ELECTRONIC PAPERS FROM THE RESEARCH LANDSCAPE PROJECT

Series Editor: Ulf Sandström

2000:6

Does Peer Review Matter?

Funding Policy, Researchers' Attitudes and Council Procedures at the Swedish Research Council for Engineering Sciences (TFR)

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From the book: (out of print) "Peers on Peers: Allocation Policy and Review Procedures at the Swedish Research Council for Engineering Sciences", TFR Evaluation Programme Volume 4, 1997

Swedish Institute for Studies in Education and Research

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SUMMARY AND CONCLUSIONS

The Swedish Research Council for Engineering Sciences (TFR) is a Swedish authority under the auspices of the Ministry of Education and Science. Established in 1990, its main purpose is to encourage and support the basic engineering sciences in Sweden. This is done in the main through a variety of grants for which Swedish scientists are invited to apply once a year. TFR distributes its financial support through five main channels: individual investigator project grants, multi-project block grants, industrial graduate studentships, post-doctoral scholarships, and grants for ”special ventures”.

This evaluation, carried out at the request of the TFR, uses a process perspective to evaluate the Council’s operations and procedures. Its purpose is to analyse TFR's performance as a research-funding agency. The framework for the evaluation was based on a number of different investigations, which examined:

- The TFR's peer-review system for evaluating research proposals;
- Characteristics of the applicant population;
- Attitudes of researchers to the Research council;
- Trends in the size and duration of TFR-funded research projects;
- How the TFR decides priorities among competing research fields.

From our investigations of the project register we have been able to show that the Council decisions have been changing in two dimensions. Firstly, time awarded per project has been decreasing since 1991 and, secondly, the committees seem to have developed a similar policy for the funding per year and project. In 1996 most of the committees seems to have a common policy for funding per year, but there might still be a lot of differences behind these figures based on averages. We have documented that there are major variances between the committees when it comes to the policy for the continuation of projects.

One common problem for funding agencies is that new priorities are often hard to implement. New areas of research might have a hard time due to the conservativeness built into the system. With the empirical material in the project register, we have also had the opportunity to investigate the amount of reallocations between committees during the six-year period the Council has been in operation. The hypothesis was that the multi-project grants would be an efficient instrument for reallocating resources, but our conclusions are negative. Even though the register is open for many different types of interpretations, due to definitions and the inclusion or exclusion of certain types of grants, we find it hard to deny that the trend towards a more or less even distribution between the committees seems to be very strong. Consequently, the Council, from time to time, may have to rearrange the committees if the actual policy is to be implemented.

The Swedish research community is growing very fast (in number of researchers) and the engineering sciences have had a privileged position in government policies since the beginning of the 1980s. One effect of this is that the integrative aspects of the research community, according to general norms and values, is hindered. We believed that the attitudes towards the Council procedures would be a conclusive strategy for investigations on this matter. We conducted a mail survey through a questionnaire composed of 87 questions (two of which were open-ended). The study population included all principal investigators (both successful and unsuccessful) who applied to the TFR during the last application period (May 1996). We achieved a response rate of 75 percent (444 out of 588). This is the first comprehensive survey of Swedish researchers. It is a pity, however, that we do not have the opportunity to make comparisons with other research councils in Sweden.

Thirty percent of the respondents are professors. The next group – senior lecturers – are about the same size. The rest is mainly a number of assistant professors. With respect to the respondents' age, the population is divided quite equally into three groups: 32 percent of respondents are aged 31–40; 33 percent are 41–50 and 30 percent are 51–60. This shows that the younger generation of researchers in engineering research is important.

Almost half of the population have had funding either from the agency for applied engineering research (NUTEK, the former STU). Most of them describe themselves as researchers with a focus on strategic research, that is, research with aspects of both basic and applied research. We seem to have a success bias among the respondents. Those who did not answer the survey (144 persons) had a success rate of 19 percent, whereas our respondents had a success rate of 33 percent. The success rate for younger researchers is quite low. Naturally, the longer you have been a part of the research community, the stronger is your chance of being funded.

A vast majority of the respondents have the opinion that they have been judged fairly in the TFR assessment. Seventy-one percent were satisfied, whereas 23 percent stated that they were dissatisfied. So the overall judgment of the peer review process was, to a large extent, very positive. But there is also a certain amount of criticism, almost exclusively from respondents who failed in their competition for research funding. Complaints are raised against the grading system and the succinct type of justifications given in the peer reports. Many of the applicants also have the impression that only one peer had reviewed their proposal.

The problem with the peer reports is, probably to some extent, that it is too short, but the complaints are generally directed towards the substance. Respondents can accept a clear-cut report as long as they have the feeling they have not been misinterpreted or compared with others in an incorrect manner. On this point we have found some interesting trends in the empirical material. A large number of the researchers seem to have had doubts about the workings of the peer review system and committee procedures. Broadly speaking, there is a certain amount of cynicism among the younger researchers, who are not convinced that things are handled in the best way in the council system.

In the report a large part of the analysis in chapter four is devoted to this question. It is based on a discussion of one question of attitude concerning the role of senior researchers in the Council. In the report it is argued that attitudes should be seen as an indication of specific opinions within the research community. Thus, the argument is not that opinions indicate how things really operate inside the TFR, but that opinions tell us about where there might be a problem. If this problem is due to misunderstandings in the research community, then it should be tackled by informational measures (type 1). If it seems to be a real problem (type 2), then it has to be dealt with by other means.

As a consequence, in this report we try to understand what type of opinion we are dealing with. Is it a problem of the first or the second type? Our answer is, more or less, that the TFR has problems of both types. Firstly, it is obvious that many of the researchers are ignorant about how the peer system operates inside the Council committees. Information and other integrative measures in the research community (see below) can solve this. Secondly, and this follows from our interviews with the members of committees, it seems clear that the implemented evaluation procedures are not as rigorous as is claimed in the policy documents produced by the Council.

Let us point out some divergences: In many of the committees there is a tendency to give the highest grade to almost half of the proposals. We have interpreted this as an indication of hidden criteria in the evaluation process. Another discrepancy is that the level of international advice in the process is much less than we had expected after reading the policy documents.

In the following part we summarise our conclusions, from the argument above, as a number of issues that the Board will have to deal with in the future: The first point concerns the composition of the different evaluation committees. At the moment, the chairperson, sometimes together with the vice-chairperson selects the members of a committee. The renewal of the composition of members seems to be low in most committees. We believe that this is a crucial problem in the evaluation procedure at TFR. Most fields of research have not only one scientific paradigm, but several, i.e. an application that is considered excellent by one peer might get a totally different evaluation from another. Studies of the peer review process in other countries have shown that in some cases the outcome of an application review is totally dependent on which reviewer you get. The solution to this potential problem is (1) to have several peers to evaluate a research proposal (2) to have a high turnover of committee members (as they try to have in the National Institute of Health [USA] and STW in the Netherlands). Both of these measures have a positive effect on the level of integration and solidarity in the research community.

This takes us on to the next point we wish to make. It is important that several peers evaluate each application. TFR should also make clear how their policy on international peer reviews should work. Now, we do not argue that the use of international peers is always the best way to evaluate applications. In fact, the use of international peers can sometimes be problematic. Firstly, international peers have less insight into the Swedish research system compared to the Swedish peers. In a committee situation, this gives the Swedish members an even stronger dominance than without international peers. Secondly, the best international peers might be hard to get. We are, however, happy to see that the secretariat on TFR together with the committees have taken up a discussion about this issue and seem to have reached some interesting conclusions about changes. One of the main conclusions of this work is a recommendation that at least three peers should have read the application before the committee makes its decision.

TFR should justify their decisions about applications more thoroughly. This is the opinion of over sixty percent of the applicants in the 1996 round. We think this is an important view, which is worth taking seriously. The comments by the committees that are sent out to the applicants are far too brief. Many applicants complain that it seemed as if the evaluator had not understood the application at all. This seemed to be caused in part by far too short a summary of the review.

The instructions to the peers (internal or external) should be more detailed. How important are the grades, for example? At the moment there exist considerable differences on how the committees use the grading system. Some committees actually use them to decide which applications are going to get funding or not, some committees just seem to use them to select the proposals that are considered not to be so good. In some groups an average grade of 5 does not mean success in funding. In fact, in two of the groups, perhaps 60% of the applications that achieved an average of 5.0 were awarded grants. This means that the grades are more or less useless.

TFR has tried to develop a policy that gives priority to a long-term and trustworthy funding of projects. This has often been something that the researchers have appreciated, since funding from other research councils (like the NFR) is generally short-term and involve less funding than the TFR grant. Our study shows that this has been the case at TFR. But that the trend is that the projects are becoming smaller, both concerning the amount of funding and the time period. While this is partly due to the recent budget cuts, it is not the whole story. We argue that TFR has to decide whether it wants to become a “normal” research council and continue the trend towards more short-term grants, or if it wants to continue to give long-term grants to research groups. That is a choice between a large number of grants to a large number of researchers, or a few large grants to fewer researchers.

1. INTRODUCTION

Within the public sector formal evaluations have become an important instrument to measure both the impact of policy and to control bureaucracy. Such evaluations have become increasingly important over the past three decades. Evaluations in the research policy area are often designed to assess the value of research programs through an evaluation of the scientific quality of research groups or fields. However, during the 1980s there has been a growing interest in so-called process evaluations. These focus on the implementation rather than on the results of a program. Their focus can be, for example, on how governmental agencies implement goals, or on how agencies organise their work.

This evaluation, carried out at the request of the TFR, uses a process perspective to evaluate the Swedish Council for Engineering Research (TFR). Its purpose is to analyse TFR's performance as a research-funding agency. The framework for the evaluation was based on a number of different investigations, which examined:

- TFR's peer-review system for evaluating research proposals;
- Characteristics of the applicant population;
- Attitudes of researchers to the Council;
- Trends in size and duration of TFR-funded research projects;
- How TFR decides priorities between competing research fields.

The Council for Engineering Sciences is a Swedish authority under the auspices of the Ministry of Education and Science. Established in 1990, its main purpose is to encourage and support the basic engineering sciences in Sweden. This is done in the main through a variety of grants for which Swedish scientists are invited to apply once a year. TFR distributes its financial support through five main channels: individual investigator project grants, multi-project block grants, industrial graduate studentships, post-doctoral scholarships, and grants for ”special ventures”.[1]

The board of directors has 1 chairperson, 10 members and 10 deputy members – altogether 21 persons. Seven of the members and their deputy members are professors, elected by the academic research community through a system of electors. The chairperson and three other members are elected by the government to represent business and organisations with connections to engineering science.

The council is supported by a secretariat that consists of a secretary general (professor), who is elected by the board of directors, a director of the secretariat (associate professor) appointed by the government, and 8 permanent members: 3 research secretaries (PhD) and 5 administrators. The main task of the secretariat is to support the board in their work of selecting research proposals.

In 1996 the TFR received about 660 applications, and allocated about 135 million SEK (about $ 20 million) to fund research projects. The average funding for each project was around 770,000 SEK (about $110,000), and the average amount awarded per year was 412,000 SEK (about $59,000).

Research Policy in Sweden

Like other small industrialised countries, Sweden is highly dependent on international trade to maintain its productivity and living standards. In 1994 exports were equivalent to more than one third of Gross Domestic Product (GDP). About 80 per cent of total exports consist of industrial products.

The Swedish economy depends strongly on a limited number of very large international companies. The dominant role of a few large companies is especially apparent in manufacturing. In 1990 the ten largest Swedish industrial companies employed nearly 600,000 people. Of these, 240,000 worked in Sweden. The top ten companies thus accounted for about one fourth of all manufacturing employees in Sweden.

The concentration of industrial output within a few very large companies is a major contributing factor to the relatively high level of research and development (R&D) spending in Sweden. Swedish multinationals are among the most R&D-intensive in the world, and over the years most of this R&D work has taken place in Sweden. However, in the 1980s there was a contraction in the knowledge- and research-intensive industry. During the second half of the 1980s, there was an increase in both Swedish direct investments abroad and in the percentage of R&D that major corporations performed in units outside Sweden. Studies show that despite the fact that Sweden has a high investment in R&D, the Swedish economy ”produces only a below average percentage of R&D intensive products relative to total manufacturing, compared to the average for the OECD countries”.[1]

From mid-1989 to the end of 1993, manufacturing employment in Sweden declined by 260,000. This means that during this period, one out of four industrial jobs was lost. This decline was not offset by a corresponding expansion in the output of Swedish-owned companies in other countries. In 1993 the net flow of direct investments shifted to a positive influx into Sweden for the first time in 25 years. The sharp fall in the number of industrial employees must therefore be seen as a consequence of corporate downsizing and a dramatic decline in capital spending. Swedish manufacturing output fell by 6 percent between 1990 and 1992. It has risen sharply since.

Higher Education. In 1993 a new Higher Education Act came into effect. The reform effected a deregulation of the higher education system, with greater autonomy for each institution and a wider scope of individual choice for students. In the new system the sizes of different programmes and the distribution of grants to institutions will be influenced both by the demands of the students and the achievements of each institution as measured in terms of quality and quantity.

The number of students in higher education has increased substantially in the last few years. Since 1991 the number of places at universities and university colleges has risen by approximately 30 percent. Slightly more than one third of young people in Sweden

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go on to higher education within five years of completing their upper secondary schooling.

The following degrees are granted: Diploma or certificate (högskoleexamen) after studies amounting to not less than 80 points (2 years of full-time study); Bachelor’s degree (kandidatexamen) after completion of at least 120 points (at least 3 years of full-time study), including 60 points in the major subject in which is included a thesis counting for 10 points; Master’s degree (magisterexamen) after studies amounting to not less than 160 points (4 years of full-time study), including 80 points in the major subject and one thesis counting for 20 points or two of 10 points.

Post-graduate education is provided at the universities (Uppsala, Lund, Göteborg, Stockholm, Umeå and Linköping) as well as at the Royal Institute of Technology, the Karolinska Institute, the Stockholm School of Economics, Chalmers University of Technology, the University College of Jönköping, Luleå University College and Institute of Technology, and the University of Agricultural Sciences.

To be admitted to post-graduate education it is necessary to have completed an undergraduate programme of at least 3 years’ duration. There are also specific eligibility requirements. A student should have at least 60 points in the subject concerned. In addition, the faculty board of the enrolling institution assesses the student’s ability to pursue doctoral studies. A graduate student should take a number of courses and also write a doctoral dissertation. The expectation is that it should be possible to complete post-graduate studies after four years of full-time study. Each student is entitled to individual supervision. The dissertation, which is the most important part of a post-graduate programme, is defended in public and receives either a Pass or Fail mark. It may be published either as a monograph or a so-called composite dissertation, made up of a number of articles or research papers, and a summary. If a graduate student passes the necessary courses and the dissertation is accepted, a doctor’s degree is awarded. Most of the faculties have reintroduced a licentiate degree. This is a degree based on a shorter period of research training (normally between 2 and 3 years), that can be supplemented at a later date in order to earn a doctorate. The licentiate dissertation is defended at a seminar.

Research is an important part of the higher education system. Practically all higher education research is integrated with and founded on close, local cooperation with the undergraduate and post-graduate study programmes of the educational establishment concerned. This applies both to basic research at higher education institutions and to what is known as sectorial (i.e. mission-oriented and externally funded) research. The universities and the institutions with post-graduate education have permanent resources for research. Institutions (colleges) without established research capacity have various links to those with research programs. University teachers at these colleges may take on mission-oriented research and contracts, and university professors can be affiliated to these colleges on a more or less permanent basis. Special government grants are available to promote research links of various kinds and for the purpose of financing post-graduate studies for teachers.

As from the academic year 1993/94, each university and university college is entitled to make its own decisions on the establishment of chairs and the appointment of staff. The categories of teaching posts that may be established are, however, regulated in the Higher Education Ordinance.

In Sweden, with the exception the University of Agricultural Sciences which lies within the jurisdiction of the Ministry of Agriculture, almost all higher education institutions are under the direction of the Ministry of Education and Science i.e., they are run by and are under the control of the central government. The employees at these universities and university colleges are national civil servants. Seven of the central government-operated higher education institutions are universities. These are the Universities of Uppsala, Lund, Göteborg, Stockholm, Umeå, Linköping, and the University of Agricultural Sciences. There are three more which are specialised institutions of higher education and research – the Karolinska Institute (medicine), the Royal Institute of Technology, and Luleå University College and Institute of Technology.

Research Policy. The main responsibility for funding basic research and postgraduate education devolves on and has been assumed by the state. Research is one of the very few sectors funded by the government where funding has increased in recent years. The quantity of research in the country as measured by dollars committed has increased within higher education, but especially within the commercial sector. The proportion of external, non-state funding in higher education is also increasing.

Universities and university colleges account for nearly 90 percent of all publicly funded research if research for defence purposes is excluded. This means that control of research within the higher education sector is the major influence on the overall direction of research in the country at large. By tradition, basic research and education of graduate students, as well as technology transfer, are carried out in the universities. In this sense Sweden is different from most other industrialised countries, where the universities take care of the education of graduate students and basic research, while technological research and technology transfer are to a much greater extent performed through research institutes, e.g. the Fraunhofer institutes in Germany. The closest parallels are with Australia and Canada.

Most of the research councils are under the auspices of the Ministry of Education and Science. Besides TFR, these are four councils: The Council for Research in the Humanities and Social Sciences (HSFR), the Medical Research Council (MFR), the Natural Science Research Council (NFR) and the Council for Planning and Co-ordination of Research (FRN). The research councils consist largely of scientists appointed by academic electoral assemblies. However, a small number of council members represent societal interest and are appointed to the board by the government. That includes the chairperson (President Christina Ullenius, University of Karlstad, Karlstad). In TFR there is also a representative for a sector-oriented research body, Christer Heinegård from NUTEK.[1]

Considerable research funding is allocated in Sweden by sectoral bodies reporting to other ministries. Their task is to ensure that the research and development needs of a certain sector of society, or a certain priority field of policy, are provided for. This is true not least for research that has a direct focus on business enterprise. A great deal of public support for technical research and industrial development, building and en-

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[1] The other members of the board, appointed by government, are the following:
Research director Gun-Britt Fransson, Procordia Food AB, Stockholm,
Director Åke Hörnell, Hörnell Innovation AB, Borlänge,
Secretary-general Carin Fischer, Stockholm – Cultural Capital of Europe '98, Stockholm,
Director Lars Kristoferson, SEI, Stockholm Environment Institute, Stockholm,
(Professor Svante Lindqvist, History of Science and Technology, KTH, Stockholm has resigned and

ergy research is distributed by the National Board for Industrial and Technical Development (NUTEK).

Various industrial research institutes maintain R & D. co-operation with industrial organisations. There are 26 different institutes whose main task is to engage in research of common interest to a group of companies or industries. In addition, and to a varying extent, they accept commissions from individual firms. Competitively neutral basic and applied research is carried out, and commissioned and testing activities are undertaken in this connection. There are about thirty industrial research institutes, financed jointly by the state and the enterprise sector on a foundation basis. Their turnover for 1993/94 came to about SEK 850 million.[1]

R&D focuses heavily on certain key industries. Between them, the five biggest R&D sectors account for more than 80 percent of all research and development in industry. Pharmaceuticals are the most R&D intensive industry, with expenditure equalling nearly 42 % of value added. Twenty-seven per cent of current (1991) R&D expenditure can be associated with telecommunications products, 20 % with the transport technology product group, 13 % with pharmaceuticals, and 10 % with machinery other than computer hardware. Research accounted for 13 % of corporate R & D. Nearly half of all R & D activities are aimed at improving existing products or processes. Just over half focuses on new product development, processes or systems for a company or market and on knowledge production in general.

The non-socialist government decision to phase out the wage-earners funds and use them for so-called New Research Foundations produced a substantial transfer of funds to support Swedish research and postgraduate studies. Seven foundations have been established for the purpose of funding research and related activities in different areas. The Foundations have led to a strengthening of many fields of research, primarily in environment, health care, problem-oriented natural science and engineering areas, (i.e. biosciences), information technology, medicine and ”basic technologies” (e.g. forestry). The major part of the new funds is used for project support to universities (approximately SEK 1.5 billion per year).

Co-operative work with the EU has become increasingly significant, especially since Sweden became a member and so obtained better opportunities to influence the scope and focus of R & D programmes. Approx. SEK 500 million a year will be allocated to universities & institutes of technology in Sweden.

