

**Quality and Research Evaluation
in Organizations**

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WP 23/2003

MPP Working Paper No. 23/2003 ©
December 2003
ISBN: 87-91181-66-6
ISSN: 1396-2817

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Quality and research evaluation in organizations

**Results from case studies of research evaluation and
management practice in Danish private and public research
organizations**

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**Paper presented at the Research, Technology and Development
Evaluation TIG, American Evaluation Association 2003 Conference,
Reno/Sparks, Nevada**

Abstract

A central issue in science policy today is the changing role and function of research evaluation. How is quality selected, how do local organizational traditions and managerial practices influence the research evaluation? Who is perceived as peers or evaluators by the researchers and by managers? Recent organizational theory has focused on organizational and social dimensions in private knowledge-based companies, but left out research organizations. How important is the organizational context for the research evaluation processes? The paper will present results from an interview-based study of four private and public research organizations and discuss the importance of the organizational context on the production of new knowledge.

Introduction:

The field of research evaluation has developed rapidly the last 10 years and can today best be described as very diversified. Methods and approaches applied to evaluate research vary extensively as well as the object for the evaluation. The object for the evaluation can be anything from the scientist to the institution to the nation state and the goals vary between organizational learning and accountability and control. The role of the evaluator too is no longer restricted to groups of scientific peers but include a growing number of professional evaluators or consultants as well as in some cases political representatives and lay persons.¹

Many of the new evaluation methods and approaches has been introduced, developed and put into use to evaluate public and semi-public research organizations in order to accommodate at least two often contradictory policy goals behind the evaluation. These evaluation goals can in very rude terms be described as either the demonstration of accountability and productivity of the researchers and the research organization through the evaluation or the perspective of organizational change and development or learning by example. The evaluation methods vary from qualitative participative studies over classic peer review studies to the use of benchmarking and best practice studies.

The recent interest in knowledge management in organizational theory has on the other hand produced a new focus on the creation and development of knowledge (for a critical review see Fuller 2001). The perspective is on how to manage and maximize the creativity and the knowledge production in private companies in order to apply the new knowledge in commercial products. From this perspective is evaluation of research closely related to research management and the organization of knowledge production. Questions of quality can then in certain aspects like formulation of goals evaluation criteria, be subjected to other organizational and managerial interests.

¹ see appendix A for a view of the diversity in research evaluation.

In other words, the first scenario picture the mertonian heritage, the cudos norms and the autonomy of the researcher, as the starting point in establishing of new criteria for quality evaluation in research integrating social and political demands (Hansson 2002). The integration can easily take the form of external policy control and demands for accountability (Power 1997). The second scenario picture a new situation where the criteria for quality assessment in the evaluation is open to negotiation and subject to management decision making (Nowotny 2001, Frederiksen et.al. 2003).

What are the consequences of these changes for the role of research evaluation in the quality control of knowledge in the modern private as well as public research organization? What constitute quality, how is quality evaluated, and who decide? What is the role for the science community, the research organization and management and the cooperation between the researchers in the quality evaluation?

The paper will present empirical evidence from a case study of two private and two public Danish research organizations². The cases will describe researchers' attitudes and expectations toward evaluation and management of research with the help of to set of questions. One is about prioritizing quality dimensions in research and the possible role or influence of the research organization in the process. The other question continues the investigation of the role of the organization from the point of view of the researcher and the research cooperation by asking about a prioritizing of dimensions of competence of the researcher. Both questions will indicate to what degree the research organization as a social environment or organization influence the quality evaluation in the knowledge creation process. Does the goals and culture in the organization influence on how researchers prioritize quality? Does the experience of the day-to-day work in the organization influence on how researchers perceive the competence of other researchers? The questions will be answered with the help of the results from three central areas of the research process: Dimensions of research quality; evaluation of quality; personal competence of the researcher.

Based on the response from the researchers the paper will contribute to a better understanding of the role and function of the scientific and social capital (Bourdieu 1997) in the organization or more general how embedded Granovetter 1985) the evaluation of quality is the organizational world.

