



Building Nordic Strength through More Open R&D Funding – Study 3

The Next Step in NORIA

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The Next Step in NORIA

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Nordic co-operation

Nordic co-operation, one of the oldest and most wide-ranging regional partnerships in the world, involves Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland. Co-operation reinforces the sense of Nordic community while respecting national differences and similarities, makes it possible to uphold Nordic interests in the world at large and promotes positive relations between neighbouring peoples.

Co-operation was formalised in 1952 when *the Nordic Council* was set up as a forum for parliamentarians and governments. The Helsinki Treaty of 1962 has formed the framework for Nordic partnership ever since. The *Nordic Council of Ministers* was set up in 1971 as the formal forum for co-operation between the governments of the Nordic countries and the political leadership of the autonomous areas, i.e. the Faroe Islands, Greenland and Åland.

Preface

A recent discussion paper entitled “*The Nordic Region as a winner in the global innovation economy*”¹, produced by the Nordic Council of Ministers states that the Nordic Region might do well indeed in terms of economic competitiveness in an ever more globalised economy. In the paper 27 key Nordic thought leaders from the business community, research and culture urge the Nordic governments to join forces in an ambitious joint winning strategy that exploits both Nordic strengths and the opportunities offered by globalisation.

The Nordic Council of Ministers has, in continuation hereof, commissioned Technopolis to conduct a study, *Building Nordic Strength through More Open Funding: The Next Step in NORIA*. The study touches upon several aspects of Nordic strength, and also comments on the recommendations from the *thought leaders* regarding how the competitiveness of the Nordic Region can be enhanced. Joint strategic actions, establishing more ambitious win-win cooperative relations, combining Nordic resources are some of the key suggestions. They also point out that globalisation is not just about looking outwards and understanding the changes, but also about looking inwards and understanding one’s own strengths and skills. The Nordic Region should have the world’s best education system and the Nordic ambition could be to become state of the art in competence development. This would involve investing more heavily in high-level research than is currently the case.

The present study states that the Nordic nations face important challenges in research and innovation. It goes on to point out that NORIA (Nordic Research and Innovation Area) could be strengthened at little

¹ The Nordic Region as a winner in the global innovation economy (Only summary in English) <http://www.norden.org/webb/pressrelease/pressrelease.asp?id=1275>

cost by selective mutual opening of national R&D programmes to allow research and innovation funders and performers to build Nordic platforms. The report also contains an analysis of what could happen to Nordic states' interests under a number of different circumstances, specifically a strong/weak ERA (European Research Area) in combination with a strong/weak NORIA. The study concludes that a strong implementation of NORIA would in all cases produce the best position for Nordic actors.

The study addresses some very timely and important issues in the light of globalisation and increased pressures on national economic competitiveness. I find the above mentioned analysis very interesting and I look forward to discussing the report with my Nordic colleagues.



Øystein Djupedal

Minister of Education and Research

Building Nordic Strength through More Open R & D Funding – The Next Step in NORIA

Research and innovation are the primary corner stones in efforts to strengthen economic competitiveness in an ever more globalised economy. This study states that the small Nordic nations face fierce challenges within research and innovation, and recommends that Nordic research cooperation be strengthened. The study points out that NORIA (Nordic Research and Innovation Area) could be strengthened at little cost by selective mutual opening of national R&D programs. Finally it is analysed what could happen to Nordic states' interests under a number of different circumstances, specifically a strong/weak ERA (European Research Area) in combination with a strong/weak NORIA. The study concludes that a strong implementation of NORIA would in all cases produce the best position for Nordic actors.

The study is compiled for the Nordic Council of Minister by Technopolis, which has been aided by a reference group with representatives from NordForsk, Nordic Innovation Centre, Nordic Energy Research and the Nordic Council of Ministers' secretariat.