The pluralism of the Swedish system for research funding is apparent. In engineering and technology research there are at least three large agencies: TFR, NFR and NUTEK, together with the so-called Strategic Foundation (SSF). While TFR and NFR are oriented towards basic research,[2] NUTEK has a responsibility for applied research. The activities of SSF will probably straddle the two. As a rough approximation, these bodies allocate SEK 1,5 billion, whereas the faculty appropriation is SEK 1 billion. The Research Policy Act of 1996 reallocated SEK 300 million from NUTEK since the SSF is supposed to fund strategic engineering research.

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[1] SOU 1996:70 Samverkan mellan högskolan och näringslivet NYFOR-kommittén p. 41. One third of the financing comes from the government.

[2] NFR allocates funds mainly to natural sciences, but some areas (physics) have strong connections to engineering and technology research. Many of the researchers funded by TFR also receive money from

The Goals of the Council for Engineering Sciences

The formal goals for TFR are specified in instructions given by the Swedish Government when the Council was set up in 1990. Listed below are the two first paragraphs of the instruction that defines the role of the Council (non-authorised translation):

> 1§ The purpose of the Swedish Research Council for Engineering Sciences (TFR) is to foster and support research of excellence in basic engineering sciences in Sweden. The Council shall work for the diffusion of knowledge about research and research results. The Council shall co-operate with other councils and organisations in the research area.
>
> 2§ The work of the Council shall focus especially on:
>
> 1. The support of research through funding.
>
> 2. Evaluation of research funding applications by the Council in a comprehensive and open manner.
>
> 3. Investigating the need for research in different fields, and in different areas of society, disseminating the result of those investigations, and taking the initiative to support research that is judged necessary to fulfil these needs.
>
> 4. Together with other research funding organisations, investigating research tasks of common interest, and deciding on the division of labour between the Council and other research funding organisations with respect to such tasks.
>
> 5. The support and initiation of international research co-operation.
>
> 6. Support of the publication of research and dissemination of advances in science.[1]

The goals encompassed by this instruction are broad. Scientific quality, diffusion of knowledge, and co-operation are stressed in the first paragraph. In the second paragraph the main issue is the funding of research. The requirement for an evaluation process in a ”comprehensive and open manner” is also stressed as an important element.

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[1] 1 § Teknikvetenskapliga forskningsrådet har till uppgift att främja och stödja vetenskapligt betydelsefull grundforskning inom det tekniska området. Forskningsrådet skall verka för att information om forskning och forskningsresultat sprids. Forskningsrådet skall samverka med andra myndigheter och organ inom forskningens område.

2 § Forskningsrådet skall särskilt:
1. fördela medel till forskning och därmed sammanhängande verksamhet,
2. allsidigt och öppet granska den forskning till vilken medel har begärts hos rådet samt utvärdera den forskning till vilken rådet har fördelat medel,
3. undersöka vilka forskningsbehov som är angelägna inom olika forsknings- och samhällsområden, redovisa resultaten av dessa undersökningar samt ta initiativ till och främja forskning som behövs för att tillgodose sådana behov,
4. i samverkan med andra forskningsstödjande organ dels undersöka vilka forskningsuppgifter som är av gemensamt intresse, dels besluta om avgränsningen mellan rådet och övriga forskningsstödjande organ i fråga om sådana forskningsuppgifter,
5. främja och ta initiativ till internationellt forskningssamarbete och

A further important task defined here for the Council is the identification of emerging areas of research that deserve to be fostered in the broad interests of society.

In the application forms of the Council three main objectives are identified: 1) to support excellence and quality, 2) to support an efficient post-graduate education and 3) to identify and initiate research in important fields. What is important? Importance is often qualified in terms of industrial relevance. In a general statement made by the former Secretary General, Professor Anders Flodström, it is pointed out that the scientific quality of the engineering sciences ”is crucial for the long-term development and competitiveness of Swedish industry”. Much of the rationale for the Council is clearly connected to an interpretation of the relation between research in the engineering sciences and industrial growth.[1] That is, an evaluation of the TFR should start with an investigation of that relation. But because of the long lead-time between research and its implementation in industry, this exercise can only be attempted after at least five or six years from completion of the research. It is much too early to begin to evaluate the Council in this sphere. The effect of the sciences on the economic sphere will become apparent only after ten or fifteen years.

The Policy of the Council for Engineering Sciences

How does the Council go about the implementation of these goals? How does the Council characterise its objectives? Within the boundaries of the charter delineated above, the TFR has developed a framework for its policy based on a few central pillars:

- Support for basic, not applied, research;
- Industrial relevance;
- The use of international peers in evaluation of research;
- The encouragement of novel types of grants for funding.

In a policy document issued in 1995 the TFR explains its mission in the following sentences:

> ”...To stimulate, initiate and support basic research of high scientific quality in engineering sciences...
>
> ”....An essential step in that aim is therefore the choice of those applications most likely to yield results of high scientific quality...
>
> ”...The productivity of a researcher or a research group measured, for example, in terms of the number of doctorates examined, number of co-operations with industry, numbers of published papers, etc., is of value only if the scientific quality of the work is good”.
>
> ”Proposals for financial support from TFR should involve at least an element of basic engineering science, and the proposals which display the highest scientific merit are prioritised. TFR funds are assigned without any caveats imposed on the need to uphold a balance between different research areas or geographic regions in Sweden.”

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It should be clear from this mission statement that scientific quality is the objective that has highest priority in the Council policy. In fact, the need for a funding agency that stressed basic engineering research with high scientific quality was the predominant reason that the Council was set up in the first place.

The creation of TFR must be seen in the context of a critique of Swedish Government research policy that became endemic in the 1980s. Many people in the academic community and many policy makers argued that the strong focus on applied research that had dominated research policy, especially during the 1970s had weakened the basic research capacity of Swedish Universities. By this they meant that societal relevance had become more important than scientific quality, that grants for research were driven by a short-term perspective. The new Council was intended to restore the balance by focusing more strongly on the perceived need for scientific excellence in the engineering sciences. Funds for engineering science research had earlier been allocated mainly by the Swedish National Board for Technical Development (STU, nowadays NUTEK). The policy of STU, by contrast, was guided by considerations that assigned priority to applied research and industrial relevance, rather than to scientific quality.

The Council does, however, stress industrial relevance, which as a complementary pillar of its mission. ”Basic research for the needs of industry” is a phrase that TFR uses in a subtitle of a policy document. It has often argued that the State needs to support industry with a stronger Swedish base in basic engineering research. This is part of a general policy, but also of specific programs which ”are of paramount importance for Swedish industry and in need of strengthening”. Earlier programs have focussed on areas such as Forest Technology with emphasis on Paper-Ink-Print and Complex Systems within Production Technology. Today there is a conscious emphasis on Applied Mathematics and Mechanical Engineering. (Below, in chapter three, the question of priorities and reallocations will be investigated and discussed.)

The third issue that the TFR focuses on in policy documents is the importance of fairness in its evaluations. It tries to achieve this by the use of international peers in the evaluation both of research proposals and of different fields of research. A report published by a governmental commission on research funding from 1996 recognises that TFR has used international peers in its work to evaluate research proposals more frequent than any other research council.[1] In the annual financial report of the fiscal year 1995/96 the Council stated that:

> ”(concerning evaluation of research proposals) For the evaluation process the cutting edge of international research is used as the point of reference. The evaluation is carried out through a system which is based on statements from international experts, so-called peer reviews, and on evaluation committees appointed on the basis both of fields of discipline, and interdisciplinary grounds.” (TFR fiscal report 1995/96)

The TFR secretariat has recognised that there are differences between the committees with regard to the use of international peer reviews. Some committees use external international peers, while some include international referees as members in their committees.

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The fourth issue stressed by the Council in its policy documents is one that concerns a new kind of grant. The bulk of the grants used are standard individual investigator project grants. These are assigned to a researcher for a period of 2-3 years. After an application is received, a Board committee evaluates the quality of the researcher's project. They then further examine the proposed budget, which includes positions, equipment, computers, etc. The stated policy is to provide support for self-contained projects of duration at least 3 years. The other research councils that support basic research also uses this kind of project grant. The TFR has, however, tried to inject further flexibility by initiating so-called multi-project block grants. The purpose of these is to foster research environments with high scientific quality. A multi-project block grant is allocated to researchers with outstanding past performance. When applications for these long-term grants are evaluated, the Council Board also takes industrial relevance into consideration. International peers always review multi-project block grants. Nowadays multi-project grants comprise 20 percent of TFR’s yearly budget.

Another type of special grant used by the Council is the industrial graduate studentship. The point of this kind of grant is to call on problems that emerge in industrial development as a motivation for research projects. These then take on a direction guided by relevance in addition to the requirement that they be basic engineering science research. Industrial graduate studentship programs are generated through co-operation between industrial enterprises and universities, which together formulate a project plan. The normal procedure is that a person employed by an industrial enterprise begins to work on that project at the university as a graduate student. After acquiring a PhD degree, the person returns to the company and now has good contacts in both the academic and industrial communities. Apart from some additional expenses paid by TFR, the cost of these studentships is shared equally with the industrial enterprise.

Post-Doctoral Fellowships and Other Grants

The primary goal of post-doctoral scholarships is to enable young researchers to go abroad for 1-2 years in order to gain international experience.

Further grants for ”special ventures” can be applied for at any time and for various purposes. They can provide support to academics that are active in industry, for the defrayal of the cost of inviting distinguished guest researchers, can be used for organising international conferences, or to take advantage of ”a golden research opportunity”.

The Council has also experimented with what is called ”the graduate student exchange scholarship”. It forms part of the additional funding that TFR provides to selected Swedish research areas that are perceived in need of strengthening. The objective is to build up competence in such areas on a long-term basis. At present this type of grant has been granted only six times.

2. THE PROCESS OF EVALUATING RESEARCH PROPOSALS

The main task for a research council supporting basic research is to evaluate applications. This evaluation process is in principal an ”ex ante evaluation”, that is, the council has to evaluate the research before it has actually been done. To evaluate potential research is, of course, a risky business. One might argue that what is actually evaluated is not the potential of the forthcoming research but to a large extent the researcher who is supposed to do the research and his/her former work. The process is therefore a matter of a combination of risk and security, fairness and efficiency, to arrive at a decision on funding. It is also a matter of power: who has the capacity of getting money and who has not? Will not the researcher whose proposals are rejected always talk about unfairness, and is this perhaps something that the research councils will have to accept?

In this study we are interested primarily in the practices used to review research proposals at the Council for Engineering Sciences. Councils normally deal with the critiques of bias and conservatism that favours the status quo or the “establishment” by creating legitimate institutions, like the peer review system. The basic question here is the following: What are the “rules of the game” of the peer review process at the TFR? What is the combination of fairness and efficiency that the evaluators agree on? How does this process work in different evaluating committees? How important is it that the process is considered fair in the research community? What are the reactions from the research community to the peer review procedure at the Council?

The method of peer review is used, to a greater or lesser extent, by most research councils in the western world, both for evaluating research proposals and to establish the scientific quality of programs and groups. In Sweden the method is standard procedure for evaluating research proposals at councils under the auspices of the Ministry of Education and Science. These councils support basic research by mandate. Other more applied research councils also use the peer review procedure to complement their selection mechanisms[1].

The peer review method of evaluating both proposals, and research outcomes and scientific publications has often been strongly criticised. Basically, two major critiques have been made:

1. The method has a conservative bias; there will always be a tendency that well-known researchers get positive evaluations. The accusation the “old-boys network” invariably controls affairs is sometimes directed against the research community; some senior professors control the knowledge production and evaluation.[2] (This comment that coincides in part with general criticism against any discipline-oriented system).[3]

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[1] For a discussion, see Sandström (1997).

[2] See Chubin & Hackett (1990).

[3] The obvious response to this critique is that the few well-known are also the ”few and the best”. This

This, it might be argued, would be a tendency that is stronger in a smaller than in a larger country.

2. Some scholars have argued that the peer review process is often based on chance. In other words, whether a proposal is funded or not is to a great degree a matter of luck. Simon Cole (1992) refers to investigations, which reveal that funding success is dependent on who makes the evaluation. That is, what is good scientific quality is in large measure a matter of opinion. Cole, Cole & Simon (1981) in an empirical analysis concluded that

> /…/ the fate of a particular proposal is roughly half determined by the characteristics of the proposal and the principal investigator, and about half by apparently random elements which may be characterised as the "luck of the reviewer draw".[1]

What this tells us is not necessarily that there are no criteria of scientific quality. Rather there are several criteria even within the same discipline that decides outcome independently of quality. In other words there are inevitable and necessary social dimensions to the peer review procedure.

A number of different methods for dealing with these problems have been presented. One possibility suggested is to make the evaluation process more open, something that would make the method less vulnerable to the "old-boy network"-critique. To deal with the second kind of critique some people have argued that a higher number of evaluators should be used for each proposal. This would make the process less likely to be affected by chance. Another possibility is to use more "objective" criteria (everybody would not agree on this description however), at least as a complement to the peer review method. Examples would be the number of publications and citations in scientific journals.

Even if it is possible to address a number of critical points regarding the peer review system, there is almost always one counter-argument, which follows from the fact that critics tend to concentrate on certain parts of the system, or details, and not on the system as a whole.

This counter-argument is effective, but it is also necessary to acknowledge that the discussion on peer review is complicated by the great variety of its applications for different purposes. The peer review system is not one, but many systems with lots of substantial variances.

A comparison of the National Science Foundation (NSF) and the National Institute of Health (NIH) in the US, for example, reveals that peer review systems can be rather heterogeneous.

The NSF-model is itself a combination of three different models inside one organisation. But these models are all a variation of the refereeing procedure employed by scientific journals since the 17th century. Some sections use the ad hoc-model, i.e. they engage new peers for each new project (ex ante). In other sections they both use ad hoc peers and have permanent panels of peers (standing committees). A panel is a number of peers who, over a time-period, are responsible for evaluation projects in a

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more if other criteria than the scientific are important for being "well known" in a discipline.

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certain discipline or research field. At the NSF they also use commissioned applications that are judged by certain committees.

The ad hoc-model leaves a lot to the discretion of the program officers. They decide who should be the evaluators and then transfer the peer result to the decision-makers. In the ad hoc-model peers have no chance to compare a number of applications and so find out where the line ought to be drawn. The strength of the model is that it leaves an opportunity to find the best-suited peers. They make their judgement (1 – 5) in four dimensions (performance competence, intrinsic merit, utility or relevance, infrastructure effects of research).[1]

Is there a NIH-model that is different from the models used at NSF? As in NSF there is a conglomerate of practices, of which most are a variation of the routine wherein a panel of permanent peers (committees) operate together with a small number of ad hoc peers. Just as in the NSF-committees, one of the peers (or a couple of them) is responsible for a proportional number of applications. The peer gives every application a grade and presents his view to others in the panel. They discuss and then agree on a selection, or a ranking, of proposals. It should be noted that the NIH applications go through a double panel, first a strict peer evaluation of scientific merit and then another evaluation by an advisory council made up with half lay members.

In some of the many institutes of NIH they apply an interesting and more consistent model built on a number of panels. In each, approximately ten "truly scientific peers" handle all the applications in their field of research. All the ten peers read and give their opinion on every application (grading between one and five). The process of grading gives an average for all the applications and the line is drawn according to the amount of available funding. The operation of the NIH-model seems to be stricter and leaves less to the discretion of program officers.[2] A variation of this model is in operation at the Swedish Research Council for Medical Sciences (MFR).

In the Medical Research Council in the United Kingdom they implement a number of principles that have been further developed in the Australian system. On this we have more detailed information.[3] In the Australian Research Council (ARC) the Research Grants Committee (RCG) is assisted by four advisory Panels, which are divided into nine discipline Sub Panels and a Multidisciplinary Panel.

The members of the Committees/Panels read approximately 100 to 300 applications. Depending on the scheme, up to half of the applications is excluded from further consideration at this point.[4] That is done at the first panel meeting. The remaining appli-

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[1] This year there is a discussion going on inside NSF where they are considering reducing the dimensions to two: quality and relevance. The argument is that relevance has tended to be over shadowed by the three quality measures. (Source: Article in Science)

[2] Readings: Chubin & Hackett (1990) *Peerless Science* and Sandström (1997).

[3] Thanks to Director David Murphy at the Deaprtment of Employment, Education, Training and Youth Affairs for information on the ARC procedures. We have also used the ARC website.

[4] "Members are required to give the appropriate reasons, based on the eligibility criteria or the assessment criteria, and additional comments where necessary, for each applicant whose proposal will not proceed to external assessment. In 1997 this feedback will be completed on a computer data base and, when printed, signed off by the Panel Chair. It is proposed that a standard format letter which includes the reasons for exclusion will be sent to all unsuccessful applicants who have been eliminated in the

cations are sent out for international peer assessment. Applicants can nominate up to three assessors. The council strives to use between one and four others selected by Committee or Panel members. It is the ARC's policy to use one of the peers nominated by the applicant.

The international peers are chosen through a database maintained by the Ministry. It is accessed through the World Wide Web by members and has search engines to enable keywords and research codes in the application to be cross-matched to assessors with expertise in these areas. A minimum of three assessors, and preferably five, for each application are aimed at. Applicants' names are not anonymous, as part of the criteria relates to track record. The assessors' comments and any panel questions are sent to the applicants with a request for a one-page response to assessor comments and, where relevant, a further one-page rejoinder to any comments or questions from the RGC's Panels. The names of the assessors are not provided to applicants.

The assessors' reports (including scores for the application against the assessment criteria) and the applicant's rejoinder are usually the starting point for each Committee/Panel consideration during their second meeting. The panel members are encouraged to use worksheets to record their initial scores for the following facets: 1) quality of applicant (out of 50), 2) quality of project proposal (out of 25) and 3) quality of research environment and commitment of host institution (out of 25). It should be stressed that the grading system is different for each program, large grants, fellowships and so on.

The problem with consistency in the grading process is discussed quite seriously in the ARC Member's Handbook. Under the heading of "Correlation between assessors' and Panel ratings of projects" they underline the following:

> With such intense competition for Research Grants and Fellowships, evaluation processes are constantly under scrutiny. Therefore, it is necessary to adopt a consistent approach to the way in which Panels use the assessors' ratings and to develop guidelines on the relationship between assessor ratings and Panel ratings. The final Panel rating can differ from the average assessor rating where:
>
> 1. An assessor has given a high/low rating to a project which is clearly at odds with other ratings and which the Panel considers unreasonable;
>
> 2. The overall rating or matrix of a project by an assessor does not reflect the written report;
>
> 3. An assessor has a demonstrable personal bias towards/against the applicant;
>
> 4. An assessor has misunderstood the project, or has asked questions which, when answered by the applicant, justify modifying the rating;
>
> 5. The overall rating is not consistent with the assessment provided in the matrix;
>
> 6. Where the ratings have been adjusted in relativity to each other.
>
> In such cases, it would be unjust if the Panel rating reflected the average assessor score. However, where the Panel's rating differs by more than 10% from the original average assessors' scores, the following action should be adopted to meet administrative law requirements:
>
> * For points 2 and 4, a change should be made to individual assessors' scores, and an explanation of the reason for the change recorded in the administrator's workbook.

> * For points 1 and 3, it should be remembered that, where particular assessor reports have been judged to detract from otherwise fair assessment, they should have been disregarded and excluded from the process. If, however, such reports have not been excluded and lead to the discrepancy between the Panel rating and the average assessor scores, this should be recorded in the administrator's workbook, but no change should be made to the individual assessor's scores.

The final rating is the responsibility of the Panel and is determined by giving a 60% weighting to the quality of the proposed project and 40% to the researcher/project team, with ratings from individual assessors forming an important component of the Panel's overall recommendation for a research grant. Based on the ratings, each Subpanel will be aiming to: (1) Derive a "sound" grading for each application, taking into account the applicant's one-page response to assessors' comments and to Panel questions, where relevant. Applications will be ranked within the Panel with funding starting from the highest ranked application: (2) Budget each successful application appropriately. Funding continues until the Subpanel budget runs out.

Unsuccessful applicants will be informed of the Committee score and the ultimate ranking of their projects. Some problems have been reported where assessor statements have been too short. Mr Murphy at DEETYA states that "if they are too short, they will be ruled out this year".[1] The assessor will also be asked to rate the track record of the investigators, relative to the opportunities available. Finally he/she is asked to provide an overall assessment (expressed as a score out of 100) of the quality of the project and the quality of the researcher or research group. When the RCG has agreed on a recommendation, it is submitted to the Council for endorsement and then to the Minister for approval.

The Peer Review Process at TFR

How does the process of evaluating and selecting research proposals work at the TFR? The process starts in early spring when the Council sends out information about their grants. The deadline for sending in applications in 1996 was 15th May. The Council takes the final decisions on which proposals will be funded during the fall. In 1996 the decision by the Council was taken on November 20th, that is, the process of evaluating the proposals takes approximately six months.

