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TITLE

Two coins – one side or Two sides – one coin?

Socio-economic research in policy making – An essay on policy learning

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ABSTRACT

The paper argues for a need of rethinking the interaction between social science and socio-economic policy analysis on the one hand and policy making and implementation on the other. The interaction, traditionally conceived as a variant expert-client interaction should rather be conceived in terms of an expert-to-expert dialogue. The inevitable conclusion is that any understanding of the impact of (social) scientific research on policy must understand the cultural context of the interaction. A suggested avenue to incorporate the effects of scientific advice on policy making is seeing such analysis as part of the policy system's or policy maker's 'innovation system'. This view has immediate consequences for the organisation of the science/policy interface.

KEYWORDS	ENGLISH	NORWEGIAN
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The paradox of the two coins with the same side

The essay on which you are to embark is not an ordinary research paper [– whatever that is]. Writing this essay is intended as an exercise in experience- and introspection-based process, coming to terms with [or *making sense of*!] disparities between different mentalities or world views, shaped by disparate functional experiences and backgrounds of the authors. It is deliberately transgressing, even to the extent of neglecting, disciplinary and experiential boundaries, and with a calculated eclectic twinge. It mixes explicit and implicit arguments and world views, from cultural studies, from economic perspectives, spinning on philosophical and psychological research and analysis. It is a report of some results of a dialogue-based learning process. Most of us would probably agree that such learning is by far the most rewarding – and even important – learning process. At least this applies to learning focussed on understanding what each of us are doing, why we are doing it, how we should be doing it [which of course includes the 'institutional framework' of our activities], and how to make sense of what we are doing to ourselves and to others – or shorter gaining understanding of the social universe in which each of us are participating.

This paper had a long gestation period. Its roots lie more than ten years back, when the two authors started a rewarding dialogue on analysis of the cognitive, cultural and political dimensions of S&T policy making. At that time, the two of us collaborated in the Department for Science Policy in the Norwegian Ministry for Education and Science on designing and writing a Government White Paper on Science and Technology Policy[1]. This White Paper and the process leading up to it introduced interactive, or systemic, innovation as a policy concept into the national science and innovation policy debate. The dialogue has been going on since then – with this essay as one outcome – and will go on in the future.

One of the authors, with academic training in philosophy and the history of ideas, remained within the policy system, developing and disseminating these ideas into policy design and implementation. In this he gained valuable experience in and insights into high level policy making in the area of S, T&I [Science, Technology and Innovation] policies, before he switched to research and policy analysis two years ago. The other (JH), with academic background from theoretical physics and several years as business manager and later as S&T policy maker, returned to research. This time it was within the field of economics of innovation and technical change, growing out of his need of gaining a better understanding of the analytical basis of innovation strategy and policy formation. Here he honed his understanding of the limitations and implications of the 'systemic' argument for understanding innovation and economic change and the implied basis for innovation policy making.

In the ongoing collaboration and dialogue over the years, during the last two years again as colleagues, the authors have often pondered the following paradox.

Over the intervening period, policy makers in the area of industrial innovation policies and wider economic policies stating that policy priorities and the tools for their implementation must be solidly grounded in socio-economic research on innovation capabilities and performance has become a highly entrenched *comme il faut*. More particular; with the emergence of systemic arguments of explaining innovation performance and firm-level formation of innovation capabilities[2], it quickly was seen as needed to argue for the need of an interactive, systemic or non-linear approach to understanding innovation – i.e. changes in firms' techno-economic

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[1] The White Paper was published in 1993 as Stortingsmelding nr. 36 (1992-93) *Forskning for fellesskapet* [Research for the Community]

[2] At least for small countries, the OECD Technology/Economy Programme was important during 1989-92 as a forum for focussing the policy system's understanding and perceived demand of innovation research based on a 'system' perspective.

behaviour. As an immediate consequence, development of innovation policy objectives and instruments should be rationally based on 'systemic' analysis and research on innovation. In short, a story was told of the inappropriateness of a 'linear' view of industrial innovation and the need to replace it by an 'interactive' view of the same.

The lesson being; science does not tell innovation what it will be, innovation and science and knowledge generation have to collaborate to create a opportunities for new modes of economic behaviour. Irrespective of the – dubious – reality of the claim that the 'linear model' dominated science and technology policies in the post war period – innovation is thus seen as not being science-based or constituted by scientific and other (formalised) knowledges. This has now become so established a view with policy makers and policy analysts that its characterisation as *common sense* within the relevant social context is highly appropriate.

The recognition behind it is simple – innovation and knowledge generation in a certain sense are two cognitive universes; distinct but complementary – and hence, successful interaction between the two require mutual understanding and balanced dialogue. Innovation is a techno-economic process, involving both domains, requiring specialised insights into both *and* willingness to communicate and understand and communication competences. All three competences; technological[3], economical, and communication and integration, are *necessary*, neither are *sufficient*. Now it should be readily seen that this [with the evident translation of key terms] applies equally well to the interaction of science, socio-economic or otherwise, and entrepreneurial policy making. Just as there are merit/effect-based norms for the 'art of doing business' and 'the art of doing science', there are norms for the 'art of doing policy (making)'. In all these and other areas performance are aided by but not explained by knowledge sourcing and generation. All are highly competence and capability demanding activities – i.e. requiring specialised skills and competences, utilising and transforming general 'knowledge', being highly specific to the environment of the activities they support.

Hence the same requirements for techno-economic innovation should apply to policy (making) innovation. The paradox both of us have noted is simply this. In the interaction between researchers and policy makers where the needs of a 'systemic' approach on the subject matter is not just agreed without debate; in fact it constitutes the rationale for the interaction. However, there is also another tacit understanding underpinning the interaction. The request from policy makers *and* the suggestions from researchers and analysts – or put differently, the implicit division of responsibilities – implies that the analysts *qua* scientific experts should deliver operative recommendations to policy decision makers. The interaction should address politically relevant issues and priorities on a 'scientific basis', in absence of complementary insights of either party into the other side of the equation. The implication of this is the noted paradox; while recognising the need of interaction – and hence co-production of relevant competences and mediation of knowledge and information from external repositories to specific techno-economic behavioural capabilities – concerning economic innovation, the immediate implications for the process at hand is not drawn.

