaces the Nordic Science Policy Council (1982) and the Nordic Academy for Advanced Study – NorFA. Its activities go beyond the original five Nordic countries to include the Baltic countries (Estonia, Latvia and Lithuania) and the Russian St-Petersburg and Barents regions.

## **Methods of work**

### *S&T data collection in Nordic countries*

Concerning survey methods, the collection and publication of R&D/S&T data have always been managed or financed by the research councils in Iceland and in Norway (more recently coordinated by the research institute NIFUSTEP, but also supplemented by Statistics Norway for the industrial R&D and innovation surveys). In Finland and Sweden the national bureaus of statistics have always been responsible for the survey whereas, in Denmark, the task has been shared over time between public and university administrations. Increasingly, the same services are now also in charge also of the collection of other S&T data, for instance, information, computers and communications technologies (IT) data.

### *Methods of common work on improving and developing S&T data*

By the late 1960s a few small ad-hoc groups had already been set up under NORDFORSK to investigate various policy areas (environment, energy, materials technologies...) or specific topics, one of which referring to the development of I&D (information and documentation) and R&D statistics and indicators. This group was later transformed into a permanent Nordic replica of the OECD Group of National Experts on S&T Indicators (NESTI), representing both producers and users of data, with the aim of proposing improvements in definitions, survey methods and data analysis in a wider international context. The Group met several times each year in the various capitals and continued to pioneer and test improvements in most of the existing indicators and the development of new input, output and impact statistics. The Group prepared carefully each year for the NESTI meeting and as the same Nordic experts also represented their country in most other international meetings (UNESCO, EEC/EUROSTAT...) they could also make their experience and opinions known throughout the S&T indicators community. Their regular contributions were always discussed seriously by NESTI and many Nordic proposals were approved and then incorporated in the subsequent versions of the *Frascati Manual*.

One strength of the Group has been the very low turnover of staff in the data collection agencies, allowing the experts to touch upon most issues of S&T statistics and indicators and ensuring the consistency of work over time (only in Denmark was there, for many years, a rapid turnover of personnel in the R&D/S&T indicators group, in line with the national public careers training programs).

Another advantage is that only a minimum of interpretation and translation is involved in these activities. Danish, Norwegian and Swedish are near enough for technical papers and discussions to be mutually comprehensible. Icelandic is further away and Finnish quite different. However, Swedish is still the official second language in Finland.

The following paragraphs highlight some of the topics where the Group was particularly influential though it also took an interest in other S&T indicators such as human R&D/S&T resources, patents statistics, technology balance of payments and bibliometrics.

## **Main areas of Nordic contribution**

### *R&D and Information/Documentation activities*

In the 1960s and early 1970s, NORDFORSK members became involved in the OECD-sponsored project on developing R&D and information and documentation (R&D/I&D) statistics entrusted to the Studiengruppe für System-Forschung at the University of Heidelberg (Germany). Despite considerable financial and human efforts nothing much exploitable came out of the I&D part of this very ambitious international project, especially in comparison with the already advancing Frascati developments in measuring R&D. The participation in this work was the start of the first systematic Nordic analysis of problems hampering the comparability of their national S&T series.

The first NORDFORSK technical report to have the preliminary status of a “Nordic manual” dealt with the development of R&D/I&D Statistics (Nordforsk, 1971). Even if this study (predominantly in Norwegian) was primarily intended to deal with the information and documentation aspects of data collection, diffusion and analysis, it identified and discussed a large number of issues of direct relevance to R&D as well, such as definitions and principles of classification (units, criteria...). Most of these basic I&D definitions and recommendations may appear to be obsolete today but they did reflect the growing interest in developing national information and S&T policies, at a time when no-one could have imagined the information and communications revolution coming up only a few years later.

### *R&D survey methodology*

As the I&D work ran down early in the 1970s, the Group intensified its discussions of R&D-related statistics and indicators. Units surveyed, units classified, institutional/functional units and classifications and various criteria of classification that had been unsatisfactory dealt with in the earliest versions of the *Frascati Manual* were presented to and discussed at NESTI and were gradually incorporated in the subsequent revisions of the Manual. In 1974, a NORDFORSK adaptation (in the Nordic languages) of the most recent third edition of the *Frascati Manual* itself was issued, with specific references to some regional issues (Nordforsk, 1974).