As pointed out earlier, the Board takes the ultimate decision, but nine evaluation committees do the practical work of selecting proposals. . Each professor on the board of directors is responsible for a field of research and for the evaluation of applications within this field. He/She carries out the evaluation by chairing subcommittees, to which national and international experts are called.

The number of committees (≈dossiers) has varied somewhat over the years. The table below shows the number of committees that was working 1996. In appendix A all the changes from 1991 – 1996 are shown in a table. Each committee is responsible for the proposals in one field of technology/research.[1] The committees that evaluated the proposals in 1996 are listed in table 2.1.

Table 2.1. Dossiers/Committees of TFR.

Dossier No.	*In English*	*In Swedish*	*Chairperson*
210	Chemical Engineering	Kemiteknik	(Schöön)
221	Computer Science	Datavetenskap	(Sandewall)
222	Scientific Computing	Beräkningsteknik	(Söderlind)
223	Applied Mathematics	Tillämpad matematik	(see 222)
230	Biotechnology	Bioteknik	(Uhlén)
240	Electronics, Electrical etc.	Elektronik etc.	(Nilsson)
251	Engineering Physics	Teknisk fysik	(Lundström)
252	Applied Materials Science	Materialvetenskap	(Johannesson)
260	Mechanical Engineering	Teknisk mekanik	(Gustavsson)
271	Signals and Systems	Signaler o system	(Ljung)
287	Instruments	Instrumentanslag	
300	Interdisciplinary Science & Medical	Tvärvetenskap och medicin	

Every committee has a chairperson who is also a member of the Council. Often, this is also the case with the vice-chairman of the committee.

From an official perspective the evaluation process of the applications at the TFR can be divided up into a number of separate steps:

1. When the application deadline is reached the officers at the research secretariat do a first rough distribution of the applications to the different committees. This process of deciding to which field of technology an application belongs is made easier by the fact that the applicants themselves are supposed to fill in which technology area they belong to. Even though this is not always reliable, as the division into areas of technology is not necessarily the one that all of the researchers are used to, this gives the secretariat a lot of help in their work. The chairperson and the vice chairperson are soon afterwards involved in the process making decisions about applications where it might be unclear which field of research/technology they belongs to. If an application is connected to several fields of technology the chairmen of these committees might decide that two or several committees should evaluate it.

2. When the distribution of applications to committees is finished, the peer review process of the members of the committees can start. Each committee consists of between nine and four members, including a chairman and vice-chairman (the average number of members is 6.8). The Board formally chooses the members of the committee, but on the basis of a proposal from the board member who is chairperson of the committee. In reality this gives the chairperson a strong influence over the process. In theory the chairperson can choose new members of the committee after every new application round, but usually most members of the committee keep their places for a longer time (maximum three years, except for members of the Board).

After allocation to the different dossiers the chairperson distributes the applications to his committee members. Normally, each member gets between 15 and 25 applications. It is then up to each member to decide on grades and/or how to rank her/his different research proposals. The evaluation is based on four formal criteria. The first one is whether the proposal concerns ”Basic engineering science” or not. The other three are the following:

- Scientific potential
- Scientific quality
- Scientific impact

The research proposal is evaluated according to these criteria on a scale from 1 to 5. The members get their batch of applications in June/July and have until September to do their evaluations.

3. In September or October the committees meet to discuss all of the applications, based on each individual member’s evaluation. Before the meeting the standard procedure is to send out the first page of all the applications (that concern the committee) to the members. Based on the evaluations and the discussions at the meeting, the committee decide on a recommendation with a ranking of the applications (we will address this issue more in depth later on in chapter five). The committee's proposal is then sent to council.
4. In November the Board meets and decides which proposals will get funding. Usually, the Board only makes small changes in the committee proposals (some extra funds, outside the range of the committees, might also be available).

In the following sections we will present three types of studies focused on the allocation of grants and the peer review system at the Council. The first is an examination of the project register of TFR-funded projects. The second is a survey carried out using a questionnaire mailed to all the researchers who sent applications to the TFR in 1996. The third focuses on the actual operation of the review process at TFR and is based on interviews with members of the subcommittees. We start the description by analysing the project register after which we continue with a lengthy discussion based on the questionnaire. Finally, we will report the result of our interviews and from this summarise our findings.

3. THE POLITICAL ECONOMY OF THE COUNCIL

– Explorations in the TFR Project Register[1]

In the TFR project register every application and every decision on funding is available. We have used this register to collect some basic data on the number of applications the council received, on how many that were funded, and how many that were rejected in every year of operation. In table 3.1 below, some of these figures are presented: (All economic data is in real deflated values, corrected for inflation). Multiprojects are excluded, as we will take these projects into the discussion later on.

It is important to notice that the years, 1991–1996, describe the decisions taken by the committees in the Council. Therefore we would like to underline that we have no access to statistics for description of actual consumption of research grants. This is not a problem as we put forward questions about decisions in the Board of TFR and, for this evaluation, we are not interested in the actual use of money.

Table 3.1 Statistical data about TFR applications and decisions on projects 1991-1996. (SEK constant prices, KPI=Consumer Price Index).

Year	A Applications	B Awarded projects	C A/B	D Years of funding (aver.)*	E Project funding/ year*	F Funding per project*
1991	888	207	23.3	2.53	387,434	978,880
1992	846	206	24.3	2.49	467,955	1,166,288
1993	942	201	21.3	2.26	396,378	896,958
1994	682	158	23.2	2.50	397,927	994,817
1995	739	269	36.4	1.96	397,690	968,774
1996	663	176	26.5	1.87	412,696	771,460
Average	793	203	25.6	2.36	409,013	965,437

Source: Appendix B.
* Multi-projects excluded.

How good are the odds of getting funds from TFR? In 1996 about 26% of the applicants were funded. This was a lower success rate than the preceding year, 1995, in which about 36% were funded. However, 1995 was an exception. During the first four years of TFR operation the average success rates were between 20 and 25%.[2]

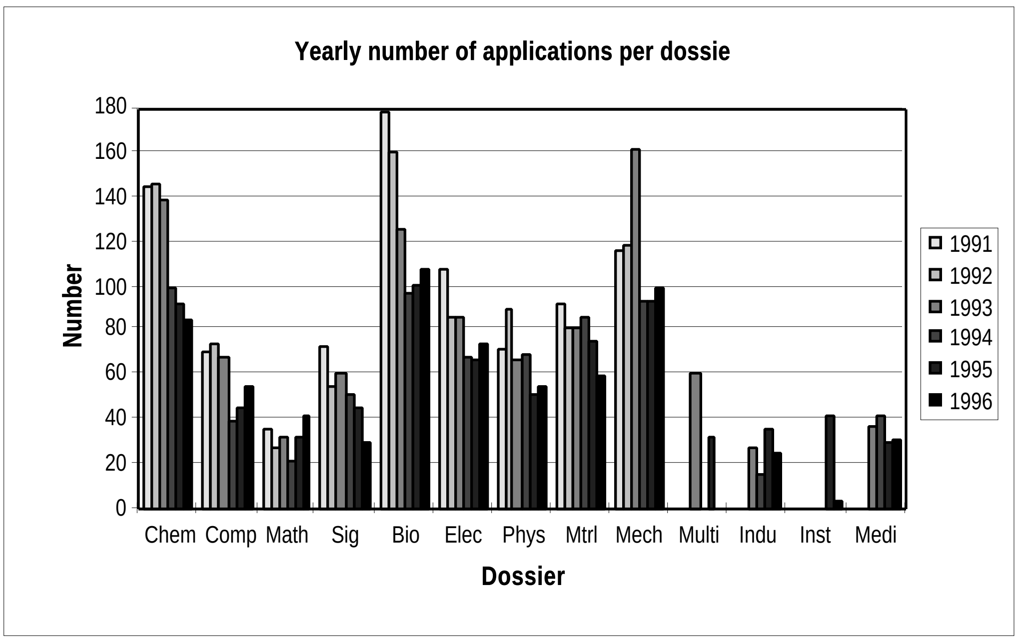
On the other hand it is important to emphasise that the number of applicants has decreased dramatically over this period. In 1991 the number of applicants was nearly 900 and the number awarded more than 200. In 1996 the number of applicants was

[1] This chapter is to a large extent based on empirical work done by Agneta Tisell.

more that two hundred less – a decrease of 26 per cent – and the number of grants awarded 176. What are the reasons for this pattern? One explanation is self-selection – a process where the researchers by themselves find out whether they are in the area of TFR or not. Mainly, this is a process of “trial and error”. Of course, through a number of applications, some of the researchers try to influence the profile of TFR. For a new organisation with a developing policy, there are opportunities for researchers to influence the path. After two or three application periods, they will realise that they themselves are not in line with the TFR policy. The decrease could also be a result of a more deliberate policy from the Board, i.e. the Council may have developed a more refined policy regarding which fields of research it is willing to support.

There are some differences between the dossiers in this respect, see Figure 3.1. The two fields of priority, Mechanical Engineering and Applied Mathematics have had a rather stable number of applications over time. The same is true for Physics and Computer Science. Chemical Engineering, Biotechnology, Signals & Systems and Electric Engineering are dossiers where the number of applications has decreased dramatically over time. In fact, these last four dossiers account for most of the decrease in number of applications. One explanation for this could be that these fields have a number of other sources for funding of research.

Figure 3.1 Number of applications per dossier. (Source: Appendix B:1).



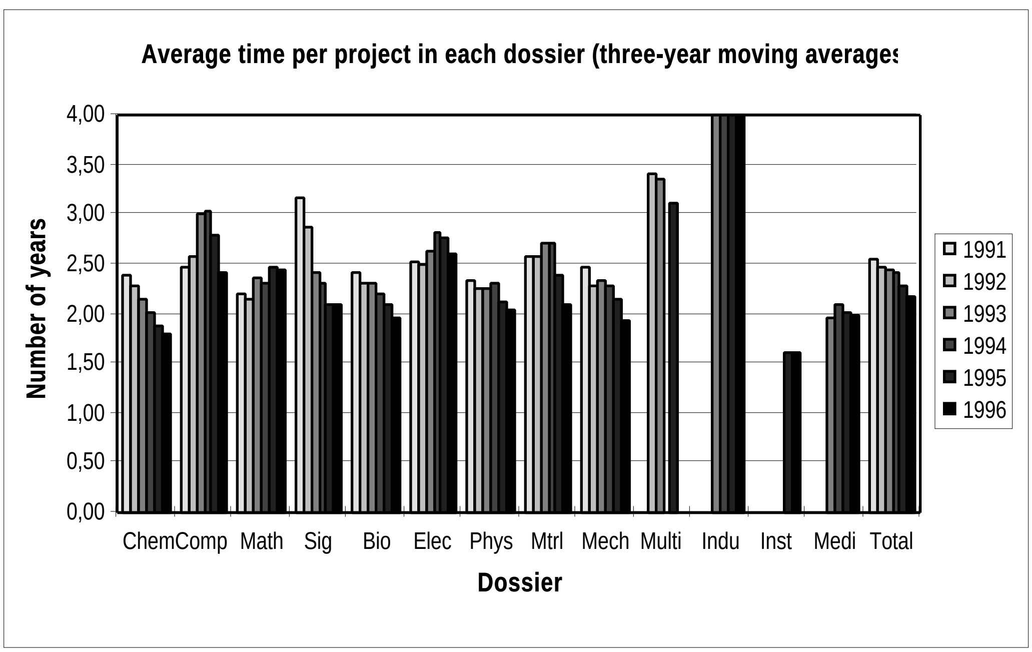
Time Awarded per Project

One crucial aspect that concerns research funding from the researcher’s point of view, is the time awarded for a project. Researchers planning to perform basic research will need of long-term commitments. How generous is the TFR in this respect?

If we look at the time allocated for funded projects, we observe that the average time per project is decreasing with time.[1] The number of years for which a project was funded in 1991 was on average 2.53 years. In 1996 this figure had decreased to 1.87 (see table 3.1 above). We can observe a clear trend in this respect although the decisions in 1994 are an exception. It is not easy to interpret these figures. However, we would argue that the decrease in funded time did start already in 1992. The empirical problem is that in 1995 all projects were extended by six months due to the changes in budget year. This would mean that the Board decisions taken 1995 resulted in an average project time of 1.96 years/project, and based on the past years we can observe a clear decreasing trend in time awarded per project. This is an important change in funding policy.

What can be the reasons be for this decrease in time awarded per project? One observation is that the number of PhD funded studentships was much higher in 1991 and 1992 than in the following years. As those grants are in effect during four years they will push the average upwards. Another explanation could be that there have been policy changes in some of the committees, but not in others. If we calculate the figures using a moving average the trend is the same within most of the dossiers (see Figure 3.2.). There are two exceptions to this: first, Computer Science and Electronics, which have had longer projects times and also have been rather stable over time, and second, Applied Mathematics (Incl. Scientific Computing), which has increased the time awarded per project.

Figure 3.2. Average time per project in each dossier/committe 1991–1996, 3-years moving average. (Source. Appendix B:5).



[1] How to calculate time awarded to projects? We have assumed that the number of fiscal years awarded in the project register is just about the same as the calender time available to the project. We have chosen to use an ex ante approach, i.e. the economic situation for the project in advance and not the

Many projects do, however, get continued funding after the project time is finished (see table 3.2). TFR's own statistics from 1996 shows that as many as 50% of all researchers applying for continued funding received such extensions. The absolute figures are the following: 64 continuation applications were awarded projects, from 128 applications. In 1994 the figure was even higher; 78% of all researchers applying for continued funding were awarded grants. But this year there were only 55 applications for prolonged funding, out of which 43 were awarded money. This means that of the total number of projects awarded in 1995 and 1996, around 40% were prolonged projects. This would indicate that, ex post, the number of years and the amount of funding per project are often higher than what has been indicated here.[1]

Table 3.2. Applications, awards and continuation projects 1994–1996. (Source: TFR)

Year	A Appl.	B Cont.	C New Appl.	D Award	E Award Cont Proj	F Award New Proj	G B/A %	H C/A %	I E/D %	J F/D %	K D/A %	L E/B %	M F/C %
1994	705	55	650	178	43	135	7.8	92.2	24.2	75.8	25.2	78.2	20.8
1995	684	151	533	258	106	152	22.1	77.9	41.1	58.9	37.7	70.2	28.5
1996	662	128	534	162	64	98	19.3	80.7	39.5	60.5	24.5	50.0	18.4

NB! Number of A, B C and D differs from table 2.1 above because of different modes of calculation due to corrections described in appendix E.

It should be noted that more than 80 % of the principal investigators apply for funding of three years. A shorter time per funding decision makes it necessary with continuation grants, and at the same time, the uncertainty for every researcher becomes higher. It is easy to understand why the committees (and the Board) have a tendency to shorten the time periods. It gives them more control, and perhaps this is a necessary reinsurance policy for high-risk undertakings. However that may be, this seems to be an important and serious matter for the Board to consider and follow up in the future.

We have also discovered that there are considerable differences between dossiers concerning the frequency with which projects are prolonged, and how decisions are made

[1] There are problems calculating figures on continuation projects. The strategy, used by the TFR secretariat, is to examine whether the researchers themselves are thinking of their project applications as extensions of earlier projects. Since the researchers can fill in a box in the application form about this, this is fairly easy to examine. This method leads, as we can see in the table, to a somewhat higher number of prolonged projects than in the method used by ourselves. There are, however, problems with the secretariats method. Researchers can look upon a project as a prolonged project, just because they see some kind of connection to their earlier project, but this does not necessarily mean that it is the same project. Thus the figures in the table should be interpreted carefully. Our criteria for calling a project a continuation project is based on whether the project title has been exactly the same for the continuation as for the original. This means that we might have missed some projects which were prolonged, but have changed their project titles slightly. The best solution is probably a combination

on how long time projects get continuation grants. We have compared three dossiers in these respects: Chemical Engineering, Computer Science, and Biotechnology. There appear to be a higher number of projects that obtain continued funding in Chemical Engineering than in the other two dossiers. Of the total number of projects in Chemical Engineering during the period 1994 to 1996, 32% received prolonged funding. The corresponding figures are 17% for Computer Science, and 27% for Biotechnology. If we instead take a look at the time that projects are prolonged the committee for Computer Science prolongs their projects for closer to three than two years. By comparison, the corresponding figures are less than two years for Chemical Engineering and just about two years for Biotechnology.[1]

Obviously, the committees implement different policies when they decide on extensions for projects. It is interesting to notice that the committee for Computer Science awards much longer time, both totally, for the original projects, and for continuation projects. From the researcher's point of view, this can be a strategy that is positive for long-term planning. According to our statistics, projects within Chemical Engineering might well have a better chance to obtain prolonged funding, but whether this helps long term planning for the researcher's is doubtful. (One might have thought, naively that computer scientists would have a better mastery of the theory of games, and would optimise accordingly). For some of the senior researchers that have an inside view of the system this might be of less importance, as they know that their projects have a good chance of continuation.

Observations on continuation projects we can do only ex post. For the researcher this information is of little importance in planning research. The rules of the game are not clear; there is no guarantee that the project will be prolonged. If the proposal of a researcher is awarded funds this means that one project only with that funding, and for that prescribed time is guaranteed. So, from a researcher's point of view, the fact that many projects are prolonged is not particularly relevant.

Funding per Project

Another important element is of course the amount of funding per project. From table 3.1 we observe that the average TFR project has a funding in total of 962,863 SEK, about 410,000 per year. There are no clear trends over time. We can see that the funding awarded per year is stable at around SEK 400,000, but that the total funding per project has fluctuated a great deal due to the shifts in time awarded per project.

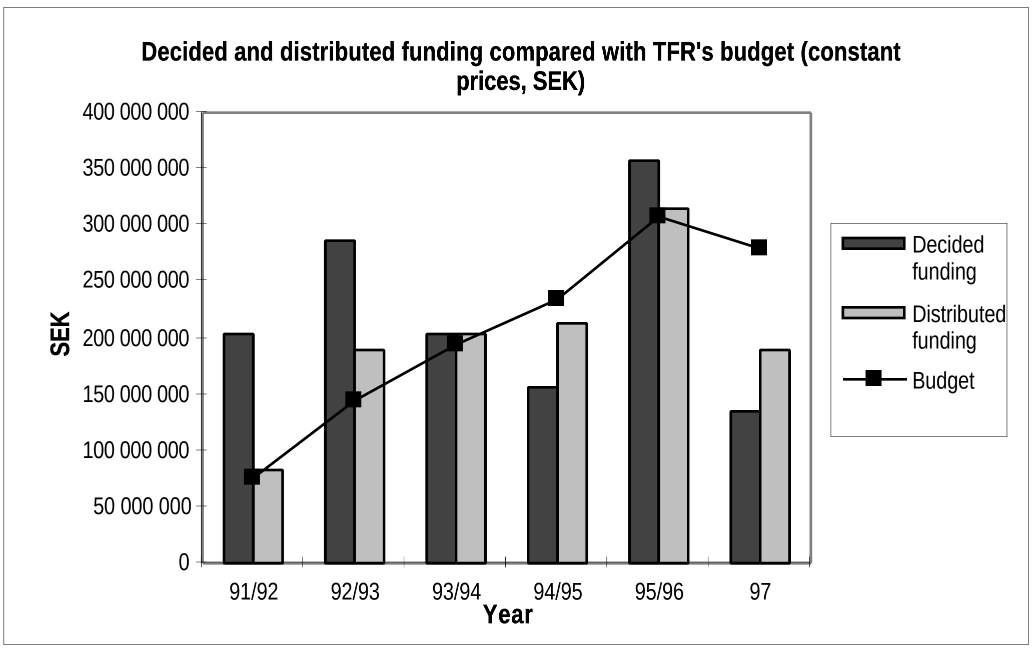
In absolute figures, there are large fluctuations between different years, especially if multi-project grants are included. This is partly because multi-project grants only were funded for three of the six years studied, and partly because of a "lock in"-effect. Let us explain: When the Board makes decisions on funding in one year (for the coming period of 3–5 years), this decision will limit the flexibility in granting funding for the succeeding years. This is a fact that can produce difficulties for applicants for funding since their funding cycles are not necessarily the same as that of the TFR. The cyclical character of the funding policy is revealed in Figure 3.3.

[1] The calculations in this paragraph is based on our own method which is described in the footnote

In the figure the governmental budget for each year is the base line and the dark staples represent decisions taken by the Board each year. The reader should notice that the amount of money the Board can decide on is larger than the yearly budget. As project time is up to three and sometimes four years it is possible for a committee to decide on funding for several years and then they will have to take the consequences of their spending strategy.