The authors' direct concern is with science-policy interaction in the area in which we have been operating for many years. However, we strongly believe that the ideas underpinning this essay have validity more generally for science-policy interaction. We argue for the need of rethinking the interaction between social science and socio-economic policy analysis on the one hand and policy making and implementation on the other. The interaction, traditionally conceived as a variant of *expert-client* interaction should rather be conceived in terms of an *expert-expert*

[3] Note we use the term technological in the customary [very] wide, and often misleading, sense – applying equally to relations to social as to natural science-based analysis – of operational or functional knowledge and competences.

dialogue, with a concomitant requisite generation of a shared framework of communication – concerning language, concepts, world view or what de denote *mentalities*, and so on.

The inevitable conclusion is that any understanding of the impact of (social) scientific research on policy must understand the cultural context of the interaction. A suggested avenue to incorporate the effects of scientific advice on policy making is seeing such analysis as part of the policy system's or policy maker's 'innovation system'. We describe the innovating firm as living in a structured techno-economic environment, conventionally denoted an innovation system. Equally, we should think of a policy organisation, agency etc. as living in a structured environment of organisations and institutions, skills and competences, incentives and disincentives. Just as with firms' innovations, policy development must be seen as driven by human agents' perceptions of their environment. The perceived environment - the mental model of the environment – is what shapes behavioural changes and adaptations, not the environment as it *is*. These views have immediate consequences for how we think about and organise the science-policy interface.

The systemic approach

The systemic approach is grounded in modern innovation theory, a view of economic activity that sees innovation as a result of interaction and competence flows in the innovation system.[4] The innovation system consists of companies, public organisations, R&D institutions and others. The ability to innovate is considered a function of the ability to build competences, while the ability to develop relevant competences is seen as a result of the companies' ability to take actively part in the innovation system. They must connect to the system in order to gain access to the knowledge and technology present in this network.

Firms cannot passively start using new technologies just by reading about them. Although companies may gain access to manuals or machinery, the ability to use this knowledge rests on the ability to understand, use and integrate this technology into its own learning and innovation processes. This ability depends on the employees' education, work experience, organisational, social and technological expertise as well as their ability to fetch relevant competences from firms and institutions *outside* the company.

If firms for some reason fail in finding, absorbing and utilising relevant competences, their ability to innovate is weakened. If this is a problem common for many firms in a given industry, region or network of related firms (clusters), we are facing a so-called *systemic failure*, where the flow of knowledge and technologies in the system is blocked or hindered in a significant way.

There can be no such thing as an optimal or 'perfect' flow of competences in social structures like these. In the real world it will always be possible to develop new networks or to improve the existing ones. Moreover, the system constantly generates new competences that can be combined in new and innovative ways to create new forms of behaviour and – as a result of this – new products, processes and services. This alone makes a state of a perfect flow of information impossible.

Ultimately it is the firm that must decide when it has developed learning practices that will make it able to absorb new knowledge and new technologies in a sufficiently efficient way. In order to make this decision, however, it must have a relatively clear view of the competences available in the innovation system. Given the large amount of knowledge and expertise present in any part of society, this is not an easy task. Hence, the company not only needs help in order to develop its own competences, for instance by co-operating with a research institution. It normally also needs assistance in order to map the sources of competence that can potentially be used in the development of the firm, i.e. it needs 'pathfinders' as well as 'co-workers and teachers'.

[4] Nelson and Winter 1982, Dosi et. al. 1988, OECD 1991, 1992, Lundvall 1992, Nelson 1992, Metcalfe 1996, Edquist 1998

Innovation services

In order to improve the functioning of the whole system, one might argue that there is a need for expertise that can develop *vectors* that can help strengthening the firms' ability to learn and collaborate with other firms and institutions. From the company perspective these vectors – which can include various R&D programmes and institutions, advisory boards, consultancies, technology attachés, financial measures and more – can be viewed as *innovation services*, i.e. units that *serve* companies the competences needed to succeed and that help them find relevant sources of competences. They are helpers, assistants, facilitators and partners.[5]

The relationship between a company and its service provider will not be based on a passive reception of knowledge and technologies. Very often competence building is a result of a form for co-operation and collaboration where both firms are experts in their own field. Hence they both learn from this competence building innovation process. Moreover, a firm that provide innovation services to one company may in its own right ask for competences from another – i.e. it will be a service provider in one arena and a competence seeker in another. These relationships reflect the systemic nature of competence building and innovation.

It can be argued that the market will and should provide the innovation services needed for company competence building and innovation, and – indeed – the data shows that there has grown up a rather large sector of so-called knowledge intensive business services (KIBS) – i.e. various forms of private consultancies that together with the research institutions provide technology and advice. Hence there should be no need for government intervention in this arena.

Others, however, argue that especially small and medium sized companies lack the competences needed to find, develop and make us of contacts in the innovation system. They are in effect unable to find the competences needed to succeed in the market. These policy makers argue that it might be in the public interest to help these companies. The companies may, for instance, contribute to much needed economic growth or employment or their competences and technologies may give important input to the development of other sectors of society. If this is the case, one can argue that someone should implement, encourage and support policy vectors that can help these companies learn where to find competence sources and how to interact with them.

The public role

Firms seldom have the ability to consider the welfare of the whole innovation system. The individual company is mainly responsible for its own survival and success. Their managers neither have the resources or the competences needed to improve the overall flow of competences in a particular industrial cluster or the national innovation system as a whole.

If the individual companies cannot be expected to take responsibility for the 'gardening' of the whole system, then who can? In some fields large multinational companies can do their part in developing a certain sector. Then there are the industrial associations, which attempt to improve the working conditions of their members. The fact remains, however, that the only institutions that have the resources needed to look after the whole system, is the national governments, or – on the European level – the European Union.

Policy development and learning

Although several European governments have developed policy vectors aimed at improving the competence flows in the system, this is a task that goes beyond the normal market failure rationale

[5] It should be stressed, however, that although these policy vectors, measures and institutions may function as services vis-à-vis the companies, this is not necessarily their only purpose. An R&D institution will often have public tasks that go beyond the needs of industry.

used to legitimise public intervention in the field of innovation and technology development.[6] In order to develop and gain support for new measures in this field, policy makers need a coherent argumentation that can be used to develop and explain such policy vectors.