In the paper I have chosen to present parts of the results from this study. Some of the results are new and unexpected. Based as they are on a rather small sample and chosen from companies willing and interested to participate in the study some warning about the validity of the results might be in place. The results alone do not constitute the outset for the creation of new theoretical explanations. On the other hand the results can be argued to represent the case

² The whole study is published in Danish as part two of the authors PHD thesis, Forskningsevaluering, kvalitet og organisation, Copenhagen, august 2003.

of 'reasonable doubt' about some of the established or traditional understandings of the foundation of the research evaluation processes in an organization.

The methodology:

The empirical results presented in the article are all taken from on a case study of four research organizations. The cases are based on 27 interviews with researchers and research managers from the research departments of two private and two government applied research organizations.

The researchers were in all four organizations selected by a senior research manager in order to accommodate the criteria I had set up: diversity in relation to age, sex, career in the organization, and experience with research management. The final selection of interview persons gave a broad and diverse population for the interviews not to fulfill demands for representation of the larger organization – my interest was the opposite, to have the largest possible variation in organizational experience and other elements in order to get responses with marked differentiation on the different questions. The interviews was conducted with a mixture of young researchers with a few years of experience after their PHD, senior researchers with 20 to 30 years of work experience in the same organization, junior researchers, research project managers and research managers. All 27 interviewed but one was working as active researchers, a few combining research with senior research management and one now working as research manager but with a former career as an outstanding researcher in his field.

All interviews were conducted by the author and took place inside the different organizations in the form of an open dialogue loosely following a number of prepared questions. Each interview lasted from one to one and a half hour and was recorded on tape. Supporting notes was taken during the interview.

The tapes was then partly transcribed with the help of notes and analyzed in four major themes: quality in research and development, research evaluation in organizations, evaluation of the researcher, research management.

The aim of the case study was to investigate the effect of organizational factors on the different quality assessment or evaluation procedures used in research organizations. Hence the unit of the study is the research organization and not the individual researchers.

The research organizations in the study:

The two private research organizations has been selected with a special interest in the more established or even old companies with a long tradition for investment in research and a dominant position in their respective field.

NKT is an old Danish company with basic products in cables and wires, later on electric equipment and IT equipment. The company has recently changed their strategy. Innovation in size and scale of equipment are the new strategic change can be described as a strong investment in external a PhD. program in cooperation with the Danish Academy.

Haldor Topsoe is an old chemical company specializing in environmental technologies, especially catalysts, and has a comparative large research and development department. The department is characterized by a remarkable stability in personal - much like university tenure in the Scandinavian countries - with a large number of researchers working in the department since their PHD. The interviewed researchers expressed a very clear understanding of an organization research culture and values based on 'making good environmental products for the society'.

The two government research institutions for applied research were selected from the criteria of size, e.g. one large and one smaller institution.

Risoe National Laboratory is the second largest applied public research institute in Denmark with special orientation toward applied technology, wind energy, biotechnology, nano technology and up till year 2000 nuclear research (the experimental nuclear facilities was closed down in 2000 by a government decision). Risoe cooperates with universities and private business in applied research projects and have a large part of the budget funded through projects. The research staff has tenure like position

The State Building and Urban Research Institute (By & Byg) is a smaller research institution specializing in applied research in technical and environmental aspects of building constructions, in housing, town and area planning and in more social aspects of planning. SBI cooperates with local building industry, with other research organizations and function as a controlling agency for the government.

Quality in research in organizations.

In the classic mertonian sociology of science quality in research has been defined operationally as the outcome of the evaluation of a certain piece of knowledge (paper, product, patent) from inside the scientific community, e.g. based on the peer review process (Hansson 2001). The evaluation took outset in the universal norms, the CUDOS norms governing the behaviour in the scientific community and was understood in general as the guarantee for quality, but the concept remained undefined. Recent development in science policy has focused on the relation between quality and costs, using evaluation methodology in attempts to improve the cost benefit of distribution of resources to research in order to improve quality. This has become a central question in any discussion of evaluation in science and research making it

necessary to try to define operationally the hitherto vague and traditionally undefined concept of quality. What are the quality dimensions in research and how can we measure or evaluate the quality of research? The operational definition used in this study is based on a large Norwegian study with a comprehensive discussion of the literature and successfully used in an empirical study³. All interviewed researchers in the four case samples was asked to selected and rank the two most important quality dimensions selected amongst four central quality dimensions; originality, solidity, disciplinary relevance and social relevance.