The light staple describes the distribution of grants during the actual year. These figures show how much is allocated to research projects in that year. We define this as "distributed funding". According to our figures, TFR should have quite a lot of funds to allocate for the fiscal year 1997. It seems as if prudence has become the general strategy for the Board. This is probably and, quite naturally, due to insecurity when it comes to governmental budgets for the coming years.

Figure 3.3. Yearly sum of funding and TFR budget 1991–1996, constant prices KPI. (Source: Appendix B:10, 17).

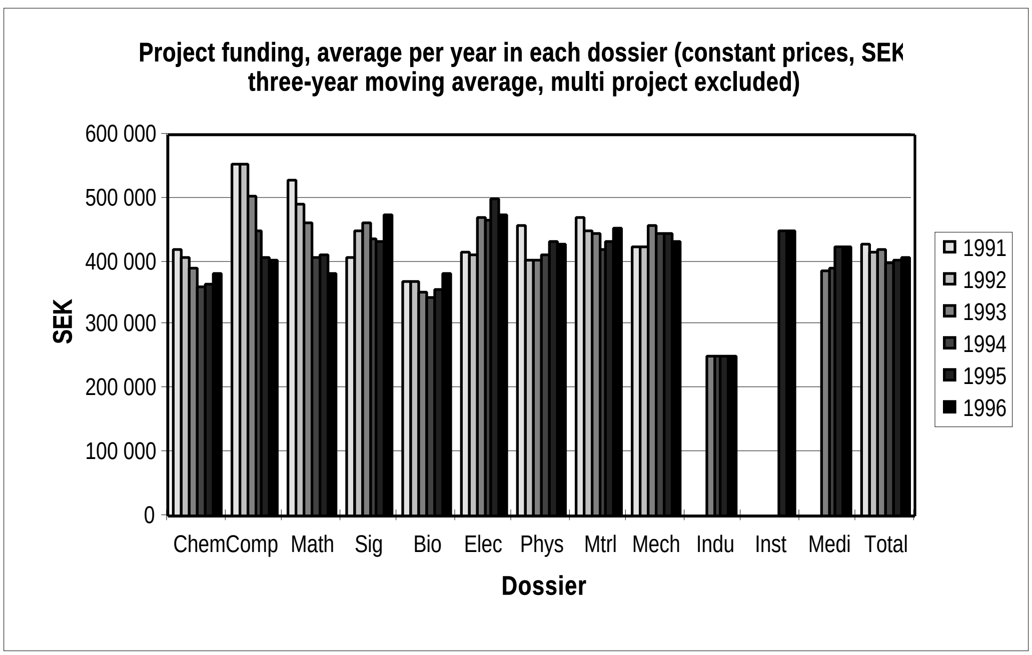


Are there differences between the committees in how much funding they award per project? A comparison shows that differences over a period of time are quite marked (see appendix B 12). During the past three years the two committees for Computer Science and Electronics, Electrical Engineering & Photonics have granted a relatively large amount of money per project (between 0,9 and 1,7 Million SEK), while the committee for Chemical Engineering has granted a relatively low sum of funding per project (between 0,6 and 1,1 Million SEK). Of course, this is a reflection of the willingness to award longer time periods to the principal investigators. In the committees for Computers and Electronics, there seems to be a deliberate strategy to award for time periods, which are often up to three years. Instead, committees like Biotechnology, Physics, Mechanical Engineering and Chemical Engineering have a tendency to award for a period of two years. An interesting result is that this tendency, from what is shown above, is also apparent in the policy when it comes to continuation of projects. Those committees that award for longer periods also award continuation for longer periods. The conclusion is that there are some substantial differences between the committees in how they reckon the need for long-term planning of research.

However, the amount of money per year has no absolute connection to number of years awarded when the whole period and all the committees are taken into consideration. An analysis carried out for each committee reveals a clear pattern. Computer Science, Material Science and Electronics are committees, which have a tendency to give longer times and larger grants. Physics, Biotechnology and Chemistry seems to have the opposite behaviour (see diagram in appendix F).

As shown in Figure 3.4, the amount of money given per year and per project has been increasing in some dossiers and decreasing in others. It seems as if we can observe an *equalisation* among the dossiers of the funding awarded per year. The dossiers that awarded a high amount of funding per year and project in 1991 have decreased their funding, while the dossiers that had low funding per year and project in the first years of TFR operations have increased their funding. Both of these groups have moved closer to the average sum of funding for the whole TFR. This trend could be a result of an intentional guideline from the Board to the committees, but there are no indications of this as an official policy. Nor are their any reasons that they should be similar, as the equipment-experimental demands must vary somewhat.

Figure 3.4 Project funding, average per year in dossiers 1991–1996, three-year moving average, multi-projects excluded. (Source: Appendix B:11)



Distribution of Awarded Funding

To achieve a more global view of the project funding of the TFR, taking into account both time and funding awarded, we have used a method developed by Sandström

(1995 and 1997). The basic idea with this method is to analyse the conditions that are given from funding sources, based on the amount of funding and the time awarded.

For the data available in the TFR project database, three different categories of projects have been identified. Category 1 are projects that were awarded less than SEK 350,000 on average for 1-3 years. Category 2 are projects that were awarded between SEK 350,000 and 525,000 on average for one, two or three years. Finally, category 3 are projects that were awarded SEK 525,000 or more on average for 1-3 years. In the tables below we have chosen to expose the figures for the most important types of categories. There are nine different types and we show the actual figures for four of them (all of the figures can be found in appendix C). It is of importance to notice that value for each year is deflated, but that the chosen intervals for categories are not. The estimated cost for a researcher on a one-year basis is SEK 525,000.

There seems to be a rather distinct pattern concerning the distribution of funds between the categories. Years 1993 and 1994 seem to be "normal years", while 1991 was a special case since it was the first year, and TFR, it is reasonable to argue, had not yet worked out a policy completely. Both 1992 and 1995 included funding of multi-project grants, which increased the number of projects in category 3 and with three years of funding. Finally 1996 was also a particular case because of insecurity due to the threat of Governmental budget cuts (see appendix C).

Most projects are awarded a rather small funding, which generally covers no more than the salary for a PhD-student or perhaps a research assistant.

Within category 3, large projects funded over three years, there are few projects. Only 5 to 7 per cent are awarded long-time and large projects. The proportions are, however, higher in 1992 and 1995 when the number of multi project grants were higher (see table 3.3) That TFR does not award researchers large funding does not mean that researchers do not apply for them. Between 45 and 55% of the principal investigators applied for a funding in category 3 and for three years.

Table 3.3. Distribution of awarded funding, percentage of the total number of awarded projects.PhD-students excluded. (Source: Appendix C)

Year	*Category 1, 1-3 years*	*Category 2, 2 years*	*Category 2, 3 years*	*Category 3, 3 years*	*Sum*
1991	39.7	41.8	3.4	1.4	86.3
1992	29.5	22.3	21.1	12.0	84.9
1993	44.0	25.7	17.3	6.3	93.3
1994	38.6	25.5	17.0	6.5	87.6
1995	33.6	23.2	9.3	10.0	76.4
1996	25.1	31.1	12.6	5.4	74.2

Category 1 are projects awarded less than SEK 350,000 on average for one, two or three years.
Category 2 are projects awarded between SEK 350,000 and 525,000 for one, two or three years.
Category 3 are projects awarded SEK 525,000 or more for one, two or three years.

The part of the total TFR budget that goes to large and long term projects (Category 3, 3 years) is only just over 20% in 1992 and 1995. These are the years when multi-project grants have been awarded (table 3.4). This is an illustration of the importance of the multi-project grants and an explanation of why so many of Swedish researchers seem to be content with the funding policy of TFR.

The percentage of large long-term funding grants applied for is however much higher (table 3.5). Research is a long-term commitment, so funding decisions have to be made for several years. The research councils have became empowered to make research project funding allocations for six years at a time, instead of for three years as previously. Funding policy at TFR does not seem to have taken this into consideration.

Table 3.4. Distribution of awarded funding, percentage of total TFR-funding, PhD-students excluded. (Source: Appendix C).

Year	*Category 1, 1-3 years*	*Category 2, 2 years*	*Category 2, 3 years*	*Category 3, 3 years*	*Sum*
1991	27.9	45.1	3.8	2.1	78.9
1992	17.3	20.8	20.2	25.9	84.2
1993	30.3	26.1	18.3	17.4	92.1
1994	23.0	28.9	19.5	10.9	82.3
1995	18.2	19.2	8.1	27.3	72.8
1996	17.1	31.7	13.3	9.1	71.2

Table 3.5. Distribution of funding applied for, percentage of total sum applied for.

Year	*Category 1, 1-3 years*	*Category 2, 2 years*	*Category 2, 3 years*	*Category 3, 3 years*	*Sum*
1991	6.7	7.5	19.0	60.5	93.7
1992	5.4	3.9	13.6	72.5	95.4
1993	n.a.	n.a.	n.a.	n.a.	n.a.
1994	7.0	6.0	19.0	54.3	86.3
1995	6.1	4.3	15.4	68.8	94.6
1996	3.6	3.2	18.0	68.0	92.8

Distribution between Fields of Research

When research councils were set up after the second world war one objective in particular was put forward as a rationale for the new administrative bodies. Through the councils, the government expected to achieve a sensible mechanism for deciding priorities between different fields of research. For this function to be accomplished it is important that the councils and the Boards have the capacity to reallocate resources between fields and to support new and growing areas of knowledge.

From our investigations of the actual political economy of TFR, we have an opportunity to analyse the mechanism of reallocation between the dossiers. That does not correspond exactly with the general question of making priorities in the Council. First, we have to consider that there have been at least some small rearrangements in designations of dossiers and committees (see appendix A). But they are small and these changes are probably not a way for the Board to fix its priorities.

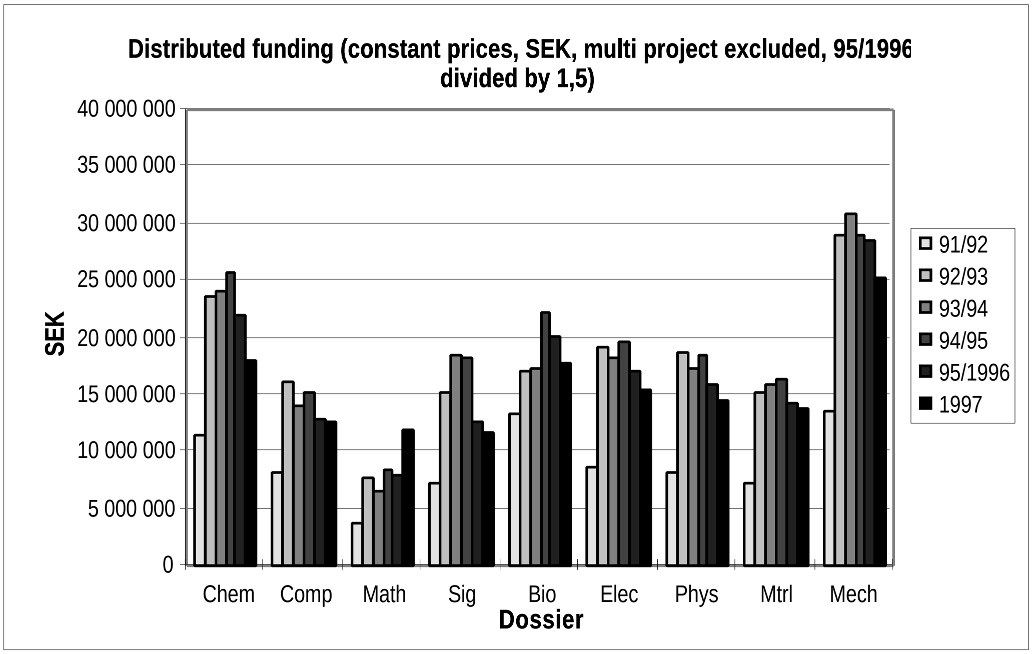
Second, we must take into consideration that there may occur some really new and decisive allocations within each committee due to paradigmatic shifts in the field of research with which it is concerned. It is, of course, impossible to trace these changes by exploring the project register. Third, TFR has only been in operation for a short period of time. Despite these objections, we have found it convenient to use the register for a short discussion of the trends and the extent of reallocations between fields of research as they appear in the form of committees and dossiers in TFR.

The project register gives us data on both the decisions and the actual distribution per year, as pointed out earlier. When the discussion is oriented towards priority making it is not advantageous to use the former numbers as there are major differences in policy between the committees. Some of them do not hesitate to “lock-in” their funds three years ahead, and some are very prudent in their economic behaviour. In any event, these differences are not in question in this section. Our interest instead is centred on the actual distribution per fiscal year. The question then is: How much money have the committees allocated to researchers for the period under investigation? How many resources have been available for research per year and during the whole period?

In principle, the Board has two possible instruments for making priorities. The first one is the amount of money that is directed towards ordinary research grants, and the second one is that via the multi-project grants. It is certainly necessary to distinguish between these two forms of grants in this respect. The multi-project grants are decided in the Board and all of them are scrutinised through international peer review. Even if there is a common equalising tendency in the council, the multi-project grants might be an instrument for new priorities. From this follows that we should divide our analysis so that it will be possible to recognise all possible effects of multi-projects.

Are there committees (dossiers) which have increased their share of TFR funding at the expense of others? To investigate this, we begin by looking at the total amount of money allocated to different fields. The results are presented in Figure 3.5, which shows the actual funding of projects in constant prices SEK (adjusted by KPI). Multi-projects grants are excluded. This figure gives us a first impression of the amount of money that is available for research in different fields.

Figure 3.5. Yearly sum of distributed funding per dossier, 1991/92–1997 (Source Appendix B:14)

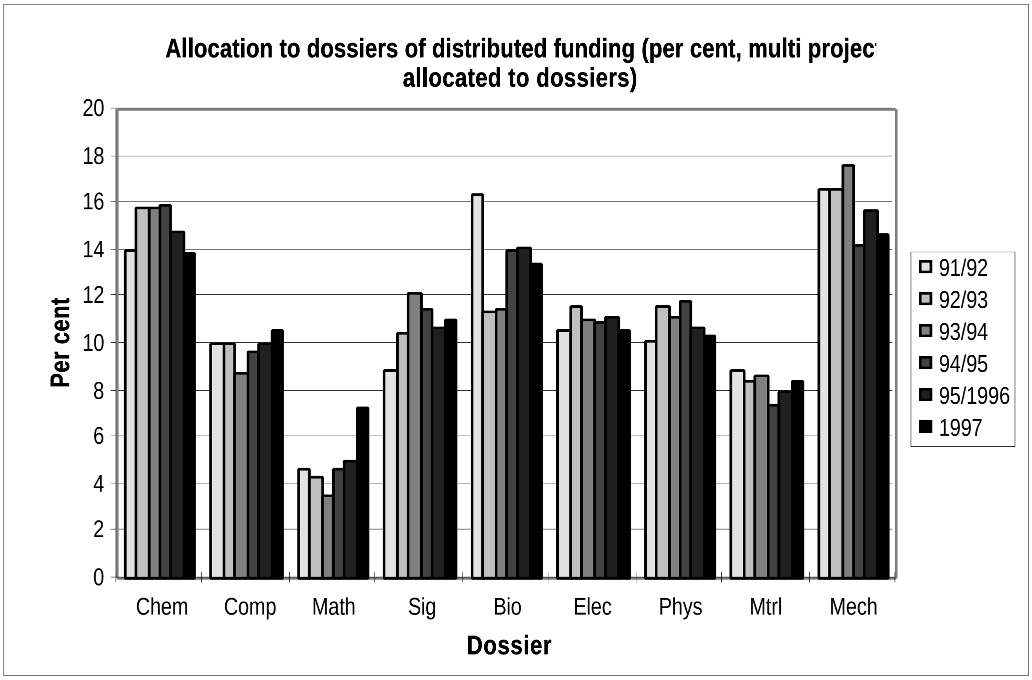


Mechanical Engineering and Biotechnology are the two largest dossiers, and Scientific Computing and Applied Mathematics (Math) have been the smallest from the beginning. In recent years the latter committee has been gaining on the others. Applied Mathematics was prioritised as a result of decisions made in 1996 (for the fiscal year 1997 and onwards). From the Figure it also becomes apparent that most of the dossiers have lost at least a small amount of money during the past two years. But this is for ordinary project grants; the picture might change when we take multi-project grants into consideration.

For a comprehensive summary of the changes, it is, of course, necessary to present the relative figures. In Figure 3.6, multi-projects are included and figures are shown as relative shares of the yearly allocation of funding to each dossier.[1] We can observe some minor changes, which could be summarised as a tendency for the larger committees to lose and a couple of the smaller to gain. That is, Scientific Computing & Applied Mathematics, and Signal & Systems are increasing their relative budgets. We can see that the only dossier that has received increased budgets is Scientific Computing and Applied Mathematics.

[1] It should be pointed out that it sometimes is a difficult task to distribute the multi-projects to certain committees. Some grants are shared between more than one committee. On this we have taken advice

Figure 3.6.Allocations to dossiers of distributed funding, 1991/92–1997, multi-projects included. (Source: Appendix B:18)

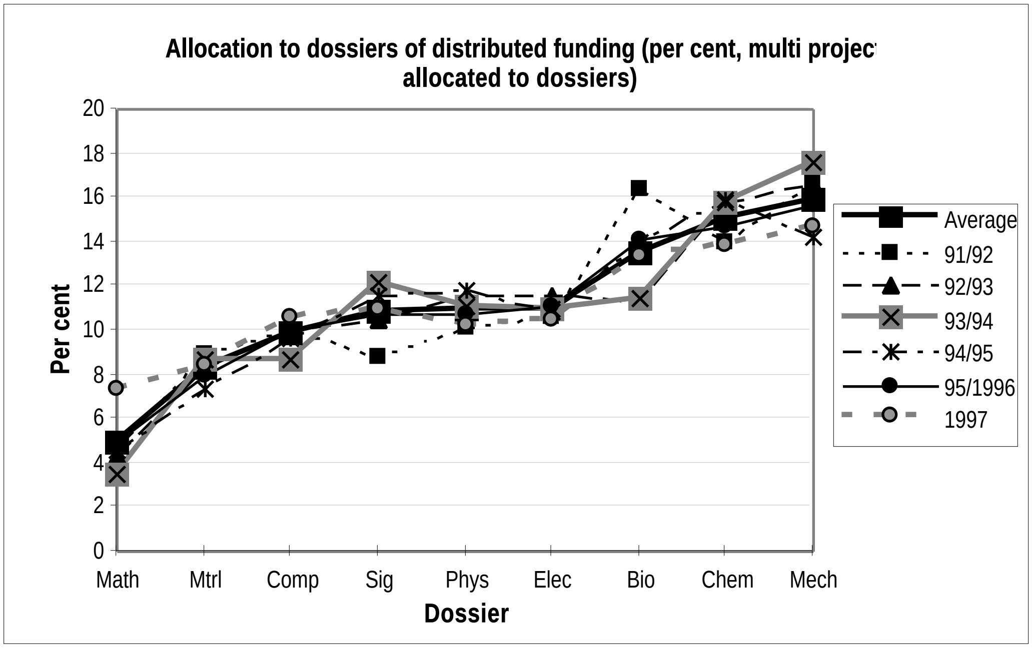


The changes over time in relative shares between dossiers are very small. When multi project grants are included we can hardly observe any changes at all. Chemical Engineering and Biotechnology keep their rather high total of funds over time, and that is the case of the dossiers for Electric Engineering and Computer Science as well. The dossiers that are assigned lesser amounts of funding due to the consequences of allocations of multi-projects, if there are any at all, are Mechanical Engineering and Applied Materials Science.

In order to get a more in-depth analysis of variations over time on the one hand and reallocations due to multi-projects, on the other, it seems necessary to use other forms of statistical presentation. In Figure 3.7 variations over time are considered, using a method where the dossiers are put in order according to their relative share of distributed funding during the period from fiscal year 1991/92 until 1997. Multi-projects are included in this Figure, which gives a good impression of the amount of variation over time. Again, the positive shift for Applied Mathematics is evident. In addition there have been some variation when it comes to Signal & Systems, Biotechnology and Mechanical Engineering. These variations are not systematic, i.e. they do not make a certain trend. As shown in Figure 3.6, it seems as if the two largest committees, Chemical Engineering and Mechanical Engineering, are losing a small share of their relatively large budgets.