Unfortunately there have not been many relevant studies of learning in policy-making institutions or the political system. Hence it is hard to fine-tune a set of tools that can be used in order to develop the policy system's competences in the field of innovation systems theory and innovation services. However, we have done preliminary studies of competence building in ministries, directorates, research councils and other relevant institutions in order to gain insight into the learning processes that take place there.

Interviews and workshop style interactions with policy makers reveal a complex system of policy making and development institutions, defying simple explanations of policy formulation. The policy makers operate within a diverse organisational culture, where he or she has to take a wide range of factors into consideration. This include the ideology of the present political leadership, the present 'political situation', the role of the media and public opinion, the ruling mentality within the ministry, organisation or unit, power struggles and established divisions of responsibility between ministries and agencies, the need for financing and so forth.

Scientific research and research based analysis are only one set among many of inputs into these processes, and generally not a very important one. The policy maker – driven by considerations of *relevance* within his or her activity world, not of *universality*, *organised scepticism*[7] or intra-disciplinary relevance – will generally see the commissioning, interpreting and using science and related analysis in the relevance context, the socio-'technical' system in which she plays a part. As contributions to the complex competence and capability bases underpinning the activity of 'policy making', science and scientific knowledge is more or less irrelevant. What is relevant, are the highly specific and even idiosyncratic *relevant* competences and capabilities these knowledges are transformed and amalgamated into. Most of the large number of policy makers we continually interact with, express a need for policy-oriented research, i.e. research that may be easily used in policy development. Many criticise innovation research for being too theoretical and academic, and not targeted towards the practical problems facing the policy agencies. Some ask for concrete policy advice, while others would like the researcher to map various alternatives as regards policies and policy vectors and to analyse the possible consequences following various lines of action. Generally there is a depreciation of the costly requirement of establishing a communication enabling meeting ground – of the development of mutual understanding of the other party's context.

There is definitely a need for improved forms of communication between policy makers and researchers. This should allow researchers better to understand the competence needs and requirements of policy makers and systems, and to give the policy maker an improved understanding of potentials and limitations of such research and transformational capabilities to utilise the general tools and conceptual frameworks the scientist provide. From a competence perspective, reading a scientific report or paper is highly unlikely to be an efficient form of policy learning[8]. In order to take full account of implications of socio-economic research and analysis, the policy maker needs to internalise an understanding of the research, within the relevance norms, world views and other structures of her 'world'. We have all learned the hard way that cross-world interaction requires time, energy and costs. The interaction of scientific experts with

[6] For a general introduction to innovation policies based on systemic approaches, see the forthcoming OECD reports on the national innovation systems (OECD 2000).

[7] or any other of the Mertonian CUDOS-norms or similar norm systems.

[8] Concerning the main mode of relaying research and analysis to the policy system, we presume we are not the only ones having heard complaints of 'dust collectors', 'timing failure' of delivery etc.

policy experts demands the creation of a common ground, where interactive 'learning' – or co-production of capabilities – is generated. It is important to recognise also that the transformation and communication process is a process of *sorting* – of sorting information according to different modes of contextually determined relevance – of reducing information redundancy. A uni-dimensional transmission of science into policy simply does not do the trick.

Hence there is a need for improved fora and forms of interaction and transmission – of moulding science into policy, laying the ground for more effective policy learning processes. This benefit the researcher as well, he has to understand the 'lifeworld' and context of the policy maker.

The following text is a (fictional) memo to an unnamed minister of innovation policy, explaining the basis of a recent research programme in which we were involved and discussing the need for a research, innovation and technology services policy. The situation is set in a realistic context of government priority setting where such questions are most likely to appear. Thus the messages of the communication with the ministerial level is many-dimensional and reflecting implicit shared and hidden agendas, as well as intendedly 'open' communication of science. Hence, you will find distorted, and even what a scientific expert would characterise as 'wrong' or out-dated, descriptions of 'scientific' results. Neither the possibility that these are consequences of 'ignorance', nor that they play intended roles in the memo, should be excluded.

Policy Memorandum

Ministry of Innovation

Directorate of Innovation Services

Director General (sign)/27 Jun 2002

MEMO

The Annual Cabinet Budget Conference: On the role of innovation services in the innovation system

To the Minister,

We refer to *Cabinet meeting document No. 2002-27*, containing the Ministry of Finance's budget proposals in the area of knowledge production and dissemination. This Memo contains arguments that might be used in the Cabinet discussions.

Proposals of the Ministry of Finance

Budget cuts proposed by the Ministry of Finance

As expected the Ministry of Finance is proposing substantial cuts in the public funding of R&D and innovation support, arguing that the economy is overheating and that there is a need to curb public spending. The Minister of Finance maintains that a further increase in the inflation rate will harm the competitiveness of our industries, which in the long run may lead to higher unemployment and social unrest.

The Minister also claims that the beneficial effects of the Government's innovation policies have not been documented, and that competence building and knowledge acquisition and dissemination for competitiveness is a task for industry itself.

The Department of Innovation Services has reason to believe that the Ministry of Finance assumes that a further increase in public spending on health, pensions and social services is unavoidable of political reasons. The Minister of Finance will therefore fight hard to reduce expenses in other parts of the budget.

The Department suggests that the Minister co-operate with the Minister of Education and Science on the topic of funding of basic university and college science (see separate Memo on the overall Government R&D budget).

This Memo will concentrate on the issue of producing, distributing and upgrading competences in the innovation system.

Market Failure

The Minister of Finance will accept that there is a need for public support for research and development. She will do so on the basis of the traditional market failure rationale. The argument goes like this:

The Market failure argument

R&D that leads to new or improved products, processes or services will not only benefit the company that perform or finance this activity. The companies and people that use this new product will also profit from increased efficiency. A new drug will not only benefit the pharmaceutical company, it may benefit the whole society.

According to the market failure argument, firms are prone to invest too little in R&D, as they are unable to harvest the profits following from this *spin off effect*. This is a problem if the competitors benefit as much from the innovation as themselves. Moreover, R&D is always a risky adventure, which may stop some firms from investing.