The Nordic countries have always shown a particular interest in the social aspects of S&T policy. This was one of the reasons why they (together with, amongst others, Germany) suggested that the OECD surveys, originally limited to the natural sciences and engineering (NSE) reflecting the approach in the Anglo-Saxon countries, should - like those of UNESCO - also cover the social sciences and humanities (SSH)

This proposal was endorsed by NESTI for the third edition of the *Frascati Manual* (OECD, 1976).

### *Encouraging methodological co-operation between OECD and UNESCO*

The inclusion of the social sciences also forwarded one of the Nordic countries' long standing objectives of bringing together the methodologies of OECD and UNESCO in a period when the latter had to provide an S&T data collection system which could be used by OECD, COMECON and developing countries. This objective reflected both the Nordic practical attitude to reducing the reporting burden on countries and also a broader international view than some other OECD countries. Indeed, given the wider membership of UNESCO, the Nordic Group tended at times to favour concentrating R&D surveys with the latter. However, other developed OECD countries preferred to maintain certain differences and a solution had to be found using keys between the sector classifications.

## *Development of GBAORD*

As already mentioned, the statistics collected by the Group consistently served in the policy debate in the individual Nordic countries and for overall Nordic analysis. The shortcomings of the *ex-post* R&D statistics, notably the delays in their provision to the users, were strongly felt and the Group therefore soon became interested in the *ex-ante* analysis of the R&D contents in state budgets and other public accounts (later entitled “GBAORD” –Government Budget Appropriations or Outlays for R&D).

A first statistical NORDFORSK report on State expenditures for R&D in the Nordic Countries in 1975 was published in Danish (Nordforsk, 1976). This work was undertaken in close contact with OECD, UNESCO and the EEC and was, at the time, closely linked to NACE 1970 (General Industrial Classification of Economic Activities within the European Communities) and then later to NABS (see below).

By 1983, a Nordic “objectives manual” (in Scandinavian languages) was ready (Nordforsk 1983) which dealt with methods of identifying R&D elements in the state budgets and how to categorise them by socio-economic objective. It came out some three years prior to the European NABS guidelines (*Nomenclature pour l'analyse et la comparaison des budgets et des programmes scientifiques* (Eurostat 1986). The Nordic list of socio-economic objectives was not very different from those proposed by EEC and the OECD though some minor variations occur in a few sub-classes. The *Frascati Manual* (OECD, 2002) currently uses the NABS 1992 classification (Eurostat, 1994) but a standard key between NABS and the NORDFORSK GBAORD objectives is still provided.

## *Improving the measurement of R&D in the Higher Education sector*

It had long been recognised that it was particularly difficult to obtain reliable data for resources devoted to R&D in universities and other higher education establishments. The Nordic Group examined this topic very thoroughly and published a report (Nordforsk, 1986) with recommendations on identifying and measuring R&D activities in the Higher Education sector. Specific attention was given to issues of functional and institutional border-line problems, data sources, time-use surveys and methods of estimating R&D shares in the total activities of the higher education sector (including the use of R&D coefficients for expenditures and full-time equivalents of personnel).

This Nordic work inspired the special supplement to the *Frascati Manual* (OECD, 1989) which also included specifications concerning outputs. The recommendations on R&D inputs have since been broadly incorporated in the Manual, both in its main text or as separate annexes.

## *Innovation*

The Nordic contribution to work on output and impact indicators was furthered when NORDFORSK merged with the Nordic Industrial Fund in 1987. A major effort was made to develop methods of measuring innovation activities and resources – i.e. a much broader concept than just R&D – designed for use in a Nordic innovation survey based on a common questionnaire launched in 1989. This work underpinned the first OECD guidelines on the measurement of innovation activities better known as the “*Oslo Manual*” (OECD, 1992) in recognition of the support of the Nordic Industrial Fund.