Report series: The Nordic Region as a Winner in the Global Innovation Economy

During its Norwegian presidency, the Nordic Council of Ministers for Educational and Research Issues (MR-U) has wanted to identify potentiality for policy developments within certain policy areas, which are relevant for the Nordic countries in the light of globalisation and increased pressures on national economic competitiveness. The interest in such issues and their policy implications, nationally and possibly at the joint Nordic level, takes its point of departure in a discussion paper, which the Council had produced bearing the title "*The Nordic Region as a Winner in the Global Innovation Economy*"². The paper concludes an array of *positions of strength*, and forwards several policy recommendation. The Nordic Council of Ministers has in continuation hereof, decided to look more closely at four specific policy areas, which in different ways are believed to be important for the Nordic countries efforts to position themselves as *knowledge economies*. Four independent studies have thus been commissioned, and are now published in a series title "*The Nordic Region as a Winner in the Global Innovation Economy*".

continued

² The Nordic Region as a Winner in the Global Innovation Economy (Only summary in English) <http://www.norden.org/webb/pressrelease/pressrelease.asp?id=1275>

The studies are not expressions of the Nordic Council of Ministers' policy or positions, but are merely an expression of the fact that a further discussion of the policy implications of these issues is thought necessary:

1. Nordic Ways of Interaction Between Public Research and Business
2. Quality Assurance of Higher Education in the Nordic Region: Towards mutual recognition and increased cooperation
3. Building Nordic Strength through More Open Funding: The Next Step in NORIA
4. Reading Skills in the Nordic Countries

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Executive Summary

The Nordic nations face important challenges in Research and Innovation. Both Nordic and EU experience shows the value of cooperation based on the needs and self-organisation of those involved. NORIA can be strengthened at little cost by selective mutual opening of national R&D programmes to allow research and innovation funders and performers to build Nordic platforms. However the institutions that could coordinate this at Nordic level are incomplete. They need to be strengthened through better coordination between ministries' areas of competence and the creation of a Nordic arena for the discussion and creation of more holistic Nordic policies than can be constructed while the Nordic Council of Ministers' structures remain overly compartmentalised.

The Nordic nations face important challenges in Research and Innovation

In research and innovation, the environment has gradually been changing around the Nordic nations. While the interdependence of innovation and research is reflected in Nordic nations' national policies, there has been surprisingly little reaction in policy or institutional terms at the Nordic level. Science has to some degree been globalised for many years. Globalisation of other parts of the research and innovation system has rapidly been increasing, as can for example be seen in the dramatic changes in ownership of the major Nordic-owned multinationals over the past 20 years, the movement of R&D within and out of the Nordic region and the resulting changes in the relations between the industrial and university research systems.

The way disciplinary and fundamental research interacts with society and the economy has been changing, too. We recognise these changes under the slogans "Mode 2 knowledge production" and "Triple Helix,"

and discuss the “changing social contract between science and society” – which in practical terms means that most countries want to see increasing social benefits resulting from research funding and are no longer prepared simply to fund research and hope that something good will happen. We now understand the world of research and innovation in terms of “innovation systems” – a concept which Danish, Norwegian and Swedish researchers have been key in developing. This innovation systems heuristic tells us that all actors involved in research and innovation need to perform well and that their efforts must be strongly interlinked. There is no single “policy lever” that we can pull in order to increase the performance of the system. We need a holistic approach. These changes are partly a paradigm shift: we understand the world in a different way now. But they seem partly to reflect changing realities. The explosive growth of higher education means that we produce and use knowledge in more parts of society than before. While we have developed new project-level funding instruments to cope with these changes, they have had little impact on the structures or institutions we use in research and innovation policy, except in the creation of unified research and innovation agencies in Iceland and Norway. Despite the NORIA reform, these ideas have not yet influenced the structures for research and innovation at the Nordic level.

The European Union has recognised the importance of globalisation and concentrating its research and innovation resources. It is implementing a series of policies to build European critical mass and strength under the slogan of the European Research Area (ERA). To do this, it has set ambitious targets, reshaped the way it makes policy, redefined its role in relation to research and innovation policymaking at the member-state level and restructured its funding instruments. In contrast, the Nordic response to the simple arithmetic of globalisation has been passive. This arithmetic says that individual countries count for less than before; that this is especially important for small countries such as the Nordic ones and that creating and accessing critical mass in research will in many fields be an essential precondition for playing a meaningful, international role. Many of the traditional Nordic cooperations answer to these needs. The new Nordic Centres of Excellence build critical mass that helps strengthen Nordic positions. But the commitment of resources and enthusiasm to these Nordic efforts today is pretty minimal.