Although this department is sceptical towards some of the premises behind the concept of market failure (especially the idea that the chaotic nature of everyday business is but a deviation from 'perfect' or 'balanced' market conditions), there is no need to argue against it. It is certainly true that society at large may benefit much more from an innovation than the company doing or financing the research. This is a strong argument for public support for R&D.

The systemic view of innovation

Traditionally economists have tended to view innovation – i.e. the learning-based process of developing new, and improving existent, products, processes and services – as something that is introduced into the economy from the outside ('externality'). Although most – if not all – economists now agree that technological development is a major contributor to economic growth, innovation policies are normally not considered a part of economic and financial policies.

Modern innovation theory argues that:[9]

Innovation is an integrated part of the economy

- Technological change cannot be seen as something delivered from the outside into the economy. Innovation is rather seen as an integrated part of economic development. Managers, workers, engineers and researchers all take part in a process aimed at producing and developing products that someone asks for or might need in the future. The most successful firms are most likely those that manage to advance new or improved commodities or services.

[9] We refer the Minister to the summary and implications of the document *Innovation policy in a knowledge-based economy*, European Commission, Luxembourg 2000, discussed at the Board of DGs meeting 15 May.

Companies take part in clusters

- No company is an island in itself. All firms take part in complex networks of suppliers, customers, partners, consultants and research institutions, as well as various forms of public governance and regulations.

  Studies show that companies are more likely to interact with some companies and institutions than others, i.e. with those they share a common interest. It turns out that most companies have the closest relationships with customers and suppliers within the same branch of industry or the same field of trade.

  If you map the flow of trade, people and knowledge between companies, you will find clusters of companies that are strongly inter-connected, often being suppliers and buyers in the same chain of production. These companies frequently interact with the same parts of the public apparatus, including research institutions, offices and programmes that are established to help these companies with advice, information, facilitation and money. You will also find privately owned consultancies (often termed knowledge-intensive business services – or KIBS) that aim at supporting these firms in their innovation effort.

  These groups of firms and institutions may be anchored regionally or locally, in which case we talk of *regional or local clusters*. However, these patterns of interaction might also cross regional or national borders, forming *national* or *international clusters.*

Industrial success rests on an efficient flow of competences

- It follows from this that the economic success of an industry to a large extent rests on the distributions and flows of competence-building resources in the relevant clusters, i.e. on whether the individual companies are able to get hold of, understand and use the resources available in the cluster. These resources may be found in various institutions, and includes formalised, research-based knowledge.

  In a similar vein one could argue that *in the long term* the main key to the economic health of a nation is found in the production and reproduction of relevant competences and knowledge in the innovation system, not primarily in interest rates, inflation rates or a balanced budget.

  A recent major European research project, the COIN project, indicates that as long as clusters have built in mechanisms to renew and re-invent themselves their competences and experience are very precious assets, regardless of their R&D-intensity (i.e. whether they are classified as ‘high-tech’ or ‘low-tech’). However, most successful clusters are the results of long and complex social processes. To artificially create new cluster may be a too costly strategy from both a policy and industry point of view. It is much easier and cost-effective to build on existing strengths.

- When developing their competences and innovative capability firms may interact with various forms of competence providers, including other firms, public institutions, universities and colleges. From the firm's point of view these all provide competence *services*.

  Some companies and institutions specialize in providing *research, innovation and technology services* for firms. These have traditionally been called RTOs (Public or semi-public *Research and technology organisations* – including public laboratories and research institutes as TENTECH and MoD's MILSON) and KIBS providers (*Knowledge intensive business services* – predominantly private consultancies, or *market-based*).

  The EC COIN study shows that in quite a number of clusters RTOs and increasingly KIBS provide all sorts of knowledge-related service functions that help actors in these clusters to innovate and to adapt. The mix of service functions and the balance between what services are provided by RTOs vs. KIBS' vary from cluster to cluster. However, the general trend is that RTOs tend to move more downstream providing more hands on and implementation like services, whereas KIBS increasingly perform services that used to be associated with RTOs and institutions of higher education only.

Competence and learning

Innovation depends on the ability to learn

Modern innovation theory argues that the companies' ability to innovate rests on their ability to learn. By this is meant not only learning through trial and error within the companies' own walls, but by learning from others in the relevant *system of innovation*.

Learning is *not* passive absorption of information. Information is in itself worth nothing unless you know where to find it, and how to mobilise it in a relevant context – hence the need for close interaction with other people and institutions.

In order to learn and stay up to date the companies and their employees must stay in touch with related companies, institutions, and other sources of knowledge and competence building (including everything from research laboratories to trade fairs, conferences and professional associations).

Knowledge is not a 'free' or common good

The Minister of Finance may argue that knowledge is a *common good* – freely available to anyone who knows how to read. In practice, however, *it is not*. In firms knowledge is but an aspect of competence, meaning the ability to perform significant tasks and to solve problems that enable firms to compete effectively and sustainably in markets. Abstract theoretical *knowledge is of small value unless it is utilised in innovation practice*. Another company cannot just download a competitor's organisation or work and life experience from the Internet.

This is why companies invest in R&D in spite of the market failure, and this is why companies adopt innovative practices and organisational structures. For a period of time they will have competitive advantage based on improved competence that may be hard to imitate, even if they are unable to patent the innovation.

Tacit knowledge

Knowledge includes so-called 'tacit knowledge', including the contacts of individuals, intuition and creativity, social intelligence, background knowledge, a sense of context and appropriateness, and more.

Culture and social skills

At the collective level, knowing 'what to do' in a firm involves company and business culture, shared 'genres' of practice, and the local languages and stories that are 'part of the furniture' of a workplace. Competences – a firm's abilities to do significant things in markets – include such tacit as well as explicit and formal elements.

Machinery

Competences also include the material apparatus of the firm – concrete configurations of capital assets such as machinery or computers, materials, documents, the communications infrastructure, the physical and practical organisation of space, etc. In practice, the competences of a company take the form of the entire organisation of resources available to actors in the firm.