Clearly, the overall impression is that the Council does not reallocate more than a small share of its funds. The committees seem to be quite successful in defending their share of the funding cake. So the next question is whether or not there are any reallocations due to impact on funding of the multi-project grants.

Figure 3.7. Allocation to dossiers of distributed funding, 1991/92–1997. (Source: Appendix B:18)



Multi-Projects and Allocation Policy

As mentioned in the introduction the TFR has tried to broaden its role as a research council by awarding some research group's multi project grants. In total 37 multi-projects have been awarded funding. Of these eleven are prolonged projects. During the fiscal years 1994/95 to 1997, this form of grant had taken a share of 22.6 per cent of the total sum of funding. The fields of research that have been granted the highest sums of multi-project funding are, according to the figures in table 3.6, Chemical Engineering, Biotechnology, Computer Science, Physics Engineering and Signals & Systems.

Table 3.6: Decisions on multi-project grants and dossier 1992, 1993 and 1995.

Dossier	Chem	Comp Science	Math	Sig	Bio	Elec	Phys	Mtrl	Mech	Sum
Number of multi project grants	5	5	1	5	8	4	5	1	3	37
Total, MSEK	38	31	6	44	37	23	24	7	11	221
Share of total in %	17	14	3	20	17	10	11	3	5	100

Source: Appendix B:19–20

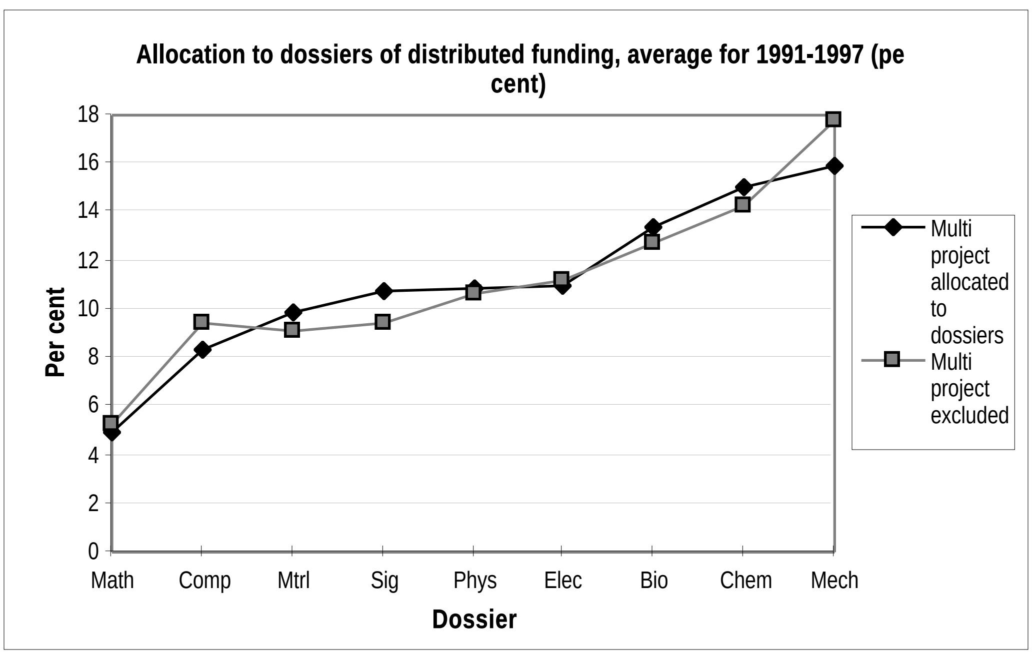
Does the distribution of multi-project grants give us reliable information about how the Council makes priority between different research fields? As has been shown before, there are few signs that the inclusion of multi-project grants in the analysis changes the picture very much, as compared to the picture that would be obtained by their exclusion.

Which dossiers have received multi-project grants? It emerges that the rule of equality is strong and rules. As shown in table 3.6, all dossiers have received at least one multi-project grant. As we can see, the number of grants is rather evenly distributed between six of the groups. The small, but growing, Scientific Computing area has only received one, and so has Applied Materials Science. Mechanical Engineering has received three, which is low considering the large amount of funding granted to this field in general. The amount of money distributed to the different dossiers is clearly not the same, which makes it probable that the scheme for multi-projects does have some effect on the relative distribution of funds.

Does the distribution of multi-project grants give an indication on which areas the TFR Board assumes are of particular interest? From the interviews with members of the Board we have learned that the decision-making process on multi project grants is scrutinised in a precise way which leaves few opportunities for aspects other than excellence to be considered. This is more or less the official explanation of the uneven distribution of multi-project grants. The fields of research have different capacities for producing applications in this form of grant., and this probably reflects how the resources are divided at the universities. Some of the areas have managed to build stronger research groups than others.

One question remains to be answered: Have there really been any changes due to the allocation of multi-project grants? An area that receives large amounts of money through this form of grant might instead lose resources for ordinary grants. In Figure 3.8, the lines represent the pattern of allocation with and without multi-projects.

Figure 3.8. Allocation to dossiers of distributed funding per dossier 1991/92–1997.(Source: Appendix B:15, 18)



The general conclusion from Figure 3.8 is that the granting of funding for multi-projects does not seem to be an instrument for reassigning priority or reallocation from less to more interesting research fields. The differences are in most cases small and not obvious. We can, however, observe that redistribution has taken place where Mechanical Engineering loses, while Signals and Systems gain from the multi-project scheme. It is also surprising that there seems to be a shift in terms of order between Computer Science and Applied Materials Science.

All in all, the conclusion is that TFR has an apparently even distribution between the dossiers and the trend seems to be that that equalisation will continue so that all the committees will have a share of 10 to 15 per cent of the total funding. If this is the case it will probably be difficult to introduce a new rationale for the distribution of funds.

Universities

Another area of interest concerns the distribution of research between the Universities. Our analysis (based on appendix D) shows that out of the 638 applications sent to TFR in 1996, 82 per cent were from researchers active at one of the following six universities: (in descending order) Royal Institute of Technology (KTH), Chalmers Institute of Technology (CTH),), Uppsala University (UU), Lund University (LU), Linköping University (LiTH), and Luleå Technical College (LuTH). “The big six” were awarded 91% of the total funds of TFR in 1996. The number of applications from each university (college) follows the size of the university.

The share of research proposals awarded is higher for researchers from these universities than from others. In 1996, 28% of the proposals from the “big six” received funding, while the same figure for the total population was 26%. Linköping University has the highest success rate, 33%, while Lund University has the lowest with 23%. There are some differences between the universities that concern how much funding each project has received. To take an example, at CTH the average funding per project in 1996 were 870,000, while the corresponding figure for Uppsala University was 680,000. The universities also show different patterns of application behaviour. Researchers from Linköping University usually apply for larger sums per year, and larger projects. Lund university researchers display the opposite pattern.

4. CONCERNS ABOUT PROPOSAL REVIEW

– The First Comprehensive Survey of Swedish Researchers

Peer review is, as was pointed out above, central to the process by which many government agencies select proposals for funding. The TFR, The Swedish Research Council for Engineering Sciences, is one of those. The council relies heavily on the peer review process and its validity when it comes to grading grants and selecting the best proposals. Most researchers are happy with the process and the principles as such, but often there are complaints when it comes to the actual handling and the consequences at the micro-level as well.

Gillespie et al (1985) stress that academic peer review is a self-fulfilling premise as scientists both judge the potential value of proposed research and the ability of proposers to perform the studies. Peer review affects science policy profoundly – how it is implemented and how decisions are justified. An important aspect is that awards are supposed to be given competitively and by using the primary criterion of excellence as determined by the peer review process. Peer review thus means that the sole mechanism for allocation of resources is quality of research. If there is a widespread understanding that other criteria come into the process, then researchers may develop cynical feelings towards the system. In this chapter we have the privilege to present the first comprehensive study of attitudes towards the peer review system among Swedish researchers.

Data and Methods

The study population included all applicants (both successful and unsuccessful) to the TFR during the last application period. The TFR office delivered the list of names of principal investigators (PI) whose proposals were awarded or rejected during fiscal year 1996. The survey was sent to 588 researchers (PIs) who requested grants for 697 research projects. The cover letter accompanying it was written by Jan Eric Sundgren, the Secretary General of TFR, who explained that the purpose of the survey was to "...explore their attitudes ...and to do a better job at the Council...".

The survey was sent by mail to all applicants, which means that it is not a sample study but a study of a total population. After a couple of follow-ups, we achieved a response rate of 75 % (N=444). The response rate varies to some extent between different fields of research (in Swedish ”teknikområden”, roughly the same as dossiers). These are the following: (the columns to the right show response rate in percent and in total numbers).

	Dossier/Committee	Abbreviation in diagram	Response rate %	(Absolute numbers)
210	Chemical Engineering	Chem	74	(57)
221	Computer Science	Comp	67	(30)
222	Scientific Computing	Math	60	(11)
223	Applied Mathematics	Math	71	(23)
230	Biotechnology	Bio	78	(76)
240	Electronics, Electrical, Photonics	Elec	67	(31)
251	Engineering Physics	Phys	83	(53)
252	Applied Materials Science	Mtrl	67	(19)
260	Mechanical Engineering	Mech	71	(48)
271	Signals and Systems	Sig	77	(18)
300	Interdisciplinary Science	Medi	71	(12)
285	Industry graduate studentships	Dokt	65	(–)
287	Instruments	Instr	100	(3)

When asked in the survey, a total number of 36 respondents could not tell to which field of research, or subcommittee, they belonged. Seventeen gave at least two answers, i.e. they thought that TFR handled their applications in more than one subcommittee (SC). All in all the response rate was high, and much higher than comparable investigations done by the NSF and the NIH in the US.[1]

Some fields of research are very small, with not more than 20 respondents, e.g. Scientific Computing, Applied Materials Science and Signals & Systems. These areas are certainly too small and will not allow for detailed analysis in subgroups, but, the response rate is high in these fields of research as well.

We have also made allowance for rates regarding where, or at which university, the respondents are employed. None of the Universities or Institutes of technology (technical universities) seems to be over- or under represented. One observation is, however, that the response rate from Linkoping University is higher than that from other universities. It might be an effect of the fact that the questionnaire was sent out from Linköping or perhaps a consequence of the strong representation of that university in the TFR Board.

Characteristics of the Applicant Population

Thirty percent of the respondents are professors, and another thirty percent senior lecturers. With respect to the respondents' age, the population is divided quite equally into three groups: 32 percent of respondents are aged 31–40; 33 percent are 41–50 and 30 percent are 51–60. The year of being awarded their PhD showed the same pattern, although almost 40 % of the respondents received their PhD during the 1980s.

There is a strong tendency among respondents to stay at their home university. This is the typical Swedish pattern of mobility; which is low.

The number of articles published by each respondent in refereed journals is generally quite low. Thirty percent report that they have published up to ten scientific articles,

1

while another thirty percent state that they have published more than ten, but less than 30 articles.

Publications together with researchers from another country:

Yes, more than half of my publications	53 %,	
Yes, less than half	27 %	
None	20 %	

Publications together with researchers from another discipline:

Yes	57 %,	
None	43 %	(N=435)

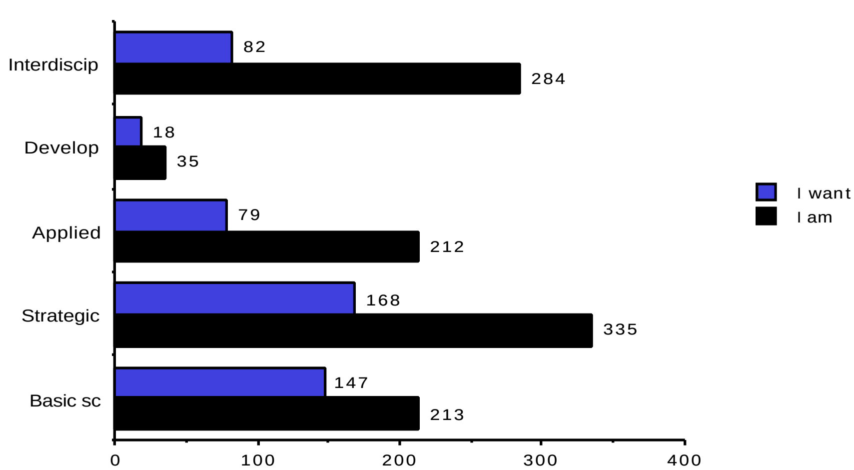
Patent holders: Most of the researchers lack patents in their own name. Some 13 % have only one patent, while another 13 percent have 2–5 patents. Only four percent have more than five patents.

Orientation Towards Basic or Applied Science?

It seems quite clear that the respondents do a lot of research that could be characterised as applied science. That is, of course, a consequence of the fact that we are dealing with fields that are doing research with more or less specific applications in mind. The researchers also have funding from different sources. Some 40 per cent of them have had research funding from the National Board for Industrial and Technical Development (NUTEK, the former STU), while 43 per cent state that NUTEK is one of the major funding bodies for their research. Almost half of population (45 per cent) state that they are being funded at present from the private sector.

We also asked the respondents how they would like to describe themselves according to the type of research (basic, applied etc.) they performed. Further, we wanted them to state what kind of research they would like to have more time to carry out. The answers are shown in Figure 4.1.

Diagram 4.1. Self-description and what respondents want to do more of. (N=430)



It should be noted that the category called “strategic” in the questionnaire was divided into two alternatives – directed basic research and strategic research.

Half of the respondents have experience of the new forms of financing of research that have evolved in Sweden during the 1990s. Examples of these new funding sources are the so-called materials consortias (funded by NUTEK & NFR) and the competence centres (NUTEK). The new foundations for strategic research, SSF and MISTRA (wage-earner funds), and EU-programmes should also be considered when talking about new forms of funding in the Swedish context. Most of these programmes or agencies are directed towards so-called strategic research, and aim at supporting research in areas where there seem to be some kind of economic benefits in a time period of between five and ten years. Almost half of the respondent’s state that they have funding from at least one of these programmes or granting bodies.

In summary, the respondents seem to be a typical sample of researchers in the field of engineering sciences. Due to their status as principal investigators they are, however, not typical of the whole research community in the different fields of engineering science. Much research is actually performed by doctoral students. We did not ask for their opinions.

Respondents’ Attitudes to the Review Process

Of all the respondents, 33 percent were successful in getting at least one proposal funded. Sixty-seven per cent were turned down. As the success rate in 1996 was 29 %, there is a ”success bias” among the respondents. (Only 19 percent of those who did not answer received funding). When asked about their own assessment of the peer review of their application, 71 per cent were satisfied and 23 percent stated that they were dissatisfied (Valid per cent, i.e. N=403). The question was formulated in terms of whether they thought that they had received a fair judgement from their peers or not. Two thirds of the respondents felt that the peers had presented reasonable requirements, and just as many maintained that the peers had understood the purpose of the application. The overall judgement of the peer review process from the applicant’s point of view was to a large extent very positive.

When the respondents were asked to evaluate the PR-process at TFR (not just the treatment of their own application), half of the applicants were satisfied, while 24 % expressed a clear dissatisfaction. (10 % were in between, both yes and no, and 15 % could not answer the question).

Differentiating between declinees and awardees shows a correlation when it comes to attitudes. In most of the dossiers (fields of research) all the criticism comes from the former. It is only in Chemistry, Biotechnology, Mechanics and Signal & Systems that some of those who received funding were critical. But they are very few.

More than one quarter of the respondents have taken the opportunity to voice their opinion on the PR-process at TFR. Respondents were asked about their views and opinions in an open-ended question. ”Please give us your personal comments on the PR- process at the TFR?”. Some of the dossiers are a lot more critical. We have to be aware of the fact there are rather few respondents who voice their opinion (N≈150), but it seems obvious that Materials, Physics and Signals are committees, which are subject to more criticism. But then again, at least a couple of those committees are small in number, and just a few comments might raise the percentage quite a lot.

Grading and Transparency

So it is not possible to draw any conclusions from the opinions discussed above. Why the respondents voice their criticism is not at all clear. One thing that might be of interest when dealing with this problem is located in the grading process in each of the committees. In the questionnaire, respondents were asked if they could estimate the grade (mean of three grades)[1] the peers in the committee gave their application. Almost one third of the respondents (N=338) received grade five (5) in a five-grade rating. Forty-five percent were given an average of four (4), and around one quarter stated that they had received an average of three (3). The overall average was 3.7.[2] We will further discuss the reasons and consequences of the high grades in next chapter.

The most common complaint was that peers are ignorant of the specific research subject. Furthermore, quite many of the complaints were directed towards the grading system: an obvious point of criticism is that it is not very logical to get high grades, but no funding.

Many respondents also ask for a better justification of why they are not given funds. It is also quite common amongst the respondents who commented to ask for greater diversity in the peer groups. They argue that being in the hands of one person in the committee does not allow for an objective evaluation. Many of the applicants have the impression that one peer reviewed their proposal only.

In this open question it happens that respondents voice the opinion that the PR-process at TFR is biased in some ways. However, cronyism and “old boys network” are mentioned very seldom in this open question. Not more than 3 % of those answering (N≈150) indicated such factors in their response.

Awareness– Do We Have a Problem?

Almost three-quarters of the respondents did not have any contact at all with the TFR office or peers in the board, even by telephone, mail or by e-mail, before they sent their application to TFR. A few of the respondents have members of the board as colleagues. It is obvious, not least from the number of partially missing answers (in the survey), that an explicit knowledge of the actual process in the Council is quite limited among the respondents. Few really know how the evaluation process at TFR actually works. From this we understand that at least some parts of the questionnaire have to be interpreted rather carefully.

The low level of knowledge regarding how the research system works might be a little surprising, but if we take into consideration the fact that a rather large part of the respondents have no experience of TFR, this result is more understandable. Twenty-five per cent of the respondents had sent in an application to TFR for the first time.

For analytical reasons we divided the respondents into three groups based on number of applications and success rate. The first group is the respondents without any, or

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[1] 1) Scientific Potential, 2) Scientific Quality and 3) Scientific impact.

[2] The high grades might be a consequence of the bias mentioned earlier; the success rate is higher

with very little, success. The second group was moderately successful and the third was quite successful. There seems to be some kind of correlation between the success rate and the number of contacts with TFR before the application was sent in and during the committee process. (see table 4.1.).[1] From this, we cannot draw the conclusion that contact is an explanation of grades and success rates. Of course, there are some obvious reasons for these correlations. Those who have had a number of funded projects come into contact with the council and these researchers are some of the seniors that are included in the peer review process themselves. There is, of course, also a positive relation between success rate and grades.

Table 4.1. Success rates, contact with TFR and grades.

Group	Success rate	Contact %	No Contact	Sum	Grade (mean)
1	low	27	73	100	3.43
2	medium	37	63	100	3.92
3	high	42	58	100	4.10

In the first group one third stated that the PR of their application was unfair, in the second and third group the number of discontented was lower: 19 % and 13 %.

The level of discontent is explained, to a certain extent, by the fact that many of the applications scored pretty high in grades; they got high marks. Fifty-five per cent of the respondents received a 4 or 5 as an average grade in the peer review report. This indicates that the committees are rather good-natured, which of course produces questions among the declinees. Why did I receive such a high grade, but no money?

Actually, the number of complaints about grades (in the open questions) differs between subcommittees (dossiers). In two of them there is, in relative terms, a lot more criticism than in others (Biotechnology and Engineering Physics). It is not easy to find a pattern, but it seems quite clear that what these groups have in common is that their success rate is markedly lower than in other committees and at the same time there is this tendency to give high grades. Approximately 60 % of those with grade 4 or 5 have been refused funding. (See appendices G where the distribution of grades for eight of the committees is displayed.)

This explanation would be conclusive if it was not for the fact that this phenomenon can also be found in two other dossiers i.e. Electronics and Computer Science. They also give high grades, and they have a low success rate as well, but they also have a low number of complaints. We will have to dig deeper to find an answer to this phenomenon. Conditions that might influence this are for example the structure of the research groups and the number of applications per group.

If we stay with this discussion of grades for just a little while, it is interesting to notice that two of the committees, Mechanics and Applied Materials Science, have done their work quite strictly. This seem to be the case with Biotechnology as well (see appendix G). Their distribution of grades is more or less bell-curved. In these committees they actually use the grades as instruments to sort out those applications that are supposed to get money and those that are not.

There seems to be one common characteristic of those two dossiers. They are both old and traditional engineering fields of research, but they also have in common the fact that they have been admitted to the “Club of Councils” quite recently. For the first time they are supposed to do basic engineering research, and it seems as if they have taken this more seriously than most of the committees from other fields of research.