The case study was conducted as an explorative study with the goal of describing in detail the organizational context for scientific knowledge production in different organizational settings. The organization of the knowledge production, the evaluation and the managing functions all influence the social and scientific capital (Bourdieu 1997) in the research organization in different ways and with different results.

The results from the qualitative interviews on quality has been analysed in order to show if its matters to distinguish between private and public research organizations and if an organizational culture on research in an organization makes a difference.

The data has been analysed by the interviewer a number of times and as the answers all results in a ranking is possible without loss of reliability to present the results in a quantitative format as can be seen in Figure 1 presenting the results from private research organizations and Figure 2, presenting the public research organizations:

³ The four dimensions were selected because they have been used with success in a large Norwegian survey on research quality, Gulbrandsen, & Langfeldt (1997) and by Gulbrandsen (2000).

Figure 1: Dimensions of quality in private companies:

Rank the most and second-most important dimension of research quality	NKT Research		Haldor Topsoe	
	most important	second most important	most important	second most important
originality	3	2	3	2
solidity	2	3	1	4
scholarly relevance			1	1
social utility - the view of the company		2		
social utility -the view of society in general		1	(6)	

The ranking of the quality dimensions by the researchers in the private research organizations dominated by researchers from the technical/natural sciences show an almost equal valuing of originality and solidity – the two elements traditionally understood as the core of research quality. This is to be expected and reflects as it can be seen in the comments to the question an awareness of originality as a both the core of science and of the interest in a private company in new, original knowledge to result in new products. In order to fulfil the demand the new knowledge has to be solid. “The original knowledge has to be trustworthy; it has to be solid in its foundation.”

Maybe the most unexpected result in Figure 1 is the very high priority given to the question *social utility from the view of society in general* from one company, Haldor Topsoe. The line in figure 1 on this subject should be read like this: In all interviews conducted in this company the researchers demonstrated some kind of a double standard regarding quality. Researchers as well as research managers insisted of having the social utility ranked together with the more traditional dimensions and this can only be interpreted as a important indicator of the existence of a special company culture regarding research quality, some kind of a double ranking. This was very clearly supported by a number of supplement statements and comments, for instance in the words of one young researcher: “Relevance or utility for society in general is and has always been the goal for the company in the eyes of the founder, Haldor. The chemistry we make, environmental protection, better use of resources, better food etc. is without question good for society.” The high priority given to *social utility from the view of society in general* has its roots in an established company research culture. The culture seems to be deeply rooted in the rather stable and traditional research organization and surprisingly in the light of the recent focus on the social responsibility of the company in the Danish debate to this date the policy has not been formulated in any internal or public company policy paper.

In Figure 2 the same dimension is ranked by researchers and research managers from two public research organizations, dominated by researchers from the technical/natural sciences.

Figure 2: Dimensions of quality in applied public research:

Rank the most and second-most important dimension of research quality	RISOE		By & Byg	
	most important	second most important	most important	second most important
originality	3	6	1	
solidity	8	2	4	
scholarly relevance		8		3
social utility- the view of society in general	4	6	1	3

4)

The ranking of quality dimensions by the researchers in the public research organizations differs from the ranking by the researchers in the private companies regarding the two central dimensions in scientific knowledge production; originality and solidity. The researchers from the private companies agreed on an almost 50-50 priority to either originality or solidity on the first or second position (Figure 1). The almost equal valuing of the originality and solidity - the two traditional most central elements in research quality - by these researchers has changed in Figure 2. In the public sector research organization the priority of solidity over originality is very easy to observe, even if originality is valued second by researchers from Risoe. The most obvious explanation of the difference is the priority to application of knowledge in these organizations – formulated in central policy papers but more importantly, a part of almost all research projects are formulated in cooperation with either industry or other public organizations and agencies. Risoe differs in this as a number of research groups in Risoe collaborate on a regular basis with basic research groups from universities.

The important difference between the two types of research organizations in relation to ranking of quality dimensions in research is the high priority given to solidity and accordingly the downplay of originality for social relevance in the public research organizations compared to their colleagues in the private research organizations.