The overall challenge to the Nordic nations is therefore to operate a “joined up” research and innovation policy that builds individual and collective strength in a world where the Nordic region as a whole will otherwise become marginal. An active response will use common strengths to build platforms that strengthen Nordic positions in the world. A passive one will leave the Nordic cooperation half-heartedly trying to solve the peculiar problems of the Nordic area. Nordic common action is not a substitute for action at the European level, but is a necessary complement for building Nordic strength in the European cooperation and beyond.

A stronger NORIA is good for the Nordic region, whatever happens in Europe

So far, the pace of implementation of ERA has been slow. The big changes have been in attitude. By and large the EU member states now accept the need for ERA and that there is a need for more cooperation at the national as well as the European level in setting research and innovation policy. They even accept that the European Commission should play a role in coordinating national-level policy. While progress on the ground has been limited, arguably the changes in attitude are a necessary precondition for more radical policies that focus resources without concern for *juste retour*. There will therefore be losers as well as winners in EU research and innovation policies. Increasingly the “Matthew principle” (that the rich get richer and the poor lose what little they have) will apply in EU cooperation. The Nordic nations ignore this change at their peril.

Our analysis considered what would be likely to happen to Nordic states’ interests under a number of different circumstances. ERA might happen quickly or slowly (strong or weak). NORIA might extend the amount and type of research and innovation cooperation in the Nordic region, building strength in both Nordic-focused and more internationally interesting research and innovation topics, or might stay much as it is (strong or weak). We therefore looked at all four possible combinations of strong and weak implementations of ERA and NORIA. We found that a strong implementation of NORIA produced the best position for Nordic actors in all cases. Correspondingly, the current (weak) NORIA implementation consistently produced sub-optimal positions for Nordic actors.

The worst combination for most was the conjunction of a weak NORIA with a weak ERA.

- Individual researchers, and especially the more successful ones, tend to benefit from any increase in funding opportunities, especially those that encourage them to build stronger positions in terms of critical mass, shared equipment, and so on. Their interests are best served by a combination of a strong NORIA and a strong ERA
- The university sector worldwide is under pressure to specialise and create larger entities. Here, too, the Nordic cooperations show the way to tackle these pressures on “home ground”, and a strong NORIA would make it easier to build platforms on a Nordic basis
- As in other places, the Nordic research institutes have been restructuring to increase scale and broaden their capabilities. NORIA mechanisms that help them plan and cooperate will strengthen their position relative to competing national systems, some of which are bigger than the whole Nordic institute system
- Research councils and innovation agencies in the Nordic area already cooperate to varying degrees. More explicit cooperation mechanisms, preferably with some funding attached to allow them to plan more together, would reinforce Nordic positions and build stronger platforms for dealing with wider international cooperations, no matter whether ERA is implemented strongly or weakly
- Subjects and problems peculiar to the Nordic area were little affected by ERA but were likely to be better tackled under a strong than a weak NORIA. Opportunities to share facilities and obtain international quality control strengthen the position of such areas under a “strong NORIA”
- Subjects and problems like pulp and paper or the Baltic Sea environment, which are important to the Nordic area and a limited number of other places in Europe do not necessarily get high priority in EU programmes or coordination efforts. A strong Nordic platform in such areas both supports Nordic interests and provides a good basis for further cooperation – inside or outside EU structures
- In large subject areas of wide international interest (genomics, ICT and so on) a strong NORIA makes it easier to build critical mass and to have a strong position in wider cooperation. Some of the new NCoE centre of excellence participants have already found that their

negotiating position in Framework Programme consortia has changed as a result of the combined Nordic strength. Such advantages are not always necessary or available, but where they are beneficial a strong version of NORIA offers the best prospects for Nordic participants to build strong research positions

- In new and rapidly emerging fields, strengthening the established linkages among Nordic actors would make it quicker and easier to set up both informal and formal cooperations, helping the creation of Nordic platforms where these are relevant

Nordic and EU experience shows the value of cooperation based on the needs and self-organisation of those involved