It is understandable that areas of research which have a longer scientific tradition have a harder time being tough to each other in the grading of applications. When you have been in the game for some time, you realise that it seldom will profit to be tough on your colleagues. Peers tend to know each other in a small country like Sweden, and at least the more senior people are familiar with the names of committee members.

From our interviews it becomes clear that arguments like this were one of the explanations of the observed grading distribution in e.g. Engineering Physics and Chemistry. The collegial procedures can be discussed in terms of a theory of distributive justice. If you are ignorant in t_0 (designation of a period in time) about your future position in the system of distribution and have the opportunity to decide on the best fundamentals for distribution, you will probably choose a more distributive form of justice. In t_1 it might be your application that is to be reviewed, and if you are outside the peer group then, you might be happy with a system where the institutions are distributive.[1]

Justifications and Decisions

Nearly two thirds of the respondent’s state that they would like to have more motivations and reasons that explain the peer review report and the final decision of the board. Respondents need more feed back on their application and they want to know on what grounds it was rejected.

It might be that the committees could use more of their time giving good arguments. It seems as if the lack of research secretaries (≈ program officers) at TFR is one of the explanations as to why this is the case. If the research secretaries were a little bit more involved in the process, maybe they could do some of the work of putting together the different peer reviews into one document. At least that is one alternative that should be discussed. At the same time it ought to be noted that the Council is quite anxious to hold back the tendency for bureaucratisation in science policy. This policy has been rigorously implemented: it is obvious that the TFR is a very small and effective Council, due to the small number of staff and research secretaries.

Although respondents voice their criticism of the motivation issue, it is noteworthy that rather many of the respondents are of the opinion that they are influenced, affected, by the peer review report. Nearly half of the awardees state that they are affected and only 14 % that they are not.

Of those who were rejected one third will try once more next year with roughly the same application. More than half of them states that they are influenced by the PR and more than one third maintain that they are not affected at all. There seems to be no variation in this respect when the respondents are divided according to research fields. It could be said that Signal & Systems has obviously done a good job, while Computer Science meets a lot of discontent due to their late distribution of referee reports.

Respondents Attitudes

In the questionnaire, respondents were asked for their opinion on a number of issues. One package of questions was organised as statements to be agreed or disagreed on regarding the TFR and the work done by the Council. In the table 4.2 the respondents' answers are arranged so that the statements which got the strongest agreements are first in line. From our point of view, those answers and statements are also the most interesting ones.

What we have here are some rather strong and clear-cut opinions regarding the two or three first statements and, of course, the last five ones. (The statements were not presented in this order in the questionnaire). It might be worthwhile to dig a little bit deeper into these questions.

In the Gillespie study (1985), dealing with peer review at the NIH, there was a statement included, which investigated the attitudes on the matter of “old boys network”, and whether they were in control of the committees. Forty-two per cent of the respondents agreed, whereas 33 per cent disagreed. The authors could show that this ”cynicism” about the NIH peer review was strongly correlated with a desire to change the system. The cynical respondents wanted an elimination of reviewer anonymity and ”blind reviewing” of proposals. They also wanted a change in the importance of the applicant's ”track record”.

Compared to the formulation of the question in the TFR questionnaire, there seem to some important differences. Firstly, it is not clearly expressed in the Swedish formulation that the seniors form a network of their own and that they control the distribution of funds. The question is unfortunately more of a non-normative description of the actual process in the Swedish case. That is, the process is really dominated by a rather small group of senior researchers. We have to find out to what degree it is controversial and somehow questionable to agree with a statement like that. How should we interpret this question and the attitudes associated with it?

Table 4.2. Statements on TFR and respondents answers.

Statement	**Answer No (%)**	**In between**	**Answer Yes (%)**	**N=**
Is the TFR’s committee process dominated by a small group of senior researchers? (SEN)	16	18	66	255
Should TFR motivate its decisions more thoroughly? (MOT)	21	15	64	386
Does TFR too seldom finance risky projects ? (RISK)	26	23	51	155
Should TFR put stronger emphasis on track record? (MERIT)	25	32	43	317
Does TFR treat young researchers unfairly? (YOUNG)	41	18	41	211
Should TFR encourage more research co-operation? (CO-OP)	34	26	40	307
Should TFR co-operate more with other financiers? (CO-FIN)	31	30	39	282
Does TFR treat interdisciplinary science unfairly? (INT.DISP)	43	18	38	175
Do the research secretaries dominate the TFR CP? (BUREAU)	48	21	31	187
Should TFR evaluate its research fields more often? (EVALU)	38	31	31	275
Does TFR underline industrial relevance too much? (RELEV)	57	19	24	309
Should TFR spread out their grants to a larger number of applicants? (SPREAD)	59	20	21	293
Does TFR treat women researchers unfairly? (WOMEN)	76	14	10	129
Does TFR underline scientific quality too much? (SCIENCE)	78	13	10	333
Should TFR allow applications written in Swedish? (SWED)	78	12	10	364

Is there anything more to take into consideration when interpreting this question? First of all we have to look at it in its context. For example, what questions lie around the ”senior power statement”. This section of the questionnaire starts with the statement on interdisciplinary research, followed by a question on co-operative research and after that the question on risky projects. It is quite clear that the survey is not asking for positive attitudes only. The formulation of questions is markedly negative and we also met a response from the office during the preparation process that questions perhaps should be formulated the other way around, that is, in a positive manner.

Even if we should not equate the formulation with opinions on ”old boys networks” there is some sort of opinion among the respondents that expresses feelings of cynicism. If you are inside you will have a better chance of getting funded, if you are outside you will have trouble getting funding. Lets go further to explore who they are, the respondents we analyse as somewhat cynical. In table 4.3, those who agree are compared with those who disagree in a number of specific dimensions.

Table 4.3. Are TFR committees dominated by a small group of seniors...?

Characteristic	Agree group	Disagree group
First-time applicant	16 %	2 %
Grade (mean)	3,16	3,93
Proportion of group who state they had an unfair review	37	10
Proportion of group who were granted funds	23	45
Proportion of group who state that the PR process is OK	38	85
Proportion of group who state that the PR process is not OK	41	10
Women/men	85/80	15/20
Proportion of group which received their PhD during the 90s	20	5

The differences between those who agree and those who disagree reveal that the question on ”senior power” is not merely a matter of objective and non-normative description. Instead it is an indication of specific opinions within the research community. It seems worthwhile to go a little bit further in investigating what type of opinion this is. The argument is not that the opinion tells us something about how things really operate inside the TFR, but, primarily, that the opinions give us an understanding of where there might be a problem. If this problem is due to misunderstandings in the research community, then it should be tackled by informational measures (type 1). If it seems to be a real problem (type 2), then it has to be dealt with by other means. As a consequence, we should try to understand what type of opinion we are dealing with. Is it a problem of the first or the second type?

Respondents who agree strongly with the senior power statement (grade 5 on a five-grade scale) are to a large extent dissatisfied with the peer review process at TFR. They believe they were unfairly judged by the peers, and that the peers did not understand their application, or put forward reasonable demands. Only 14 % of this group were funded, while the same figure for the total population was 33. Among the respondents who did not agree with the senior power statement, 60 % were funded. Furthermore, there is a difference between the groups based on their overall judgement of the review process: In the critical group 60 % state that the process is not good, while in the positive group 91 % think the process is good.

Let us go even further. We also expect that there should be a correlation between previous success and attitudes regarding attitudes to senior power. A comparison of the three groups with different experiences leads to an interesting result. In table 4.4 a cross-comparison is made between previous success and opinions on senior power. Group 1, with a low success rate, have a strong tendency to agree with the statement on senior power inside TFR. The group with a high success rate have the reversed tendency, i.e. they disagree to a much higher extent.

Table 4.4. Success rate and attitude on senior power statement.

Group	Success Rate	Agree %	In Between	Disagree %	Sum	N=
1	low	86	9	9	100	153
2	medium	65	22	15	100	183
3	high	50	22	27	100	89

In the questionnaire the project leaders were asked about their attitudes on the peer review system in general. Based on the answers to these questions, it is possible to examine to what extent respondents are prepared to support changes within the peer review system. Should applicants be anonymous to the peers? Should the names of the peers be made public? We also took the opportunity to investigate to what extent the respondent's thought that the TFR did a good job with their peer review system. The figures on these questions are in table 4.5.

Table 4.5. Attitudes on the Peer Review System

Statement	Disagree	In be-tween	Agree	N=
Peer review is the best system for funding decisions (PR OK)	7	15	79	405
PR is conservative (CONS)	22	27	51	195
PR is used in a proper way at the TFR (TFR PR OK)	24	27	49	308
Applicants should be anonymous (ANON)	55	11	34	367
The names of the peers should be made public (IDENT)	57	10	33	387
PR at the TFR is to a large extent arbitrary (ARBI)	47	23	30	314

A large part of the researchers do think that peer review is the best system for the selection of research projects for funding. But quite many agree that conservativeness is one of the problems related to peer review. Regarding the desire for change among Swedish researchers, it is quite clear that in general there is no need for reform. Just as in the Gillespie study, a vast majority is in favour of the system as it works right now.

But there is a division in the research community, which actually has to do with the experiences and attitudes that are exhibited in the question on senior power. We have found that certain attitudes seem to be correlated with opinions on senior power. Using the Chi 2-method, differences are revealed between those who agree and those who disagree on a number of attitudes asked in the questionnaire. The questions where there seem to be a highly significant difference (0,01-level) are indicated in table 4.6 below: (Degree of freedom =1)

Table 4.6. Statement on Senior Power Correlated to Other Attitudes

Difference between groups and Statement	Signific. 0,1 %	Not signi-fic.	Chi^2
PR is used in a proper way at the TFR (TFR PR OK)	X		43,8
Should TFR justify its decisions more thoroughly? (JUSTIF)	X		39,7
Do the research secretaries dominate the TFR CP? (BUREAU)	X		35,4
PR at the TFR is to a large extent arbitrary (ARBI)	X		34,2
Does TFR treat young researchers unfairly? (YOUNG)	X		25,7
Should TFR evaluate their research fields more often? (EVALU)	X		24,6
Should TFR spread out its grants to a larger number of applicants? (SPREAD)	X		21,4
The names of the peers should be made public (IDENT)	X		20,1
Should TFR put stronger emphasis on track record? (MERIT)	X		17,4
Applicants should be anonymous (ANON)	X		11,8
Peer review is the best system for funding decisions (PR OK)		X	
PR is conservative (CONS)		X	
Does TFR underline industrial relevance too much? (RELEV)		X	
Does TFR treat women researchers unfairly? (WOMEN)		X	
Does TFR underline scientific quality too much? (SCIENCE)		X	
Should TFR have more co-operation with other financiers? (CO-FIN)		X	

The difference between the ”agree” and ”disagree” groups (on the senior power question) is significant on the 0.1-level when it comes to the attitudes towards how peer review is performed at the TFR.[1] That is, those who think that seniors are in power believe that the operation of the peer review system at TFR is not acceptable. They want more of substance in the review reports. They think that young researchers are treated unfairly, that research fields ought to be evaluated more often, that merit (track record) should be the only ground for decisions, that bureaucrats at the TFR have too much power, and that applications should be anonymous. They want to spread out funding among more project leaders, and they seem to call for properly justified decisions from TFR. Those who disagree on the senior power question have the opposite attitudes in all these cases. When it comes to attitudes like those about the operation of the peer review system in principle, about its conservativeness, and about the importance of industrial relevance, co-financing and unfair treatment of women appli-

[1] To be able to study and calculate the differences between attitudes of the respondents some simplifications have been done. All answers to questions concerning the performance of TFR and the Swedish research has been cut down from six possible values into two. Values ”1” and ”2” have been given the value ”1”, and value ”5” has been kept as value ”5”. If the respondent has answered ”3” or ”4”, hasn't answered the question, or answered ”don't know”, this value has been excluded. The reason for this is

cants, there do not seem to be any significant differences between the two groups. All this is perfectly logical.

It should be noted that correlation coefficients (Spearman's) reveal the same pattern as the Chi 2-method. The correlations between attitudes to senior power and other variables are indicated in the table above. All are significant on the .01 level.

Does this indicate that this is a type 2 phenomenon? How should the Council deal with this? When Gillespie et al did their investigation (1985), the NIH had implemented a reform in which the operation of the system was changed in various dimensions. Strict rules had been in force for several years, severely restricting the service of any individual in the peer review committees and requiring that various categories of scientist be represented, e.g., young investigators, members of minority groups, and women. These rules had actually led to a growing suspicion that the committees had a lack of specialised expertise to produce competent decisions. Gillespie's conclusion from this was that a large proportions of applicants were *uninformed* about the operation of the NIH-system.[1]

If this is correct then they were dealing with a type 1 problem. Is it the same in the TFR context? The answer is probably both yes and no. Rather many of the respondents are ignorant of how the TFR-system operates. The answers on the question about research secretaries' power (BUREAU) are but one indication on this. At the same time it seems obvious that we have strong indications of cynicism about the system which are also associated with a desire for change.

The most cynical group is however not too big and it might be impossible for a research council to keep away from these kind of problems unless they want to distribute their funds to everyone who applies for money. If we correlate success rate to a number of attitudes and some of the descriptive variables like sex, age and if respondents had served as a referee themselves at TFR, we get an interesting pattern. In table 4.7 these variables are correlated firstly to whether respondents were awarded a grant in the 1996 application scheme or not, and, secondly, the number of awarded grants during the period from 1991 and onwards (those with less than three projects granted were one group and those with more than two granted projects were the other group).

Table 4.7. Success rate, attitudes and background variables

	Contact	Sex	Age	Senior.	Referee	Risk	Relev	TFR.PR. OK	Spread.
Awarded	-0.231	0.013	0.019	-0.07	0.215	-0.213	-0.130	0.139	-0.323
(1996)	P=.005	P=.392	P=.341	P=.111	P=.000	P=.000	P=.004	P=.002	.000
Total	-0.131	0.131	0.140	-0.126	0..304	-0.249	-0.148	0.119	-0..355
awards	P=.003	P=.003	P=.002	P=.022	P=.000	P=.000	P=.001	P=.007	P=.000

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The advantage with the Spearman's correlation coefficient is that they show both the direction and the significance of the relation between variables. (The significant figures are underlined). Using the this analysis it is possible to relate variables and attitudes to each other in the way described in the footnote.[1] From table 4.7 we learn that success rate is not significantly correlated to attitudes on the senior power question. From this follows that the attitudes on this question is not only a matter of how successful you have been. But, on the other hand there seem to be a quite strong relation between the referee variable and success rate. The same is true with age and sex, which means the older you are the bigger chance of getting funded, and that women have had a low success rate between 1991–1995, but the last year they seem to have had a fair chance of receiving funds.

Success rate is positively correlated with opinions on how the peer review system is used in the TFR operation. That is understandable and natural. Strong negative correlations can be found when it comes to attitudes like ”Risk”, ”Relevance” and ”Spread out”. People with high success rate are happy with the actual policy of TFR and do not want any changes. Obviously the respondents with low success rate hold the opposite opinions. And those researchers are many and young, they are not so established in the research community.

Favouring and Opposing Changes in the Peer Review System

Is cynicism to the operation of the peer review system at TFR related to a will to change the system? The strength of this attitude in table 4.6 is very clear and obvious. Respondents with a dedicated attitude on senior power do also have a tendency to favour changes in the peer review system. We find a strong desire for identification of peer names and a bit weaker wants when asked on opinion on whether applications should be sent to peers anonymously. A desire for better motivations is a change which is called for by many of the respondents (see table 4.2). Those with dedicated attitudes on that question seem to be more in favour of radical changes. Actually this group have a stronger desire for change than respondents with critical opinions on senior power.

From the analysis in table 4.8. it is indicated that researchers who express the attitude that TFR treat women and young people unfairly, also have a desire for changes in the system. There are for example a positive correlation between the variables ”Women”, ”Young researchers” on the one hand, and ”Identity”, ”Anonymity”, ”Spread out”, and ”Motivation” on the other. Certainly those groups of researchers want to have a more open and pronounced process. They want to set up new rules of the game. As was shown above, these groups are also the respondents with a low success rate. From this we can conclude that there is a strong correlation between success rate and desire for change. It is, however, interesting to notice that the attitudes towards the TFR peer review system in general are not at all that strongly negatively correlated with the variables ”Women”, ”Young” and ”Senior power”. This indicates that the researchers

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[1] In the Spearman correlations we have not used the method of reducing answers on the correlating variable that was desribed in the footnote above. Instead the reducing operation is only done on ques-

are dissatisfied with the openness and the transparency of the system, not the system itself.

Table 4.8 Desire for Change Correlated to Other Variables.

	Anon	Ident	Women	Young	Mot.	Tot. award.	TFR.PR OK	PR.OK
IDENT	0.129	X						
	P=.003							
WOMEN	0.203	0.055	X					
	P=.000	P=.128						
YOUNG	0.126	0.158	0.407	X				
	P=.005	P=.001	P=.000					
JUSTIF	0.193	0.175	0.219	0.149	X			
	P=.000	P=.000	.000	P=.001				
TOT AWARD	-0.120	-0.144	-0.171	-0.225	-0.180	X		
	P=.006	P=.001	P=.000	P=.000	P=.000			
TFR.PR OK	-0.049	-0.180	-0.004	-0.111	-0.06	0.119	X	
	P=.153	P=.013	P=470	P=.011	P=.109	P=.007		
PR. OK	-0.245	0.034	-0.004	0.063	0.054	0.032	0.314	X
	P=.306	P=.237	P=.464	P=.097	P=.131	P=.251	P=.000	

Attitudes to Swedish Research Policy

What do the researchers think about the severe changes in Swedish research policy? In the questionnaire not more than five statements were explicitly dedicated to general policy issues. The questions and their responses are displayed in table 4.9.

Table 4.9. Attitudes on Research Policy

Statement	Disagree	In between	Agree	N=
The wage-earner funds could be used more efficiently if the research councils distributed them.	22	12	66	386
New forms of co-operative funding such as competence centres, materials consortia, and technology transfer organisations, contribute to the impoverishment of basic engineering science in Sweden.	31	19	50	366
A part of Research Council funding should be transferred to the faculties	67	10	24	375
Engineering research should be performed in closer contact with industry.	51	31	18	411
Doctoral degrees could be efficiently done in three years.	81	7	12	423

Scepticism towards the new foundations (SSF and MISTRA & others) is an apparent mood among the respondents, and this is understandable. During the period when the questionnaire was distributed there was an intense political discussion on this issue. It became obvious for a large part of the research community that some of the money previously distributed by the councils would be withdrawn. The government declared that the foundations had the task of replacing what was withdrawn. NUTEK lost 26 % of their funds and the councils 14 %.

In most of the cases the attitudes to these questions are those to be expected. Engineering researchers do not like the idea of council funding directly transferred to the faculties. A vast majority want project decisions to be made in a peer review system, and do not want be dependent on faculty policy when they have good ideas for research projects. In interviews it is revealed that funding from the TFR is one way of getting legitimised in the research community . If you are funded by TFR, it is much easier to apply and get funded from other agencies.

We did not expect that so many respondents would agree with the statement regarding new co-operative forms of funding (competence centres, materials consortia, and so on). The attitude among a large part of the project leaders seems to be that these forms of funding contribute to the impoverishment of basic science in Sweden. The figures on agreement and disagreement indicate that researchers might be divided on this issue.

Divisions in the Community?

We will have to go further with the attitudes to new forms of funding, and we have done some groupings of the material in order to search for explanations of the pattern of attitudes.

Firstly, we have distinguished between two groups: those who describe themselves as researchers doing basic science, and those who do not describe themselves in these terms. We call the groups ”basic” and ”applied”. Secondly, we have divided the material according to the respondents’ contacts with private firms. Those who for the time being have private funding are called ”industry” and the others are called

”university”. What the groups ”applied” and ”industry” have in common is that they have more funding from NUTEK.

Are there any significant differences between respondents in each group? If we start with the basic-applied dimension, it is apparent that to a large extent the applied group have patents. The ”basics” have in common the fact that they are situated in the five big universities (KTH, CTH, LU, LiTH and UU).[1] Investigating the differences regarding attitudes between the group’s reveals that there is some, but not too much shifting of values. As expected, there are different answers to the need for industrial relevance. The applied group did not agree with this statement. Questions dealing with the operation of the TFR system do not seem to differentiate between the groups except in one case; although the groups seem to have just the same success rate, there is a tendency in the applied group to be a little bit more critical when asked for their opinion on the operation of peer review at the TFR.