This can of course be explained in a number of different ways but the differences in the organizational goals and policies seem very obvious to follow. Private research based companies live by continuously creating new products based on application of new knowledge. Researchers from both private companies agreed that innovation and new products have to be based on reliable, solid knowledge. But especially researchers from Haldor Topsoe underlined the relation between originality and risk-taking, stating ‘that nobody has ever been fired for using millions on a non-successfully project’. The situation around risk taking and originality in knowledge creation is different

⁴ A note on methodology: The researchers from Risoe were interviewed with a first draft of the interview scheme and were not asked to prioritize between most and second most important dimension. Based on an intensive analysis the answers have been categorized accordingly, but difference in interview questions explains the deviation in numbers.

for the applied public research organizations as can be seen from the following quote from a researcher in wind energy: ‘one of the major success criteria in Risoe is publication in international journals, but there are problems, some results cannot be published because of cooperation with companies and our main user group, the wind mill engineers, does not read international journal – so in order to demonstrate the usefulness of our research to the sector we have to make special information presentations’. The applied research is measured against the traditional scientific standards, publication in international journals as well as by the ‘social relevance’, the use, distribution and application of the produced knowledge.

The major differences in the goals and function between the private and applied public research organizations provide a solid foundation for the explanation of the observed differences of the prioritizing of the quality dimensions in research. The scientific capital as a part of the research culture in the different organizations is constructed in order to fulfill different goals and policies. Evaluation systems, research management and the organization of the day-to-day work mediate this construction.

From the perspective from the organization and the organizational interests and policies I will shift to a perspective of the individual researcher, a kind of sociology of work perspective, where the focus is on the personal competences, e.g. what is most valuable or important in a researcher working under the conditions of the research organization. In all four case-organizations in this study the normal work situation is one of team or group work, most research work is formally or informally organized in some collective way.

The data from the question on the most important criteria in the selection of a competent researcher can as it was the case with the question on quality dimensions be presented in a more quantitative format as the answers all was about a ranking. Figure 3 presents the results from the private and public research organizations.

Figure 3: The competent researcher in private and public research organizations⁵

	NKT Research		Haldor Topsoe		By og Byg	
The most important criteria when you have to evaluate the competence of a researcher	one selected	more than one	one selected	more than one	one selected	more than one
publications /patents		4		2	1	4
conferences (participation in)				1		
networks				1		
social competences	1	1		1		1
success in projects (track record)	1	1	4	1	5	1

In the three research organizations the most important competence for a researcher is the ability to ‘do’ projects. What this means is probably a complex combination of having experience with projects and a good ‘track record’, e.g. having demonstrated ability to work in projects and to produce results. The second important choice is not surprisingly publications/patents, the classic scientific performance indicator in the peer review system. The ranking vary a bit between the three organizations but still it stands out as the second important criteria for competence. There are some small but insignificant differences between the three organizations; the only important one seems to be the higher priority given to networks and social competences in NKT. Taking into account that NKT Research is going through a large rebuilding or reorganization of the research organization directed toward a network concept and with downsizing and other changes in the organization, while Topsoe as well as By and Byg are old well-established organizations these shifting priorities is not so surprising.

What should be a surprise then is the fact that the traditional indicators of quality for the individual researcher, publications/patents, the classic scientific performance indicator in the peer review system, does seem to be important but is clearly ranked lower and hence not as important in either organization compared to the project track record. It does not mean that this activity is unimportant in these organizations; on the contrary⁶ both companies are quite productive in the more traditional scientific activities.

⁵ This question was not asked to the researchers from Risoe because the importance of the question became clear after the preliminary analysis of the first interviews.

⁶ Haldor Topsoe is one of the very productive private research organizations in Denmark, as the results of searches in Science Citation Index ISI and in Espacenet shows. But articles are the side effect of good work – not an end by itself in this organization according to a communication with the Research Manager Rostrup Nielsen.

1998	1999	2000	2001	2002
138	143	189	146	54

Patent applications from Haldor Topsoe

Two things are important to notice; a good track record in projects is as important in this organization as in the two private ones and publications/patents the other selected criteria. There is an important similarity between the two types of organizations in regard of the more sociology of work related dimensions of the researcher competence. This is an important observation taking into account the very marked and clear differences in the ranking of quality dimensions between the private and public research organizations. We found an equal ranking of originality and solidity in the private research organizations and a dominance of solidity over originality in the public research organizations.