Tradeable assets

Consequently learning is related to the acquisition of assets, including tradable knowledge assets, the 'public goods' of basic science and 'hard' technology and machinery. But tradable assets and public goods are not, in themselves, competences. Further investment is required to 'configure ' them into significant competences – to make them useful.

Whether a firm succeeds in developing the much-needed competences, depends to a large degree on its ability to build linkages to relevant firms, organisations and innovation services. Although a firm can be said to belong to a certain 'industrial cluster' (which is a theoretical concept), that does not necessarily mean it is good at 'networking'.

Institutional failure

The *Minister of Finance would like to cut the budget of several programmes* targeting competence building in firms and knowledge dissemination, claiming that this is the responsibility of industry. She claims that the public's responsibility should be limited to funding university and college science.

Lack of networking and the ability to find, understand and use new

However, recent research from the EU research project COIN and others confirm *the need for a pro-active and extensive Government policy* of such programmes. A lot of companies lack the competences needed to make use of university science in specific competitive settings. The staff may not have the education that is needed, they may lack the necessary contacts in

knowledge

the university sector or they may lack the experience of transforming academic knowledge into industrial competences.

As it happens, most innovation is done without *direct* use of university research.[10] For most companies it is more important to build learning relationships with other firms, suppliers as well as customers.

Moreover, they may also lack the experience to evaluate how relationships with external sources of knowledge, skill, assets and insights might contribute in a practical way to new, improved, relevant competences.

Systemic failure: Plugs in the knowledge flows

Companies thus often face what researchers have called *systemic failure*, i.e. they are unable to mobilise resources needed to perform certain innovation activities. They cannot get access to a relevant competence (from an external specialist) or the means of building a relevant competence within the firm. One could say that flows of knowledge and other competence resources in the innovation system are restricted in such a way that it hinders much needed innovation. This is especially true for small and medium-sized firms that often lack the personnel and competences needed to access the relevant networks and institutions.

Issues of perception are involved, together with interpretation ('making sense' of unfamiliar arrangements), communication, practical abilities to get certain things done, finding the right institutions etc., which make them invisible to potential beneficiaries.

In a sense these are all 'market failures'. A perfect market would have none of these problems because all information would be perfectly meaningful and all resources perfectly available. But in real-time and real space, real humans and real firms have these problems of institutional failure. 'Hard' institutional failures are in formal organisations (e.g. universities, government departments, firms), 'soft' failures are in culture: good practice, norms, language, expectations, stereotypes, etc.

Some policy makers argue that the impressive growth of the KIBS market, shows that the private technology services do meet the demand of industry and that there for this reason is no need for public measures. However, the COIN programme has documented that research, innovation and technology services may be marginal in particular clusters of innovating firms, while simultaneously being viable as revenue-generating companies. In other words, the market in innovation services does not guarantee that the companies that need them most get acccess to these services. Hence as society we do not reap sufficiently the potential benefits from these

[10] Meaning that they are not using results from basic research directly and that they are not in contact with universities and other institutions doing basic research. However, they use knowledge and technologies, which have components that have been developed through basic research, and personnel trained in universities. For instance: All companies use computers, and although modern computers are not developed in science labs, they contain materials developed through basic science and software based on logical systems developed in universities.

developments. The Minister may argue that the Government has an important task in ensuring that these welfare effect are reaped, to the benefit of our society.

Systemic policy measures

Public support to the development of a network of innovation services

This is why the *Ministry of Innovation has decided to support the development of an extensive policy initiative towards the provision and use of so-called innovation services*. These are services provided by several firms, institutions, organisations or programmes, helping firms get access to much needed competences in these external organisations, or to factors that enable them to build and upgrade sustainable competences in-house, as well as exploiting the existing assets, resources and competences of the firm.

The *Ministry of Finance will probably argue that the public contribution to innovation services should be the responsibility of public universities, colleges, R&D institutes and laboratories only*. These do indeed play important roles as service providers in this.

However, *the Minister could argue that institutions like the universities and colleges have tasks that go far beyond the needs of industry*. Their role of providers of basic, long-term science often demands a culture that is not always compatible with the short-term horizon of small and medium-sized businesses. A too strong focus on industry needs may undermine the long-term aspect of university research. Furthermore, what the firms need is often not new basic science, but more practical technological or organisational solutions based on already existing knowledge.

RTOs and KIBS

The main business oriented competence services today are the research and technology organisations (RTOs, mainly industry-oriented, public-funded technology institutes or research laboratories) and knowledge intensive business services firms (including various forms of private consultants and professional services firms). Under pressure of reduced public funding many RTOs increasingly operate as KIBS, perhaps on a private non-profit basis.

The recent COIN study shows that RTOs are so diverse in their institutional form and service activities that it is impossible to give a clear definition, and misleading even to offer a typology. From an *innovation policy* and *functional* point of view it is probably better to talk about research institutes, laboratories, consultancies as *innovation services*. To these services one should also add units performing routine operations associated with the productive use of technological apparatus – for example, testing and certification, maintenance, health and safety audits – and providers of machinery and new technology. These may not all be targeting innovation directly, but by improving the competences of the firm they strengthen the firm's ability to innovate.

It should be added that from an institutional and administrative point of view, it may still make sense to speak about R&D institutes and labs (as

TENTECH), RTOs, KIBS etc.

Some innovation services do an excellent job connecting firms with firms, firms with R&D institutions, and firms with relevant public measures, but the effect of their work varies from region to region, industry to industry. This variation is partly due to individual, cultural and historical differences in the institutions, but mainly due to the differing dynamics and requirements of the clusters that the RTOs and KIBS serve.

Of course, innovation systems and clusters are dynamic, i.e. they evolve over time, and the relevance or effectiveness of public-funded RTOs, for example, may change (especially if RTOs or universities themselves do not change).

The innovation system is varied and constantly changing, hence the need for dynamic innovation policies

This variation means that *one cannot base innovation policy on a theoretical basis that treats all firms, industries, regions and innovation services in the same way. This is why the Ministry of Finance is mistaken when they claim that there is no need for public measures in this field*. The individual business owner cannot – and probably should not – concern herself with the overall functioning of the innovation system. It is her job to develop a successful firm where she is. The same applies to managers of RTOs; they have a difficult job maintaining the excellence of their services, balancing the budget and identifying appropriate, competent clients for their services.