The applied group describe themselves as interdisciplinary researchers to a larger extent. But that is the only clear-cut difference when we ask for their opinions on TFR (MERIT, RISK WOMEN etc.) and the peer review system. Another picture emerges when it comes to the research policy questions. There are some sharp differences between the basic and applied groups on two issues. The first is the new foundations (SSF and MISTRA), where it is apparent that it is basic researchers who are worried about their future. The second is the impoverishment issue where, the same pattern is revealed.

Does the same pattern appear when differences between ”industry-” and ”university” researchers are investigated? This investigation has been performed more thoroughly and reveals many more differences.

Private funding is more common in a couple of the TFR fields of research, namely Chemistry and Mechanics. The ”Industry”-group has a lower success rate, and their judgement on the TFR process is clearly more critical. They are also more experienced as they have been inside the research system for a longer period, but they seem to be less productive when it comes to publishing articles. They are, naturally, patent holders. They have had funding from the former STU and have it nowadays from NUTEK. (This difference is clearly significant!)

The industry group seem to be more directed towards interdisciplinary research and not as few respondents in that group believe that kind of research is unfairly treated by the TFR. The university group would like to underline scientific quality to a larger extent in the selection process. They also agree with the statement that relevance is too heavily emphasised by the TFR, while the industry group does not. Interestingly, there is also a difference between the groups on the ”spread-out” (distribution) question. The university group is more positive to a wider distribution of funds than the industry group. That might indicate that the latter group does more large project research, and that the former group is more dedicated to traditional one-person, one-subject, projects.

There are, of course, some differences between groups on the research policy questions (foundations and impoverishment). This is expected and significant.

Does this indicate a cleavage in the research community? Once again it seems easy to find arguments for both ”yes” and ”no”. Differences do not always indicate problems, but it might be necessary for the TFR to keep in mind that their clients are divided into at least two groups. These two groups could be described in terms of their degree of interest in application-driven research, or in terms of a split between those researchers who accentuate basic research and those who stress applied research. Or the two groups could be described in terms of a division between researchers with a focus towards industry and researchers with an explicit orientation on university research.

This will not pose a problem for the TFR if only the peer review process operates in a proper manner for both groups. There are some indications that the applied and industry groups are slightly more disappointed. At least there is a tendency for them to believe that the system should be reformed at the TFR.

A major part of the problem may lie in the definition and understanding of what exactly is meant by pure, basic, applied, strategic, development. Many of the differences and resulting tensions may be a result of misunderstandings and semantics.

5. EVALUATION OF RESEARCH PROPOSALS AT TFR

To get a more in-depth and detailed description of the evaluation process at TFR, some results from two different investigations will be presented and discussed. The first investigation was carried out within the framework of this study. It was an interview survey where a selected number of members from all of the evaluation committees where interviewed about how the peer review process in the committees worked. The second investigation was carried out by the secretariat of TFR during the fall of 1996. This investigation was based on discussions at meetings with the chairmen of the committees and on descriptions of the process made by the members of the committees themselves.

The evaluation committees at TFR represent different academic disciplines and backgrounds. It is, therefore, to some extent natural and justifiable that the peer review procedures are different from committee to committee. The empirical material has, however, shown that there are some important differences between the committees, which are not necessarily dependent on differences in academic tradition and the character of the research. The purpose of this section is to explore what different kinds of procedures exist among these committees, and to identify problems in these procedures.

For this purpose we have chosen to concentrate our analysis on four different aspects of the evaluation process.

1. The use of international peers
2. The number of peers/proposal
3. Criteria for evaluation
4. The openness of the peer review process

The reasons for concentrating our analysis on these factors are twofold. First, these are issues that are frequently discussed and argued about in the academic literature and public debates about the peer review system. Second, these factors have also been identified as important on the basis of results obtained from the questionnaire reported in chapter 4. It should be noted that all of TFR committees are analysed based on these factors; with one exception : the committee for medical technology and interdisciplinary research. This committee has a changing focus from year to year, and primarily consists of chairpersons from other committees. The number of applications evaluated by this committee was also very low in 1996, only 24, which is less than 4% of the total number of applications this year.

International Peers

Using international instead of domestic peers is generally considered as a way of dealing with two problems:

1. The problems of smallness and an old-boys network. In a small country with a small research community (such as Sweden), everybody generally knows each other. This leads to a tendency to ”scratch each other's backs”. Peers from other research communities are considered as independent from this community and the presence of friendship relations between the peer and the applicant is less plausible. Therefore, it is argued, an international peer can make a more objective, or less subjective, evaluation.

2. The issue of the competence base. In many research areas the Swedish research community is too small to be able to find a competent peer for evaluation purposes. It might therefore be necessary to go beyond the national level to find a competent peer.

These two advantages can also be considered as the criteria on which basis an international peer can be evaluated. We will refer to these criteria from now on as the ”independence criteria” and the ”competence criteria”.

These advantages have to be contrasted with a number of disadvantages of the method. First, there is the problem that international peers normally have a limited knowledge of the Swedish research system. There can, for example, exist cultural, and/or national differences between the way researchers present their research in applications. In the Swedish system, for example, researchers are supposed to state what they intend to do, including possible results, in a research proposal. In the US, researchers put more emphasis on how they intend to carry out the project.

Another disadvantage can be the problem of finding good peers. It might be hard to convince the ”best” peers to participate, with the result that the ”international peer” does not represent the research front, and simply becomes a legitimation of decisions already taken (although he/she could, in principle, fulfil the independence criterion).

It is also possible to question the first argument in favour of international peers. At least within many research fields the research community is more or less international. The consequence of this is that an international researcher could be involved in a professional and friendship link with Swedish researchers in very much the same way as domestic researchers. The importance of national borders is diminishing.

As we have seen in the description of TFR's objectives as they are formulated in different policy documents, there has been a tendency at the Council to emphasise the wide use of international peers to evaluate applications. But how often is this instrument really used? Can we observe differences between the different committees in this respect?

At the TFR there are two major ways to use international peers. The first is to use peers from foreign universities as members of the committees. The second is to send out the proposals to peers abroad for external evaluations. This second procedure can be further divided into two subtypes depending on whether the peer is chosen and contacted by the chairperson of the committee or by an ordinary member of the committee.

Table 5.1: Use of international peers in different evaluation committees

Committees	Chem	Comp	Math +Sig	Bio	Elec	Phys	Mtrl	Mech
Is there frequent use of international peer's external to the committee?	No	Yes	Yes	No	No	No	No	No
Are there members of the committee from foreign countries? (Foreign members/total number of members)	2/8	2/6	0/6	1/8	3/6	2/8	0/6	0/9

Sources: TFR internal report 1996 and interviews with committee members.

As we can see in table 5.1 there are obvious differences between the various committees. Only in two committees are external international peers used to evaluate almost every proposal: Computer Science and the joint committee for Scientific Computing and Signals & Systems. It is true that the other committees also use external international peers, but not at all to the same extent. In the other committees external international peers are used for special cases where, for example, competence are low in a certain research field in Sweden (or in cases of conflict of interest).

The interviews with members of committees also indicated that there are differences in opinions about the value of external international peers. In the committees where international peers are used only in special cases, it was often considered as a problem that these peers did not understand or did not have knowledge of the Swedish system. In the few committees where international peers were used more frequently, the opinions were different. These people pointed out the importance of being evaluated by the international research community to be able to keep up international standards. It was, however, pointed out by one of the members of an internationally oriented committee that international peers can be or more or less valid instruments in depending on the field of research. He argued that in mathematics, for example, international peers made a lot of sense since a lot of work is done individually, which means that the context, the quality of the research group, matters less than in other fields where the research process is perhaps more group oriented.

A problem with using external international peers in evaluating research proposals is sometimes what we can call the problem of lack of comparison. If an external international peer only gets one proposal to evaluate, he/she cannot relate this to the quality of the other proposals. If one believes in some kind of objective criteria for what is good quality in a specific field, this might not be a problem, but, as we argued before, there seems to be the case in most fields that there exist several parallel academic paradigms. As suggested by the chairperson of subcommittee Scientific Computing and Applied Mathematics, it might therefore be a solution to send out several applications to each external peer that is used by a committee. In this way the peer gets some idea of the general quality of the applications and can, above all, do a ranking among his different applications.[1]

As for internal international peers, the committee for Electronics, Electrical Engineering and Photonics has the highest share of members from institutions abroad. Three out of six members of the members of the group are from other countries. In addition Computer Science performs a strong international profile in this category; two out of six members are from abroad. Three of the committees (Signals & Systems, Applied Materials Science, and Mechanical Engineering) have no members from abroad at all.

As mentioned above, there are, problems with using international peers. We must, for example, ask ourselves if the peers that are members of the committees are really independent of the Swedish research system. The first remark that can be made is that five out of a total of ten foreign members in the committees are from Scandinavian countries.[2] With existing, rather close Scandinavian links (including similarities in language and culture) the extent to which these peers should be considered international can be questioned. Furthermore, at least two of these researchers have done several years of research in Sweden, and one of them has also been the head of a Swedish research institute. This means that it could be argued that they are actually ”inside” the Swedish research community, and would therefore not fulfil the criteria of independence. This, of course, is not an argument against the use of these specific peers per se. Naturally the other strong argument for using international peers, the lack of Swedish competence in a certain research field, can still be valid. We would, however, argue that this is not the primary reason for using international peers. Instead the main argument is the ”independent-argument”, and it is doubtful whether the Scandinavian researchers fulfil this criterion as international peers.

To summarise we can see that there are several differences between the committees. When the different committees are compared to each other in this respect one committee stands out: Computer Science. In this committee most of the proposals are sent to external international peers, and two of six members of the committee are from universities abroad. No other committee uses international peer reviews to the same extent as this one. The committee for Scientific Computing also uses international peers to a higher degree than most other committees. The committee on Electronics, Electrical Engineering and Photonics also has a very strong international profile, but only in terms of many members from universities abroad in the committee, not of a consistent use of external, international peers. (half of the members of the committee are from universities abroad). The other committees have less or no members from universities abroad and use external, international peers to a limited extent.

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a [1] This method is used by Norweigan Research Council in some of their evaluations of research proposals.

[2] *Beredningsgruppernas sammansättning hösten 1996,* Bilaga nr 13 95/96. TFR:s protokoll 1996-06-

Number of Peers

As mentioned earlier, the peer review system is debated and many of the themes in that debate are summarised in Simon Cole's book *Making Science* (1992).[1] He argues that the system does not consider the fact that there is never one truth in the scientific community, instead several paradigms exist at the same time. If this is the case, this means that whether your proposal gets awarded or not is to a large extent dependent on which peer(s) that is chosen to evaluate your proposal. One possible solution to this problem is to use many peers, and perhaps also try to get a more or less wide range of types of peers. The system in Australia seems to be a model that can manage to correct for this problem.

It is true that at the TFR the responsibility for evaluating the proposals is given to committees consisting of between four to nine members, and the committees' final proposal to the board is taken as a collective decision. The detailed evaluations, however, are made by a small number of people in the committees (sometimes in co-operation with external peers). So how many peers are actually involved in doing detailed evaluations of the proposals? As we will see in this sect there exists some differences between the committees ion on this dimension (see table 5.2).

Table 5.2 Numbers of peers per application in each committee

Dossier	Chem	Comp	Math+ Sig	Bio	Elec	Phys	Mtrl	Mech
Number of peers/application (Chairman+member/ external peer)	1+1 or 2	1+1 or 3*	1+1 or 2	1+1	1+1 or 2	1+1 or 2	1+1	1+1 or 2

Sources: TFR internal report 1996 and interviews with committee members.

The committee that seems to have adopted as a rule the use of many (more than 2) referees is the committee for Computer Science. As we could see in the earlier section that committee also make frequent appeal to international peers, which are included in this number. Apart from these committees the number of peers that actually evaluates the application seems to be low. If there exists even the slightest risk that the choice of peer can be decisive in determining success of a proposal, the solution would be to use many peers to evaluate each proposal. The disadvantage of using many peers would perhaps be that it could cost more money, and more time. These factors, however, have not stopped the committee for computer science from using many peers.

The issue of the number of peers has been taken up in discussions about evaluation committees between the different chairpersons and the secretariat of the Council. One of the conclusions from these discussions was that it was preferable if at least *three* members had read the proposal before the committee meeting. Due to the discussion

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above this number does seem to be minimal, and a higher number should probably be necessary.

Single or Multiple Criteria?

As was pointed out earlier, the evaluators use three criteria to grade each proposal; but how important are these grades when the committees make their decisions?

In the questionnaire sent out to the applicants in 1996, the researchers were asked to fill in the grades they got on their proposals. Their answers gave a material that can be used for a discussion of the importance of the grades in the final evaluation process (see diagrams in appendix G).

Committees such as Applied Materials Science, Mechanical Engineering and Biotechnology have a rather normal (bell-curved) distribution of grades, which seems to indicate that the grades are important as selection mechanisms in this process. High grades normally mean funding, while low grades means no funding. This explanation is also strengthened by the interviews. In, for example, the committee for Mechanical Engineering, the interviews indicated that the grade system seemed to play an important role. The committee meeting (when the final decision about proposals is made) is, for example, concluded with a presentation of the total grades of all the proposals on the blackboard. Interviews with members of the Applied Material Science committee also indicate that the grades are important selection mechanisms.

In committees such as Physical Engineering and Chemical Engineering the grades seem to play a less important role for the evaluations. Most of the proposals get very high grades, and around 45% get the highest grade possible. Since only about 25% of the applicants get funding, this means that getting a high grade does not necessarily mean that you get funding. In fact, in two of the groups, perhaps only 60 per cent of the applications that got an average of 5 were awarded funds. The conclusion is that other undefined criteria have to be used to make a final decision.

There are also differences in how the committees operate their meetings. In most committees the applications are discussed in the first round in order of registration number, but there are exceptions. In one group, Computer Science, the applications are discussed in order of university/college. In most of the other committees, each member presents all his/her applications at the same time, followed by the next member, etc.

Open or Closed Review System?

Should the applicants be contacted during the evaluating process about their applications or not? In most committees this does not seem to be the rule, but some individual members have a different opinions about this. It could sometimes be good, they argue, to hear directly from the researcher what he/she really wants to do, whether he/she is able to carry out a project with less funding, etc.

The responses from the researchers in the questionnaire clearly show that knowledge about TFR and its peer review system is limited. For example, it is not clear to everybody whether one or several peers have evaluated their proposal. Quite many researchers whose proposals were rejected also claim that their applications have been course, only be expressions of dissatisfaction being rejected, but we think that it is important to take these opinions seriously (compare discussion in chapter 4).

One possibility of coming to grips with this problem is to give the applicants an opportunity of feedback during the evaluation process. In fact, some members of the committees did make contact with applicants during the process, but these were exceptions. Most committee members had the view that the applicants should not get the opportunity to give feed back or comments, except in very special situations. One of the members, for example, called applicants to ask such questions as: ”If you get half of the funding you asked for, what will you (or can you) do then?”.

In the investigation done by the secretariat of TFR, one suggestion that came up was to create an ”application set” for the peer just as the procedure in the Australian system (where it is called the Black Box). This set should include some supervision and application forms, but also some front pages of a number of compulsory appendices.

Heterogeneous TFR – Four Models

In this section we have shown that there are differences between committee evaluation procedures on two dimensions in particular: the use of international peers, and the use of grades as mechanisms for selecting proposals. On the other two dimensions the differences seem to be less. Only the committee for computer science has a larger number of peers/application, and this depends on its frequent use of international peers. The openness and the feedback procedures seem to be similar among all the committees.

Based on these two crucial aspects of the work of the committees, we have identified four different models of evaluating research proposals that can be observed in the TFR committees. Our analysis below is a bit provocative, but at the same time of importance for the current discussion about the operation of the system. We suggest an understanding of the different models which tries to detect their historical ancestors.

1. The NFR model

The model is characterised by the fact that grades seem to be of less importance and by a relatively limited use of international peers. The committees in this model are responsible for traditional research areas and closely connected to supporting engineering sciences directed towards the natural sciences, e.g. Physical Engineering and Chemical Engineering. Generally, they use the same procedures as the ones normally followed in the NFR.

2. The Transfer Areas

The committees using this model are research areas that are ”new”. They could also be said to complement other research areas under the umbrella of TFR. They have evolved as engineering sciences during the STU-period and were the fruits of research foresight and proactive management of programme managers at that agency. Examples are the committees for Computer Science and Signals & Systems. The transfer area model is certainly characterised by a wide use of international peers, and also many peers per application, completely in line with TFR policy. The most important dimension in this model is to support research groups and not individual projects. That is the management dimension of research funding.

3 The Traditional Model

The committees using this model are the research areas which did not have a ”natural” fund-giving agency before the creation of TFR. Examples are Mechanical Engineering and Applied Materials science. This model is characterised by the fact that grades seem to play an important role, but there is a limited use of international peers.

4. The TFR Model?

The comittee for Electronics, Electrical Engineering and Photonics represents a model that has some components of each of the three others. They do use internationel peers, but mostly inside the committees work. The number of external peers are small. Otherwise they have the same procedures as the NFR-model, and although they are an old area of technology they are not as bounded to the grades as in the traditional model.

This was a very generalised description of how the committees actually work. The following question is whether any of these models should be preferred to the other? Based on the analyses above and based on the objectives set up by TFR themselves, three factors have to be stressed on this point. First, the use of international peers should be used in a more frequent way than is so today. This is stressed in TFR’s formulation of policy , and should therefore also be reflected in the implementation of this policy. Second, the number of peers/project should be higher. This would be one way of dealing with suspicions of ”old-boys' network” critique from the researchers. Third, it should be made clear what kind of role the grades play in the selection of proposals. At the moment it seems as if there are major differences between the different committees in this respect.

Until now we have concentrated our analysis on TFR, without looking at other research funding agencies and their policies. Even though we cannot do an in-depth comparison, let us finally take a brief look on how the processes at TFR work as compared to other research councils in Sweden.

TFR in Comparison

Let us first look of some figures concerning the role of the research secretaries at the different research councils (see table 5.3).[1] In general the role of the secretaries has not been very prominent within the councils. Their role has been limited to functioning primarily as secretaries to the peers in different evaluation committees. However, in many of the councils, the number of people working with other tasks such as information or international co-operation has increased. This contrasts to the role that research secretaries play at the research agencies funding more applied-oriented research in Sweden (so called sectorial research). In these agencies the secretaries make decisions themselves or in a collegial form together with other secretaries, most often after a process where a proposal has been refereed by peers or/and industry (See Sandström 1997).

TFR in this comparative perspective is a council with a rather small secretariat: It has 12 people, and among them there are only four research secretaries working directly with the evaluation process. The Council for Medical Research (MFR) has fewer re-

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search secretaries (2), but a larger staff in total (18). It is also interesting to notice that TFR has a much smaller staff and consequently smaller costs for this staff, than HSFR, which has a research budget that is somewhat smaller than TFR's.

Should research secretaries play a more important role in the evaluation process? This would go against the ruling norm among the research councils in Sweden, but internationally a model with stronger research secretaries is not unusual. At The National Science Foundation (NSF) in the US, so called ”program officers” (equivalent to research secretaries) play a vital role in the process of evaluating proposals. The officers send out the proposals to a certain number of peers before the final decision is made in the board of the Foundation.

Table 5.3 Budget and staff in Swedish Research Councils

Agency	Total Budget MSEK	Staff Budget MSEK	Number of Staff[1]	Research Secretaries[2]	Research Secretary/ 10 MSEK
NFR	595	18.6	40	7	0.12
MFR	365	13.1	18	2	0.05
TFR (incl. HPDR)	307	8.8	12	3	0.10
HSFR	226	10.0	15	8	0.35
SJFR[3]	168	4.9	11	4	0.23
SFR[4]	88	5.7	7	4	0.45
FRN	79[5]	9.4	34	8	1.01

Note: Data on budget and staff FY 1994/95. (Source: Reg. prop 1994/95:100 and WWW).

There is, however, no reason to limit the discussion to the Swedish research system. Although we cannot give a total picture of other countries’ procedures when research proposals are selected, we will focus on a few interesting examples.

It is an old truth in comparative social science, that one should try to compare countries that are as similar as possible on as many variables as possible. When comparing countries it is a common method to keep some general variables constant by comparing countries of similar size and, for example, political and socioeconomic situation. Following this principle we have chosen to present a couple of examples from the Netherlands, a country which is rather similar Sweden in size, socioeconomic and, partly, political situation.

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[1] Secretary generals included. Data on number of staff, not working time on yearly basis.

[2] Secretary general and Head of office not included.

[3] The Swedish Council for Forestry and Agricultural Research (SJFR) reports to the Ministry of Agriculture.