Conclusions about research management and questions for further research

The results presented above are open for different interpretations. Maybe the most obvious is that the research organization as an organization with its social and scientific capital has gained a new role in relation to evaluation of quality in research. Truth claims are not solely or primary neither decided by organizations nor is the competence of the researcher only a question of making projects work, but beside the traditional disciplinary evaluation and training, the diversity in the organization seems to have a growing importance in the complex knowledge creation. A long tradition for ignoring the organization in the sociology of science has been broken due to the input from the new organizational theory.

From the interviews we have learned that differences in the overall policy and strategy of the research organization matters for the priorities of quality dimensions; researchers in private research organizations work in an organization with a long term interest or pressure - even if it never is explicit formulated – mediated through the market in the end to come up with new original knowledge to be materialized in new products. In the private research organizations originality is ranked much higher as a quality indicator among researchers than in public organizations. The public organizations rank on their side rank solidity clearly as the most important criteria. Another important result is the very clear demonstration on of how important the existence of a special corporate research culture is in the case of Haldor Topsoe. The corporate research culture underlines the central importance of social relevance for research quality more clearly than the more foreseeable focus on social relevance in the applied public research organizations. All these results taken together demonstrate a high degree of complexity of research quality in a modern research organization. These results are based on the more general or policy and managerial view on research quality.

1998	1999	2000	2001	2002
138	143	189	146	54

From the point of view of the day to day research work in the organization the focus shifts from the result (the quality knowledge product) to the process, to the how is it produced? The results on the competence of the researcher in Figure 3 present a view from the other side – how is the work organized successfully and who can do it. The results from this sociology of work approach to the question of researcher's competence is a clear demonstration of the importance of the ability to 'do' projects as the single most important dimension in the competence of the researcher, followed by the more traditional publication.

The private research organization

How do researchers and research managers in the private research organizations describe their own experience with this complexity? Most important is the repeated statements from researchers and research managers in both private organizations on how important it is that the research manager has a solid scientific background in the field or in related fields in order to be able to participate effectively in the person to person interaction and in the group discussions. In all case organizations I found a high level of agreement on the importance of the informal and direct personal relations, 'you have to look people in the eyes when you ask how they feel about the project to see if they mean what they say' as one research director explained and continued, 'we cannot wait and evaluate on the more formal results'. The direct interaction and personal relations based on an amount of trust is very important in these organizations, one research manager commented it this way: 'you can never go out and say do it to a researcher' because 'research management is a question of making trust, you have to create a situation where people dare take risks in research knowing that management accept that it can go wrong'.

In the private research organization the rule of the game or the ultimate criteria for success for the company is production of knowledge for the market - today very often a very competitive and changing market place – and this is the overall goal direction for the research work. Following this general idea control and organization of the research work based on Taylorism or scientific management principles should long ago have found their way into these organizations. In most universities and public research organizations we find today new public management accountability systems based on publication and citations count and other productivity and control systems. Recent studies of large research organizations, private or public has argued for the necessity of the implementation on a total scale of quality control systems (TQM, performance management systems) in research (Boath and Bodnarzcyk 1995, McLaughlin 1995).

It was a very clear message from the interviewed researchers and research managers in the two private companies that such systems had no place in these organizations. All interviewed researchers and research managers were asked about their own experience and general view on the use of quality control systems (TQM, performance management systems) in research. As a managerial tool both researchers and research managers view these systems as serious

threats to the necessary risk taking consciousness⁷ in research and if implemented it could result in some kind of duplication or ‘me too’ research strategy. For background information it is necessary to note, that these systems was well known in both companies because the production departments used tqm, iso-certification and other control systems, meaning that all interviewed researchers had a very clear idea of the content of these systems. When asked directly about the possible use of tqm and other performance and quality control systems in research neither researchers nor managers could see any use for these systems.