The public institutions have the overall responsibility for developing the innovation system

On the other hand, the public policy makers, the industrial corporations and relevant researchers must have *an overall view of the national and regional innovation systems*, including the public and private innovation services provided within them.

Public policy must contribute to the development of a comprehensive system of knowledge institutions and innovation programmes that can improve the flow and distribution of relevant competences and competence factors in various industries and clusters. Neglecting this implies the neglect of prospective long term welfare gains for society at large, in breach with the main policy objectives set out in Minister of Finance's White Paper to Parliament on long term economic policy objectives, WP 23/2001 *Prosperity for All*.

Private KIBS will always play an important role as competence suppliers for firms, but they are not able to fulfil the needs of the whole system. There are definite needs for publicly organised and funded policy vectors at these firms and sectors and their interaction with their clients.

The COIN programme identify several core elements for policy related to innovation services:

- Build firms' competences to use external innovation services (In most advanced countries, articulating demand is more important than

increasing the supply of innovation services).

- Facilitate a sound division of labour between various kinds of suppliers and different kinds of service content.
- Match services to cluster requirements in strategically important cluster ('high-tech' as well as 'low tech', new as well as traditional industries).
- Integrate actions across policy areas and government functions.
- Assess the contribution of innovation services in specific clusters, and give priority to existing clusters when developing public-funded or sponsored vectors/measures.
- The various institutions contain mixes of economic and social tasks or functions, which vary from cluster to cluster and from country to country. When developing policies it is important to identify the actual innovation functions of these units.
- Safeguard multiple roles of innovation service providers (RTOs and KIBS) under other aspects of policy (including employment, labour relations, the environment, health, public welfare, culture and social affairs).

The Innovation White Paper

Change and Opportunity

The Minister could remind the Cabinet of the recent proposals forwarded in the White Paper on Innovation Policy *Change and Opportunity – on Industrial Innovation and Creativity*. This clearly states that the Government wants to go beyond the traditional science and technology policy, where the State focuses on supporting R&D institutions only. The paper states that:

To establish a structure of competence institutions

- 'It is the goal of the Government to establish a well functioning institutional structure of R&D institutions, knowledge-intensive business services, public measures for high risk financial support, and programmes aimed at improving the competences of firms to learn.' (p. 17)

Dynamic capabilities of firms

- ' One should increase the dynamic capability of firms, thus strengthening their absorptive capacity and generating and updating their strategic technological competences.' (p. 18)

Uphold modern education

- 'It is the goal of the Government to uphold a modern, adaptive sector of education of high quality that may bring out skilled and creative people that can fulfil the needs of our society, our culture and our economic life.' (p. 35)

However, this is not enough. When focusing on the needs of business, the paper also focuses on the systemic nature of innovation and knowledge-creation:

Develop public innovation services for interaction and co-operation

- 'The Government will continue to develop public services aimed at improving the interaction between the participants in the innovation system. These will include publicly funded, chartered or franchised innovation services in areas of the economy where there are few or no relevant private companies. Where the opportunity offers, these will be 'prototypes' of potentially viable commercial services. (...)

  'The main effort, however, will be targeted towards programmes for co-operation and interaction within and sometimes across various industrial clusters: 'collaborating for competition'. These measures will counteract institutional failure of both an organisational and a cultural kind within the system, failure that prevents resources and competences outside the firm from being identified or used in innovation. (...)

  'Sometimes market failures of a straightforward kind are involved and appropriate financial measures (e.g. public venture capital) will be integrated with 'institutional failure' measures.' (p. 45)

Regulatory reform.

- 'The Government will continue to improve structural elements in the system, including regulatory frameworks, taxation, technical standards, risk-management rules, health and safety regulations.' (p. 46)

Programme aimed at strengthening the learning capacities of firms.

A system based on a mix of private and public institutions.

Programme for strengthening the competences of policy makers.

The white paper also announces (pp. 54-60):

- The creation of a new programme aimed at supporting the building of systematic competences of firms to evaluate and use external sources of knowledge and capability,
- The development of a service system based on a sound mix of private and public institutions, including hybrids based on public as well as private finance and participation,
- A new programme aimed at building in the strategic and administrative competences of policy makers involved in innovation policy and the design of innovation services. The Government shall identify the actual innovation functions performed by public-funded suppliers and R&D services in the various industries, clusters and regions, and get a better insight into their various roles and tasks.

Some RTOs have functions going beyond the role of research and technology services, including scientific advice to the public, inputs to political debate and decision making, inputs to judicial processes, operational services to firms and government departments, or – even –

basic research. *The Government has been criticised for trying to sacrifice these long-term public tasks on the altar of 'short-sighted' innovation processes in industry. Some of the ministers may repeat these concerns on the conference, especially the Minister of Culture and the Minster of Health and Social Affairs*.

The Minister can refer to the White Paper's discussion of these matters. It states that these functions should not be weakened, as the interaction between the various functions will strengthen their long-term ability to perform innovation services, as well as their capability of accomplishing other tasks.

Conclusion

University science and industry

There now seem to be *broad agreement on the need for strong support to our R&D institutions*, and especially for university science and 'bridging' mechanisms between university R&D and industry such as the Foresight programme and various regional networking initiatives.

Clearly *university research has cultural and social goals that go far beyond the needs of industry*. From an economical point of view, however, *the Government has a responsibility for making certain that relevant competences and resources developed in these institutions are utilised by industry in the most efficient way possible*.

Exploiting the competences of industry

It is also important to ensure that the competences of our industry are exploited effectively, since these constitute a far larger national resource base than the whole of the university sector. This can only be done by a two-pronged strategy:

Establishing a learning framework

- *Establishing a framework that improves the companies' ability to learn, mobilising, generating and using new competences*.

Improving innovation linkages

- *Improving the linkages between firms and between firms and institutions* (including firms*) providing innovation services* in the form of either 'ready to use' competences for innovation, or various factors for competence-building (including data, information, staff, physical technology and intangible assets).