Successful Nordic cooperations tend to be a mixture of formally organised and self-organised activities. For example, the NOVA cooperation among the agricultural universities arose because the rectors saw a need and simply got on with it. Attempts to extend this to a wider agricultural cooperation got stuck when confronted with the Nordic Council of Ministers structures. The Nordic energy cooperation has its roots in a similar bottom-up movement, and in practice survives outside the mainstream of the Nordic structures. The Nordic Centres of Excellence, initiated by the NOS committees, are established by researchers creating alliances bottom-up and then making proposals to the Nordic level. In many cases, a key factor is that at grass roots level, actors who want to cooperate have decided to do so and then sought Nordic-level support.

In the last few years, the European Commission has fostered new structures – especially ERA-NETs and Technology Platforms – that bypass established programmes and exploit self-organisation to identify and organise needed R&D and related activities. The ERA-NETs provide a little money, which allows research and innovation funders to explore joint needs, plan how to tackle them and to begin to implement more open ways of funding projects. The most important lessons are that the planning component brings the biggest benefits and that implementation of joint calls and actions is bureaucratically complex but possible. This would be easier if there were established routines.

The Technology Platforms allow a wide range of stakeholders to work together to define common needs and to assemble a portfolio of funding,

based on those needs. The results differ among platforms, but clearly allow configurations to emerge that could not easily have been foreseen or designed in the form of a programme.

These, as well as other examples from national level policy, illustrate the power of using bottom-up organisation to identify and implement effective cooperations.

NORIA can be strengthened at little cost by selective mutual opening of national R&D programmes to build Nordic Platforms

In principle, the Nordic nations could decide to open their R&D funding programmes to each other simply by accepting applications for funding from people in all the Nordic countries. No one regards this as a serious option. More realistic dimensions of opening are to build Nordic Platforms through

- Joint needs analysis and planning among funders and other stakeholders across the Nordic area, either instigated by the funders (as in ERA-NETs) or by other stakeholders bringing cooperation proposals to the funders
- Parallel but separate calls for proposals in Nordic countries, as an outcome of this planning
- Joint calls for proposals. These can easily be financed on a “virtual common pot” basis, so that funders fund their own nationals only, or they could eventually lead funders to create real common pots, with *no juste retour*

The variation in structures and resources among the Nordic countries means that such opening needs to be done with variable geometry: at least three Nordic countries should participate in each case, but the participation of all five should not be required. A modest amount of money needs to be made available to act as a “lubricant” by subsidising the planning effort involved. Implementation can be done largely using existing budgets.

There are important differences of law, administrative practice, timing of calls for proposals and so on among the Nordic countries. However, the ERA-NET experience shows that such obstacles can be overcome. Building experience and routines for tackling these questions will create an advantage for the Nordic region compared with other intra-EU coop-

erations, where the geography is more ad hoc and partnerships are different in every case. A clear signal from ministers that these barriers should be reduced and managed would provide useful encouragement for the agencies involved and *de facto* increase their autonomy by allowing them to pursue internationally coordinated as well as national strategies.

However the institutions that could coordinate this at Nordic level are incomplete

NordForsk and NICE are the current institutional pillars in the Nordic system for discussing and implementing research and innovation policies at the Nordic level. NordForsk is a very recent creation and has yet fully to find its form but promises to bring together the research councils and build upon the work of the established NOS committees. However, NordForsk and NICE live in different ministry fiefdoms (Education and Industry, respectively). Their links to the grass roots at national level are limited and their links to each other seem largely confined to sharing office space. There is no common governance or coordination channel. The Nordic level therefore lacks key ingredients of good research and innovation governance practice that would be necessary to develop the holistic research and innovation policies, which the Nordic states individually see as crucial to good performance. There is little strategic intelligence available that is structured at the Nordic level, so the ability to assess needs and design interventions is correspondingly limited. They have poor governance links to non-state stakeholders, especially industry. Crucially, their overall size is very modest – possibly even under-critical for performing a significant international role.