What we found in the two private research organizations is the type of research management based on a high level of self and group organization and governance best described as third order research management (Ernø-Kjølhede et. al. 2000). To what degree is this result a product of unique or special factors operating in the two cases? The two companies have both a research director highly respected for their scientific status as well as their personal style in managing. The interviewed researchers to picture the situation in the private research organization often used the picture of the life in a university research department. The very informal management and organization has been criticized especially by some of the younger researchers for lack of guidelines and goals in the projects and some organized training in project management is planned.

The applied public research organization

Researchers in the applied public research organizations when asked the same question on possible use of tqm systems expressed the same general attitude toward the use of quality control systems. But research managers in these organizations expressed an interest in some the quality control ideas and explained that the use of such systems has been considered in relation to applied research in order to demonstrate quality in the fierce competition with private consultancy firms. Publication and citations counts has on the other hand already been introduced as an established control system in the public research organizations in order to demonstrate public accountability for all activities in the wave of new public management. But it has in some circumstances created conflicts in the organization.

The use of the very traditional system for evaluation of research, publication counts and reviews is more or less implicit based on a notion of superiority of this kind of research activities in the organization. But the necessary research work in these applied research organizations is much broader and reaches from basic research to consultancy work, technical advice and other activities in the field of application. A majority of these activities are not evaluated in the more traditional approach to research evaluation. ‘Applied researchers do not write in international journals’ was a statement from a senior researcher at Risoe and

⁷ Compare the statement from several persons in Haldor Topsoe: “Nobody gets fired in this department even if they burn up several millions on a unsuccessful project”

he continued 'even if Riso have tried to build a system to value other activities, it is international publication that counts at the bottom line'.

The general research management policy in the applied public research organizations is in many aspects not very different from the private. The work is often organized in teams or groups based on a rather informal day to day management with a high level of self management or what has been named third order management. But the management role is more formalized and the accountability and control systems are more visible in the day-to-day work. One research manager expressed his own approach to management as 'informal management in a formal structure ...informal management of the research work and formal management in the organizational work. I have people from universities who have found it a relief to have somebody who takes responsibility.'

Questions for further research

The results from the case study present some very important and complex questions to future modern research management.

Is the informal, direct and personal management style from the private research organizations the future? It is almost charismatic in the weberian sense based on the strong scientific authority associated with management.

Is the strong organizational research culture in one company an important or even decisive factor for an open, self-governing research organization?

The tendency to dismiss quality control systems in research in the private research organizations seems to contradict the growing implementation of accountability systems, publication and citation, in the public research organizations.

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Appendix A. THE MANY DIMENSIONS OF RESEARCH EVALUATION.⁸

<p style="text-align: center;"><i>Evaluator</i></p> <p>→</p> <p style="text-align: center;"><i>The evaluated unit</i></p> <p>↓</p>	<i>Scientific Peers</i>	<i>Professional evaluators</i>	<i>Lay persons, NGO, political groups and panel</i>
<i>Individual</i>	Peer review of articles for publication, appointments, awards	Research management, researchers productivity, human resource management	Public debates, writing books, Participation in media
<i>Institute/Department</i>	Modified peer review Rating/quality assurance Peer advisory board	Research Management: - marketing - resource managing - benchmarking	User studies (as interest groups in the field), training of young researchers, production of new knowledge (patents, products)
<i>Institution</i>	Modified peer review Rating/quality assurance Research advisory board	Contract steering- Negotiation of conditions (contracts) Resource allocation Benchmarking TQM	User studies (as interest groups in the field), quality, employers of candidates, users of new knowledge (business, politics)
<i>Cross-institutional Evaluations (institutions, disciplines, areas)</i>	Informed peer review, Rating/ quality assurance site-visits, Research advisory board, Accreditation; EQUIS, ISO9000		Social consequences, Public hearings, consensus conferences, Public or NGO advisory boards
<i>Territorial/-nation state National Policies</i>	Rating/Expert-statements, visions, scenarios, proposals. Evaluation and prioritation of areas, cost-benefit studies, forecasting		- Political debates, public discussion of visions, public or NGO advisory boards

⁸ **Finn Hansson**, Department of MPP and REMAP. Workshop on Upgrading the Danish University System, CBS September 25.th 2002. also published in Fredriksen, Hansson and Wenneberg (2003).