[4] The Social Research Council reports to the Ministry of Health and Social Affairs

Dirk J van de Kaa (1993) discusses some different models used by grant-giving public organisations in the Netherlands. The most common models used by NWO are the two types of committee models, one simple and one complex variant. The committee model in general basically means that the final assessment of a research proposal is the result of oral discussion in a committee of assessors. In the simple model the committee obtain advice from experts in the field, partly proposed by the applicant, partly porposed by the committee secretariat. The members of the committee makes their individual assessments of applications based on this advice during a meeting of the entire committee.

This simple model is primarily used in larger research programs. For more direct project funding, a more complex variant of the committee model is used. In this model the applications are assessed in a first step by a so-called study group, which is a national forum bringing together all qualified university researchers in the particular field of study concerned. In the next step this general assessment is assessed in more detail by a committee assigned by the study group. This committee makes their decisions based on written advice from experts, which is submitted to the applicants, with a request for comments. The final assessment of the committee, in the form of both an absolute assessment of quality and a priority list, is based on these advice and the comments from the applicants. In the third step the final decision is made by the board of the foundation. The whole procedure takes about seven months.

These committee models are similar to the general model with committees used by TFR. The Dutch model seems to involve many more individuals in the process, since advice is obtained for all applications. In the first step, although it is hard to value the real influence of this group, the whole research community within a field is involved. Another important difference is that in the Dutch models the comments from the advisors are sent out to the applicants during the evaluation process. As shown in the earlier section the members of most committees were sceptical about the procedure of contacting the applicants before a final decision.

Another type of model is used by The Technology Foundation of the Netherlands (STW). This is an organisation for sponsoring and supporting technology and technological research. It uses an evaluation model of research proposals which was created to avoid problems of too few peers and ”old-boy's networks”. Each proposal is sent out to five persons, both peers and people from industry, who evaluate the proposal on the basis of two criteria. From these evaluations one of the programme officers compiles a document, which is sent back to the applicant for comments. A final document is then provided to a jury consisting of 12 ”highly qualified” persons from the university, government and industry. Every time STW has received 20 new proposals, a new jury is set up with a new set of members. Each member evaluates each proposal based on two criteria, quality and relevance, on a scale from 1 to 9. A mean is calculated, and a priority list with all the proposals is set up. Finally, the board of STW makes a decision in accordance with the priority list.[1]

The three most interesting aspects of this model are (1) that it includes a very high number of people who actually evaluate the proposal in detail, (2) that the creation of a new jury for every 20 new proposals enables a lot of people in the system to be a part of the evaluation procedure, and (3) that the applicant is given an opportunity to give some feed back during the evaluation process. Thus the model provides ”checks and balances” that limit the risk of personal biases, and ”old boys' network”. The evaluators are not only peers, but also include individuals from government and industry, which make the model more application-oriented than the models used by TFR committees.

SVENSK SAMMANFATTNING

Utvärderingen har organiserats som tre undersökningar: Den första bygger på TFRs projektregister och har analyserat fördelningen av forskningsmedel över tid och mellan olika teknikområden. Den andra undersökningen baseras på en större enkät som besvarats av de forskningsledare som ansökt om forskningsmedel under 1996. Den tredje undersökningen, slutligen, har genomförts som en serie intervjuer och studier av TFRs beredningsprocess i kommitteer. Intervjuerna har riktats till kansliet och till beredningsgruppernas ordföranden och ledamöter.

Sammanfattningsivs kan sägas att TFR förefaller ha funnit sin plats i det forskningspolitiska systemet. Rådet har ett kvalitetsinriktat bedömningssystem som uppskattas av forskarkåren.Verksamheten i sin helhet erhåller ett eftertryckligt stöd av forskarna. Det framgår med önskvärd tydlighet av den enkät utvärderingen arbetat med och som har besvarats av närmare 500 projektledare, som sökte anslag hos rådet under 1996. Svarsfrekvensen var drygt 75 procent, vilket får betecknas som tillfredsställande. Av enkäten framgår att ungefär tre fjärdedelar av respondenterna är positiva till TFRs handläggnings- och beredningsprocess. Trots att inte mer än en tredjedel, av dem som besvarat enkäten, har erhållit anslag i 1996 års ansökningsomgång, är de överlag mycket positiva till TFR och framhåller rådets betydelse i det svenska forskningssystemet.

Om enkätpopulationens karakteristika kan följande noteras: Åldersmässigt och med avseende på tjänsteställning är enkätpopulationen jämt fördelad – en tredjedel är under 40 år, en tredjedel mellan 41 och 50 år och en tredjedel över 51 år. På samma sätt fördelas populationen över professorer, lektorer och övriga. Över 40 procent mottog sitt doktorsdiplom under 1980-talet, villket visar att de som ansöker om medel, i egenskap av projektledare, är förhållandevis unga forskare. Av enkätens frågor framgår att mobiliteten också inom denna kategori av svenska forskare är påfallande liten. Majoriteten av de som besvarat enkäten har ännu inte hunnit publicera särskilt många artiklar i vetenskapliga tidskrifter. Däremot är det tydligt att det skriftliga samarbetet med forskare från andra länder har fått ett starkt genomslag. Likaledes är det en stor andel som uppger att de publicerat sig tillsammans med forskare från annan disciplin. Få har patent, endast ett tiotal respondenter har mer än fem egna patent. Andelen kvinnliga forskare är fortfarande mycket liten, inte större än en tiondel av enkätpopulationen.

När respondenterna får karakterisera sig själva med avseende på forskningsinriktning framträder en jämn fördelning mellan dem som inriktade på grundforskning och dem som har sin tyngdpunkt förlagd på andra typer av forskning. En stor andel uppger sig huvudsakligen arbeta med grundforskningsuppgifter och en lika stor andel anser sig vara tillämpningsinriktade. Beteckningen strategisk forskning är en kategori som vunnit burskap – många anser sig ha en position mellan grundforskning och tillämpad forskning. Två tredjedelar vill gärna kalla sig tvärvetenskapliga forskare. Ett stort antal har erfarenhet av de nya anslagsformer som uppkommit till följd av materialkonsortier, kompetenscentra, löntagarfondsstiftelserna, teknikbrostiftelser, EU-program etc.

Även om många uppskattar TFR och dess funktion är det samtidigt många som upplever stark frustration. FoU-medlen inom TFR är små och det är många som vill ha del av resurserna. Bevillningsandelen har under hela perioden legat runt 25 procent. (1995 var den dock 36 %). Under den period som enkäten genomfördes var det dessutom ett osäkert läge om den framtida forskningsfinansieringen, vilket sannolikt har påverkat utfallet och attityderna. Det bör även noteras att antalet sökande sjunkit avsevärt under senare år – från cirka 850 till cirka 650 per år.

Många uttrycker tillfredsställelse med TFRs hantering, men en relativt stor grupp (25 procent) uttrycker ett direkt missnöje med beredningsprocessen. I så gott som alla fall sammanfaller denna grupp med dem som erhållit avslag på ansökan om forskningsmedel. Det finns ett starkt samband mellan forskarens ålder och hans förmåga att dra till sig anslag. Ju kortare tid man varit del av forskarsamhället desto svårare att erhålla anslag från TFR. Detta förhållande fäster vår uppmärksamhet vid de integrativa aspekterna av ett forskningsråds arbetsuppgifter. Ett spörsmål som vi får anledning att återkomma till.

Klagomålen handlar i stor utsträckning om det utlåtande (review report) som TFR skickar ut till de sökande som svar på deras framställan. Många efterfrågar bättre motiveringar och nöjer sig inte med några få rader i beskrivning av projektets eventuella svagheter. Andra ifrågasätter och förvånas över att de erhållit högsta betyg, men ändock blir utan forskningsmedel. Det är sannolikt så att den höga status, som följer med TFR-anslagen också betyder, att forskarna förväntar sig en, på ett eller annat sätt, användbar feed-back.

I enkäten utnyttjades möjligheten att pröva ett antal attitydfrågor om tre skilda företeelser: (1) TFR och TFRs policy, (2) peer review systemet och (3) svensk forskningspolitik. Låt oss kort redogöra för den bild som framträder av denna attitydundersökning.

Enkätpåståendet att TFR borde ge utförligare motiveringar till besluten ger en kraftfull respons. Närmare två tredjedelar svarar instämmande. Hälften av respondenterna menar också att det finns en tendens inom TFR att undvika projekt där utfallet är osäkert och där riskerna är höga. Frågor om huruvida TFR missgynnar tvärvetenskap eller unga forskare; om TFR borde understödja mer samarbete mellan forskare; om TFR borde utvärdera sina teknikområden oftare, möter en delad respons där svaren fördelas ungefär lika mellan instämmande och avståndstagande. Få instämmer i påståenden som att TFR skall ta fasta på industriell relevans eller sprida ut forskningsresurserna på flera anslag, eller att TFR missgynnar kvinnliga forskare.

Det påstående som vinner största andelen instämmande svar (av den andel som besvarat frågan) var formulerad enligt följande: ”TFRs beredningsprocess domineras av en liten exklusiv grupp av seniora forskare”. 66 % svarade instämmande på denna fråga, (men det bör observeras att svarsandelen på denna fråga inte var större än 60 procent). Formuleringen av påståendet ger inte direkt anledning att jämföra denna opinion med den relativt vanligt förekommande kritiken mot ”old boys network” i anglosaxisk diskussion om peer review-problemet, men våra undersökningar visar att seniorpåståendet har att göra med attityd med relativt starka inslag av cynicism. Denna cyniska hållning visavi forskningsrådssystemets funktionssätt återfinns inom stora delar av forskarkåren. Det är i stor utsträckning yngre forskare, som ger yttryck för dessa åsikter. De har svårt att erhålla anslag. Det bör också framhållas att åsikterna sammanhänger med en stark vilja att reformera systemet, t.ex. att avidentifiera sökandes namn eller att ge identitet åt dem som deltagit i utformningen av review report.

I rapporten ägnas relativt stort utrymme åt att utreda hur den här opinionen ser ut och hur den skall förklaras. Här har TFR onekligen ett problem som kan hanteras på flera olika sätt. Det kan ses som en informationsuppgift: TFR skulle kunna vara tydligare om sina rutiner. Det bör åtminstone inte tas för givet att forskare har kännedom om hur ett forskningsråd arbetar och hur beredningsarbetet går till. Det kan också ses som ett organisationsproblem. TFR skulle kunna arbeta med rutiner som involverar flera forskare och på detta sätt erhålla en större öppenhet och en större förståelse för systemets allmänna villkor, dvs fästa större vikt vid de integrativa aspekterna av sin verksamhet.

Attityderna till den svenska forskningspolitiken är relativt tydliga och ensartade. Det fanns, när enkäten distribuerades och besvarades, en stark motvilja hos ett stort flertal mot löntagarfondsstiftelserna, som ett inslag i det svenska forskningssystemet. Två tredjedelar av respondenterna instämmer i påståendet att stiftelsernas medel skulle hanteras effektivare av forskningsråden (av 386 svarande på denna fråga). Inte heller andra nya former av forskningssamarbeten och nätverksinsatser ses med särskilt blida ögon av dessa svenska forskare. Många av dem (hälften av 366) delar påståendet att dessa nya former har bidragit till att utarma villkoren för grundläggande forskning. Försvaret av forskningsråden är däremot ett framträdande drag i svarsbilden.

Bearbetningarna av enkätsvaren har vidare visat att det bland de sökande av TFR-anslag finns flera distinkt skilda grupper. En första dimension för att sortera dessa grupper har att göra med forskarnas inriktning – grundforskning eller tillämpad forskning. Den andra dimensionen är besläktad – universitetsforskning eller industriinriktad forskning. Sammantaget kan hävdas att dessa bildar två grupper som har påtagligt skilda erfarenheter, inriktning och uppsättning av attityder. Detta förhållande påverkar sannolikt förutsättningarna för TFRs arbete och bör tas med i framtida diskussioner om arbetsformer och policyutveckling.

Hur har TFRs anslagspolitik utvecklats? Har rådets prioriteringsarbete resulterat i omfördelningar mellan teknikområdena? Våra bearbetningar av TFRs projektregister visar, som redan nämnts, att det redan efter några år skedde en dramatisk sänkning av antalet ansökningar. Detta har gjort att bevillningsandelen har hållits uppe. Till avgörande del är det de större teknikområdena, Kemiteknik, Bioteknologi, Signaler & System och Elektronik, som svarar för detta sjunkande ansökningstryck.

TFR har som sin policy att utverka anslag över längre tider för att understödja långsiktig kunskapsuppbyggnad. Mot bakgrund av detta är det förvånande att det finns en tydlig tendens att projekttiderna blir allt kortare inom en rad teknikområden. Undantagen är två: Datateknik och Beräkningsteknik. Övriga dossierer har tenderat att ge bidrag under allt kortare tid. Projekten blir därmed kortsiktiga. Huruvida detta är en effekt av osäkerheten vad gäller forskningsfinansieringen i landet eller ej är svårt att säga, men det är uppenbart att trenden startade långt innan 1996 års anslagomgång. En del av förklaringen till denna trend kan vara att vissa dossier har varit pigga på binda stora andelar av sina medel för två- och treåriga projekt. Dessa beredningsgrupper hamnar i en olycklig anslagscykel där det vissa år finns relativt små resurser till förfogande för nya projekt. Då framtvingas korrigeringar av projekttidernas längd. Förra årets forskningspolitiska osäkerhet förvärrade denna situation.

Vad gäller projektens storlek mätt i antal kronor är denna naturligtvis en effekt av tidsfaktorn. Förvånande nog finns det avsevärda skillnader mellan beredningsgrupperna när vi analyserar dessa båda aspekter tillsammans. I appendix F redovisas en analys som kan sammanfattas i följande ordalag: De tre kommittéerna Datavetenskap, Elektronik och Materialvetenskap har en betydligt generösare anslagspolitik, medan Teknisk fysik, Bioteknologi och Kemiteknik har en motsatt strategi. Huruvida detta resultat kan förklaras av skillnader mellan teknikområdena eller av andra faktorer har vi inte haft möjlighet att utreda i föreliggande projekt.

Intressant är också att se hur medlen fördelas till projekten på årsbasis. Vilka medel förfogar projekten över per år? Vad gäller denna aspekt sker det av allt att döma en stark utjämning över åren: de teknikområden som har varit försiktiga i sin anslagsgivning ökar sina årsanslag och de som varit generösa har tvingats att minska ned. Två tredjedelar av ansökningarna gäller projekt som söker medel för minst tre år och som vill ha över en halv miljon kronor per år att förfoga över. TFR har inga möjligheter att motsvara dessa behov. Inte mer än knappa 20 procent av totalt fördelade medel allokeras till projekt som uppfyller dessa villkor, medan närmare 40 procent av medlen fördelas till projekt som har mindre än 350,000 per år (då är industridoktorander m.m. undantagna i beräkningarna). Det bör framhållas att denna analys baseras på en enkel medelvärdesmetodik, vilken kan dölja relativt stora skillnader mellan de olika beredningsgrupperna.

Om vi ser närmare på rådets prioriteringar är det också i detta fall frågan om en allmän utjämningstendens. Två av de största områdena, Kemiteknik och Mekanik, har minskat något, medan Matematik och Beräkningsteknik har ökat sin relativa andel av budgeten. När ramanslagen medräknas är omfördelningarna inte särskilt stora, utan de relativa andelarna ligger fast vilket visas åskådligt i de diagram som används i rapportens tredje kapitel. Analysen av ramanslagens betydelse visar att omskiftningen är ytterst marginell, varför det finns anledning att ifrågasätta det inom TFR vanliga antagandet att dessa utgör ett instrument för att prioritera mellan teknikområden.

Rapportens femte kapitel ägnas den faktiska beredningsprocessen inom TFR. Rådet har i sin policy markerat att peer review och ett starkt inslag av utländska bedömare är viktiga delar av arbetet med att ge stöd till de bästa ansökningarna. En närmare undersökning av beredningsgruppernas arbetsmetoder visar att det internationella inslaget varierar kraftigt mellan teknikområden. Egentligen är det inte mer än ett par beredningsgrupper som systematiskt arbetar med internationella peers som de skickar ansökningarna till. Vanligare är att ha med internationella peers direkt i beredningsgruppen, men även där skiljer sig ansatserna och graden av internationalisering. Med tanke på TFRs klart uttalade policy i dessa frågor förefaller det möjligt att öka ansträngningarna för att öka den andel av ansökningarna som får en gedigen genomgång av internationella peers.

En frågeställning som ligger i närheten av föregående gäller hur många som deltar aktivt i bedömningsarbetet av en ansökan. I många fall förefaller det vara så att det endast är två personer som bedömer ansökan innan den tas upp av beredningsmötet. Det förekommer visserligen att flera är inblandade, men i regel är det endast en bedömare, förutom beredningsgruppens ordförande, som obereoende av de andra sätter ett betyg på ansökan. Eftersom grupperna arbetar med ett ansvarigsystem finns det en automatik som leder till detta resultat.

På denna punkt finns i rapporten en omfattande redovisning av hur man arbetar i andra länder, dels i Australiens forskningsråd, dels i det holländska systemet. Det är vanligt att eftersträva ett större antal (cirka 5) bedömare och att ha en relativt stor omsättning på dessa beömare så att så många som möjligt dras in i systemet för beredning och bedömning av ansökningar. Ju större andel som deltar desto större spridningseffekter och sannolikt även en mindre andel explicita klagomål och misstankar om oegentligheter i hanteringen. Mot denna bakgrund förefaller en hög personomsättning i beredningsgrupperna vara eftersträvansvärd.

En annan viktig skillnad mellan det nämnda förfarandet och det svenska systemet är att de sökande erbjuds att föreslå bedömare, och att de ges tillfälle att ge synpunkter på utlåtandet innan beslut fattas.

Vi menar att TFR idag härbärgerar inte mindre än fyra olika modeller för beredningsarbetet. Till viss del har detta att göra med det faktum att TFR arbetar med en forskarkår som representerar minst flera olika forskningstraditioner. Här finns för det första en NFR-inspirerad modell, vilken i stor utsträckning utnyttjas inom de båda teknikområdena Kemiteknik och Teknisk Fysik. Man är relativt sparsam med att utnyttja internationella peers och man använder inte heller andra formella metoder för att metodiskt särskilja de ansökningar som skall tilldelas medel från dem som får avslag.

En radikalt annorlunda modell används av Datateknik samt Signaler & System. Utnyttjandet av internationella peers är flitig och helt i linje med rådets officiella policy. Man verkar också vara angelägna om att erhålla flera utlåtanden om varje ansökan. Det starka inslaget av utländska bedömare i beredningsgruppen synes dock ge gruppens ordförande en ovanligt inflytelserik position. Eftersom de aktuella områdena båda härstammar från och har etablerats i Sverige via STU (Styrelsen för Teknisk Utveckling) är det troligt att det managementperspektiv på forskningen som varit vanligt där följt med och ävenledes bestämmer väsentliga delar av verksamhetens organisering. Beredningen sker utifrån forskargruppernas kapaciteter och behov, vilket självfallet kan göra det svårt för yngre forskare som önskar bryta nya banor.

En tredje modell, som utgör en blanding av de båda föregående, återfinns hos beredningsgruppen för Elektronik och Elektroteknik. Där har man valt att skaffa det internationella inslaget endast genom att låta dessa vara med i beredningsgruppen. I övrigt arbetar man helt i enlighet med den första modellen.

Ytterligare en fjärde modell representerar de gamla teknikområden, vilka först genom TFR fick status av rådsunderstödda forskningsområden. Det handlar om Teknisk Mekanik och Materialteknik. De är inte särskilt inriktade på att använda internationella peers, men är i stället, förefaller det, mycket noggranna med att reviewers report ger en betygsgradering som kan användas som ett effektivt beslutsunderlag.

Vår sammanfattande bedömning är att TFR har stora möjligheter att påverka forskarkårens uppfattning om och förståelse för rådets verksamhet utan att behöva tillgripa omfattande insatser. Samtidigt är det klart att de disintegrativa tendenserna bland områdets forskare har en materiell grundval i det faktum att TFRs beredningsgrupper inte alltid tillämpar den policy för peer review, som rådet låter komma till uttryck i olika dokument. Att genomföra nödvändiga förändringar på dessa punkter betyder inte genomgripande förändringar, men likväl resurskrävande sådana.

Avslutningsvis vill vi understryka att TFRs kansliresurser är underdimensionerade. Jämfört med andra forskningsråd har TFR ett avsevärt mindre kansli, vilket sannolikt inverkar menligt på möjligheterna att informera om verksamheten och att engagera ett större antal forskare i beredningsarbetet.

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