As they stand, these structures do not have the mechanisms or the defined role that would be needed to coordinate the kind of bottom-up cooperation initiatives that historically have resulted in successful Nordic cooperations and that could in the future create the joint programmes and platforms that will strengthen Nordic actors in the Nordic and international R&D arenas.

Nordic structures need to become better able to develop holistic research and innovation policies and to respond to bottom-up pressures for cooperation and opening of programmes

Periodic meetings and creating a joint secretariat between EK-NE and EK-U, inviting and funding bottom-up planning initiatives would be a good step towards enabling bottom-up driven cooperation and joint funding initiatives to be put in place across current research and innovation spheres.

The mutual dependence of innovation and research is widely acknowledged in national-level policies. The Nordic level, like the individual states, needs to create structures that can cope with this reality. Experience suggests that it is easier to cooperate in research than in innovation, so it is natural for the research and education ministers to take the initiative and to propose and create mechanisms that will eventually allow increased cooperation to spill over from research into innovation policy. We suggest in the first instance therefore that the Nordic Council of Ministers, and its secretariat should propose mechanisms to do two things

- First, to invite the individual Councils of Ministers into a process of horizontal coordination that can build the needed Nordic-level policy arena
- Second, it should find a way to run a pilot programme to encourage bottom-up initiatives across the whole of the research and innovation area. The pilot programme should initially aim to provide planning funds to 5–10 projects per year, which should result in concrete proposals for new cooperations, including proposals for limited mutual opening of national Nordic programmes.

To implement such a programme requires agreement from at least some of the national research councils and innovation agencies. (It is not clear that every one of them has to be involved.) It further needs an allocation of, perhaps, a handful of millions of kroner per year for three years to pay for the joint planning projects ahead of an early evaluation to determine the usefulness of the scheme.

The principle of research funding across Nordic borders using a common pot and without *juste retour* is already established. Researchers are voting with their feet to support it. This scheme will extend that principle

and allow the research and innovation communities themselves to identify where Nordic Strength is to be found, where cooperation and co-funding makes sense at the Nordic level.

1. Introduction

This report was commissioned by the Nordic Council of Ministers, as a basis for discussion at a Workshop in Copenhagen on 16 October 2006. It aims to answer the question “What happens if we open the internal Nordic borders for research funding – and what happens if we don’t?” It goes on to make some broad policy proposals, based on the report’s conclusion that “We should.”

As Niels Bohr famously said, “Prediction is very difficult, especially if it’s about the future.” Our approach has therefore been to try to minimise the amount of guesswork involved in answering our central question, by learning what we can from available evidence about setting up more open funding systems. We also recognise that the development of a Nordic Research and Innovation Area (NORIA) and the European Research Area (ERA) are interdependent, so we explicitly try to relate them to each other. This report is based on a combination of desk research and interviews with Nordic academics and policymakers as well as with EU officials. We used the interviews partly to explore the perspectives of knowledgeable people about the usefulness and implications of increased openness in Nordic R&D programmes and partly to test the ideas set out in this report as they were developed.

Our approach is not based on a narrow definition of research activities but aims to consider these in their wider role in the Nordic and European research and innovation systems, based on current theory and policy principles that are already accepted at national level. The report therefore sets the scene in Chapter 2 with a discussion of challenges facing the Nordic research and innovation system, sets out key elements of the current “in-

novation systems”³ perspective on research and innovation policy and reviews the Nordic states’ research and innovation policy priorities.

We then go on in Chapter 3 to look at R&D cooperation structures in the Nordic area and in the EU more widely. In the European context, we here look at the increasing extent to which European R&D policy now involves not just an additional layer of cooperative R&D projects “on top” of national efforts but also involves attempts by the Commission to coordinate national policies and promote the mutual opening of national R&D programmes.

In Chapter 4, we look at both Nordic and EU experiences of opening R&D programmes and draw some lessons about the need for a gradualist approach based on cooperation but also self-interest.

Once we have laid out this background and experience, we are in a position in Chapter 5 to articulate scenarios about the future development of NORIA and ERA. We lay out one weak and one strong scenario for the future of each, then discuss what the possible combinations of scenarios at the Nordic and European level are likely to mean for various areas of research, research prefers and funders. The main conclusion is that – irrespective of whether the ERA develops strongly or weakly – the Nordic countries would benefit from strengthened cooperation in NORIA.