An innovative industry gives a strong economy

Our economy and our welfare rest on an industry that is able to innovate and adapt to constantly changing environments. Hence it is in the interest of both society and the Ministry of Finance to support measures that improve the competitive edge of industry.

Need for strong public institution for

In order to develop such instruments and policies, strong public institutions and offices with the financial resources necessary to learn the nature of the

innovation and co-operation

various clusters and industries *are needed.* Innovation services must be available and relevant for industrial use.

The Minister of Innovation must therefore oppose the proposed cuts in the research and innovation budgets, and asks that the proposals forwarded in the White Paper on Innovation Policy is carried out as set out by the Cabinet, and strongly supported by the Parliament majority.

END OF MEMO

Innovation services and policy development

The synthesis report of the OECD TEP programme, *Technology in a Changing World*[11], reproduces the policy statement on technology and the economy that was adopted by the OECD Council at Ministerial level at the conclusion of the TEP programme in June 1991. In the statement OECD Ministers '...reaffirm the importance of fostering diffusion and wide acceptance of technology within their economies and societies,' and 'underscore the critical importance of human resource development and mobility for the competitiveness of firms and countries' (p. 9). Through the TEP programme and the subsequent discussions among policy makers and researchers, the systemic approach to innovation policy became the accepted line of arguments among policy makers within systems having responsibility for technological research and development, industrial development and guidance etc., in most OECD countries. Policy makers and politicians in this area today make frequent use of arguments from modern innovation theory, based on the view of innovation as the fruit of efficient flows of and generation of information; perceptions, competences, knowledge and ideas in a larger network of firms, organisations, public institutions and regulations.

Theory and reality

However, both with researchers and policy makers, this viewpoint is in no way taken for granted, it is quite evident that there is still a need for defending the position – often against strong counter-forces. In an often ritualistic manner policy documents and research papers frequently have spent substantial resources on declaring 'the death of the linear model', evidently seen as way of convincing the generally undeclared 'opponents'.

"We all say the linear model is dead," one policy maker told us, "but still a lot of policy makers [in other agencies or ministries] act as if this is not the case. Maybe they have not grasped the true implications of the new way of thinking, or maybe they still find it opportune [for their other purposes!] to use more old fashioned arguments."[12]

There are no simple explanations for this phenomenon – whether referring to ignorance, rhetorics or otherwise. Firstly, in no country[13] do we see a policy apparatus characterised by monolithic ideological consensus, detailed objectives and their operative expressions. Rather, there are generally large variations in ways of thinking, policy strategies, historical traditions and institutional frameworks, conflicting interests or interpretations of shared goals and interests. Even within the same ministry, the world-view in one department or directorate may be in direct conflict with that of another. This may reflect or be reflected in intense battles of the positions or impact, not just between, but even within ministries.

In research on the economics of innovation attempts, with some progress, have been made to develop an evolutionary-based microeconomic theory that generalise or may supplant textbook 'neo-classical' microeconomic theory. Including basic aspects of the 'technological' competitive framework facing firms, innovation would be integrated into the basic platform and tool box for analysing economic phenomena. The confrontational approaches of some of these documents towards 'neo-classical economics' are clearly unwarranted, but evidently play a role for internal purposes. Although our experiences mainly are within one national (Norwegian) context, collaboration and discussions with colleagues in other countries have convinced us that conflicts

[11] *Technology in a Changing World*, OECD Paris 1991.

[12] From an interview with a Norwegian ministerial policy maker June 2000.

[13] At least no country with which we acknowledge comparison.

and schisms may be identified, though they may be strongly imprinted by the specificities of institutional structure and divisions in each country.

Research and policy making, another 'linear model'

There is no one-to-one mapping of socio-economic studies onto policy development. Policy development, the evolution – and revolution – of objectives, instruments and other modes of implementation etc. is not reducible to explaining an expanding socio-economic knowledge base. Surprisingly researchers and policy makers addressing innovation and its systemic characteristics as a primary activity, often seem to fall back to a linear understanding of the relation beween socio-economic research and analysis and policy development and implementation. Policy makers implement objective analysis of researchers into relevant policy measures.

The daily reality of policy makers is much more complex. Scientific inputs are only one of many factors influencing policy development. Policy makers and politicians must also continually balance 'sectoral' objectives against other 'sectoral' objectives and overall policy objectives and priorities – far beyond the sphere of innovation and industrial development. Then there is the press and public opinion to consider, cultural and ideological differences, as well as the constant struggle between the various parts of the political apparatus for funding and power (Edwards 1999). Policy making is an activity that must be seen as operating on the basis of a complex competence base by itself, the operation of which requires a wide range of tacit and hands-on skills and capabilities. It is an activity that is definitely knowledge intensive – maybe one of the most knowledge intensive activities in our economies – but its incentive and norm structures are very different from the rather simple ones operating on the science side.

These and similar views have strong implications for how we think about the interaction of scientists and analysts with policy makers and how we may design the interface between them.

Mentalities

Periods with dominating mentalities

In a recent paper Hauknes and Wicken (2002) outlines some aspects of recent innovation policies in Norway and points to some possible trends of these policies for the upcoming years. A main concern is to elicit what the underlying presumptions about industrial production and 'value creation' is and what the ultimate aim of 'modern' competitive industry was.

A core assumption in the paper is that industrial innovation policies in any period basically find their political aim in the perception of a gap between what is regarded as the 'idealised modern' industry and characteristics of the present industries. This ideal may vary over time, and an identification of key ideal models in various phases would thus contribute to explaining shifts in policy maker's perceptions of challenges to be met or problems to be solved by industrial policies. The same applies to shifts in policy objectives and in the measures and instruments developed and used to attain these objectives.

Though there are various other mechanisms that may cause shifts in these policy *mentalities*, such as enhanced scientific understanding of economic growth and development, it seems that the contribution of these to explain wider mentality shifts of the public communities generally are minor. The guiding role of these inputs lies probably more in shaping and advising policy formulation at the detailed level, within the framework of any governing mentality.

The core rationale for an industrial policy and its daughter innovation policy is based on the role of the industrial enterprise as a generator of welfare. The industrial enterprise, and the economic system, is a 'value creator' in these terminologies, generating national income both on the private and the public hand, determining the level general (economic) welfare.