## *Human Resources for Science and Technology - HRST*

From the very beginning, matters of the demand for and the supply of qualified personnel were among the top policy priorities in all the Nordic organisations and individual countries. Early on, specific Nordic programmes were launched to deal with the training and recruitments of researchers, usually understood as persons qualified at the doctorate level. Problems of ageing, mobility, recruitments of women were discussed and possible measures suggested. The national education (and also occupation) statistics revealed wide differences between countries, for instance concerning the level classifications of specific categories of personnel. During the 1970s and 1980s all the Nordic

countries introduced a number of education and training reforms, with a view to increasing the proportions of the youngest generations engaging in third-level (higher education) studies and also to favour the promotion of doctorate students. From the R&D personnel point of view, some of the differences identified between countries were due to variations in the data availability, quality and sources. Here, countries with specific and sophisticated registers of all their university staff (such as Norway) evidently had less difficulty in compiling consistent and relevant data than some of the others. The experience from these studies led to the methodological work discussed above concerning improvements of R&D measurements in the higher education sector. The experience of the Nordic group also broadly contributed to the preparation of the OECD/EUROSTAT “*Canberra Manual*” - *Manual of the Measurement of Human Resources devoted to S&T*” (OECD, 1995) and, in more recent years, the OECD work on careers of doctorate holders.

### *Evaluation*

The Nordic countries, being particularly concerned with the supervision of the use of their tax payers’ money, early introduced procedures to evaluate the relevance and quality of R&D institutions, programmes and projects. In 1974, NORDFORSK nominated a working group in charge of measuring the results of technical R&D. Both R&D statisticians and policy makers were engaged in the group. One year later, their work resulted in a first methodological report drawing on the international “state of the art” literature, on a number of Nordic National State Accountancy Office reports and on the results of a special survey addressed to the NORDFORSK member organisations and to selected industrial and S&T policy bodies (Nordforsk, 1975).

The debate and exchange of experience of evaluation practice and methods which followed, revealed, amongst other things, considerable resistance, notably in academic circles, to the use of publications and citations counts for evaluation purposes. This resistance, however, weakened over time, especially following a number of pertinent high-level bibliometric studies presented by a few newly created university S&T policy groups and the research councils. In 1987 the group issued a report presenting the lessons from Nordic cooperation in the fields of evaluation (Nordforsk 1987).

### *Other topics*

In the long list of other topics addressed by the Nordic S&T R&D statistics group it is worthwhile mentioning their work on now-casting/forecasting (or projection) of R&D data, in the absence, especially for the private sector, of up-to-date information (same reasons as those explaining the Nordic interest in the GBAORD approach for the public sector - see above).

Prior to the introduction of the purchasing-power parity approach for conversion of national expenditures into one common currency for international comparisons, the Nordic group had some discussions on what currency to use for Nordic comparisons (depending on the topics and reports, practice varied between the use of the Danish, Swedish or Norwegian currencies (crowns).

### **The last decade**

Since the mid 1990’s the Nordic countries have ceased to have quite such a major collective impact on the development of S&T indicators at OECD, though individual countries and delegates are still very influential. The Group still publishes data, most recently the review of public R&D funding in the Nordic countries. (Nordic Ministerial Fund, 2005).and there are ongoing co-operative S&T indicators activities in the Nordic area, for example the annual workshops on bibliometrics (NIFU, 2006). A new project, for the period 2006 – 2008, has just been initiated aimed at identifying and presenting the most relevant indicators for innovation policy and how these indicators can be interpreted and used in policy design (Nordic Innovations Center, 2006).

Despite all the years of common statistical work (surveys/data collection and management, analysis and diffusion), the Nordic group was never awarded grants for the setting-up of a common permanent

R&D statistics database. However, finance has recently been provided by NORBAL for a database on doctorate degree holders and students (a project managed by the Norwegian NIFUSTEP). For all their regular and ad-hoc work, information was requested each time from the national data providers and then processed separately for the specific exercise underway.

## Conclusion

Thus, over 25 years, the Nordic countries had a considerable impact on the direction and content of OECD work on S&T indicators. This was certainly because of the sound practical work based on international comparisons which backed their proposals and also because these proposals usually matched the needs of the other smaller OECD countries. Furthermore, within the consensus framework of decision-making at OECD, a coherent group of five NESTI countries wielded considerable influence particularly, as in this case, it was backed by a similar Nordic policy group within in its OECD parent body, the Committee for Science and Technology Policy – CSTP.

These “strengths” may also have had downsides in that they encouraged an interest in detail rather than the big picture, that the methodology proposed was not always suitable for much larger countries or those with less compliant survey respondents and that the Group could dig in and prevent developments they did not favour. Nevertheless, without the efforts of the Nordic Group OECD S&T statistics and indicators would not be what they are today.

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