Thus ultimately industrial policy is a central part of overall welfare policies. As well as pointing to why industrial policies have been given strong attention in the period we consider here from political parties and the policy system, it also throws light on why the indicated mentalities are important; they are ultimately ideals about the 'best' generation of social economic welfare.

The mentality concept

The mentalities of policy practice have emerged at specific periods in history, in the form of relatively coherent and explicit clusters of policy positions and practical measures. They may be interpreted as 'genres', 'paradigms' or as ideal models of industry[14].

Mentalities persist, or have inertia. They continue to operate after the period during which they originated and are embedded in institutional structures and arrangements as well as in policy practices and instruments. They constitute a framework for policy discourse among policy makers and between these and the relevant policy environment.

Mentalities and ideologies

Mentalities are often considered 'self-evident' and are not necessarily explicitly formulated by policy makers. Researchers and scholars may, however, try to give a clearer description of such worldviews, developing what one can call 'ideologies', i.e. systematically developed models based on a given mentality or view of 'reality'.[15] Studies of innovation may for instance be linked to one or more of the dominating schools of economics, including traditional neo-classical economics, new growth theory and evolutionary innovation theories. These may be considered the ideologies of innovation research and policy making.

There is, however, no one to one relationship between these ideologies and the mentalities of policy makers. Studies show clearly that any idea of policy development as being solely a product of ideologies or practical research is misconceived. There are no linear processes – neither starting in universities or science, nor in 'false ideologies' – leading to new policies in ministries and policy institutions. Rather there is a complex and multi-directional interaction between these and other factors, continually strengthening and counter-acting each other. History is important, reflected in institutional (in the wide sociological sense) structures, in the socially constructed reality of the policy system etc.

This should come as no surprise to people involved in innovation policies and innovation theory, given the strong slant towards systemic thinking. Nevertheless, the fact that there have been few studies of policy learning has often led to an oversimplified and distorted understanding of the

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[14] The term 'mentality' will have to be an ambiguous one, given that a lot of the attitudes and opinions that follow are not necessarily the result of systematic reflection. In this respect it has a lot in common with Thomas Kuhn's 'paradigm' (Kuhn 1970, Masterman 1972), Michel Foucalt's 'mentality' and Hans Blumenberg's 'epochs' (Blumenberg 1983), although *our* 'mentality' must be understood as a matrix of ideas that encompass a specific group of people, not a whole society or epoch.

One can also interpret the term hermeneutically. In this case the basis of the lifeworld (i.e. the total life experience and competences) of the individual is shaped by ideas, competences and attitudes that are common in his or her cultural and social context. Hence policy makers and researchers in a particular environment and period of time will have their lifeworlds shaped by the same influences – they will take part in the same 'mentality'.

[15] An 'ideology', theory or philosophy may, of course, also give birth to a new mentality. However, one should be very careful picturing any linear process form mentality to ideology or visa versa. Researchers, philosophers and policy makers all take part in a complex social and cultural systems, where competences, ideas and cognitive structures may influence and inspire various individuals and groups in a wide variety of ways. One way of interpreting the development of new ideologies would be to model a feed-back loop where the ruling mentality of a social group or school inspires researchers to develop new theories that ultimately challenges the basis of this mentality, thereby changing it.

relationship between socio-economic research and policy making. Decisions of development and implementation of innovation policy programmes, funding schemes and other policy instruments are made in a complex environment of heterogeneous power distribution and responsibilities. This implies that simple models of rational policy choices and implementation does not resemble 'policy making in action'. It also implies that simple models or analytical alternatives cannot address concrete policy issues and choices in a sufficiently rich way, relevant to the incentives structures, necessary trade-offs and negotiation processes of the policy makers' working context. This also emphasises the contextual dimensions of policy vectors introduced, the concomitant limitations in their transferability and hence, the strong limitations learning based on simple 'best practice' exercises.

In analysing the interaction of research and analysis with innovation policy development, it is necessary to approach the two environments as different cognitive systems or fields of expertise, with different norm and incentive structures.

Research vs. policy making

Policy makers taking part in interviews and workshops with us have often complained that generally the main message of reports and other material from our and other research institutions are too 'academic' or not relevant to policy and policy vector development. In short, they are not perceived as focussed at the 'right', or relevant, questions and issues – or giving sufficient depth to the analysis of the policy questions. Some explicitly state the view that researchers and analysts have simply not 'grasped the issues'. Scientists on the other hand complain of contractors and policy makers grasp of the underlying questions and messages. This could mean that the scientist has failed to understand the needs of the other party, or that she is unable to communicate the new insight in an efficient way. It could mean the recipient simply is not willing to invest sufficient resources into developing the required capabilities to understand the messages. Or – which is often more likely if our experiences count for something – it is a classic situation of not paying sufficient attention to the communication process, its language and 'presentation mix'[16].

In general the formal background of policy makers are not substantially different from the ones of scientists and analysts. Neither are there reasons to believe there are systematic gaps in capabilities between the two. This implies that at least some policy decision makers should have competences needed to understand research results in general. If they find presentation of these inaccessible or even useless, one should look for other causes.

We have indicated some possible, at least partial, explanations, such as those stemming from disagreeing mentalities or worldviews, or from differences in institutional incentives and norms. Furthermore, differences in assessment of the 'value' or merit of the products supplied may stem from the fact that what for one party – the scientist – is the essential part, the 'meaning of life', for the other is one tool among many – and perhaps even not the most important one.

These are neither complete, nor final explanations. The main message we want convey here is rather a call for an improved understandingof the interface between social science and policy analysis and the use of this in a policy making and priority setting context.

Of course, there may also be rather prosaic reasons for the state of communication between policy makers and analysts. But what is clear, is that they are not the *only* reasons – and that any attempt to understand these reasons in their proper context require an understanding of other not so prosaic reasons.

[16] For a rich discussion of a related interaction, see M. Hales (1999).

We cannot venture suggestions to improve communication, co-production and learning. It is, however, possible to map some of the most important aspects of learning and innovation in such institutions and give a presentation of how some of the policy makers themselves experience their situation. An accompanying paper outlines some concepts and suggestions for how we may approach policy learning from this angle.

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