Finally, we sketch a policy proposal in Chapter 6. Today, NORIA has two “pillars”: NICE in innovation; and NordForsk in research. These are important structures. NICE acts as a Nordic level innovation agency, with rather weak ties to the national level. NordForsk is a coordinating institution, through which actors at the national level can bring initiatives to the Nordic level. They operate respectively in the spheres of the industry and education ministries. However, the Nordic level lacks the cross cutting structures needed to help create the kind of holistic research and innovation policy that all the Nordic states say they want to have at national level. It needs also to support the relevant Nordic stakeholders themselves to plan and initiate cooperations from the bottom up, based on their percei-

³ While “innovation system” is the accepted terminology, it is an unfortunate misnomer. First, the “innovation systems” literature does not only talk about the innovation process but about the whole complex of relationships between knowledge production and use in society and the economy. Second, “innovation systems” are not systems in the sense of “computer systems”, for example, which we to some degree know how to control. Rather, “innovation systems” are systems in a more ecological sense: everything is connected to everything else, and therefore different parts of the “system” are interdependent

ved common interests. This will not only allow the opportunities for more cooperative and open research funding actions to reveal themselves but also create interest groups that can articulate the logic of opening in their case and play a central role in putting a cooperation in place.

It is frequently objected that closer cooperation and mutual opening of R&D funding across borders is prevented by a series of administrative and legal obstacles. Available experience strongly suggests that if you want to overcome these barriers, you can do so and that if you don't want to overcome them they prove insurmountable. Rules and laws exist to implement policy, not to prevent it. We therefore relegate discussion of administrative and legal obstacles to the Appendix.

We have been supported in our work by the constant help and availability of Gard Titlestad and Rene Belsø of the secretariat to the Nordic Council of Ministers. Liisa Hakamies-Blomqvist of NordForsk, Ketil Storvik of NICE, Birte Holst Jørgensen of Nordic Energy Research and Lene Lange of the Danish Strategic Research Council kindly acted as a reference group for the project, and commented on various drafts of the report. A large number of people kindly agreed to be interviewed during the course of the work. We are very grateful to all of them. The usual disclaimer of course applies: if the report is good, then those who helped us should be given credit; if it is bad, that is solely the authors' fault.

2. The Nordic Nations in Research and Innovation Policy

The Nordic countries have strong traditions in funding and performing research and innovation activities but are not immune to the challenges of globalisation, increasing competition and new types of technological change faced by all countries. Like others, too, the Nordic nations increasingly use the idea of “innovation systems” as a guide to formulating policy and recognise the need for research and innovation to be treated holistically in order to capture the benefits of their interrelationship. As well as differences, there are important similarities among the Nordic nations’ research and innovation priorities, especially the pursuit of critical mass.

2.1 The Nordic Nations Among the Leaders in a World with Many Challenges

Nordic countries are generally heavy investors in research, compared with their populations, but are so small in global terms that they need constantly to ensure that their effectiveness counterbalances their size. As the rest of the world develops and internationalises, this is increasingly hard to do.

The Nordic area is traditionally a strong investor and performer in research and innovation. The NORIA White book, on which current research and innovation policy at the Nordic level is based, points to the fact that all the Nordic governments spend an unusually high proportion of Gross Domestic Product (GDP) on research, compared with other countries. It reminds us that business expenditure on Research and Deve-

lopment (R&D) is very high in Sweden, Finland and Iceland, so that all these three countries exceed the “Barcelona Goal” of the European Union to spend 3% of GDP on R&D. It neglects to point out that this high level of BERD in Iceland depends essentially on the activities of one company, that Finland’s Business R&D is also concentrated, that even in Sweden 80% of business R&D is done by 5 companies and that Sweden is also approaching the Barcelona goal – but from above. In short, the *fragility* of these high business investments in R&D ought to be a policy concern, as should the strength of the knowledge infrastructure that supports them. This is one reason for ensuring that research policy is a coherent part of wider policy for the Nordic research and innovation system.

On the academic side, publication productivity is high in the Nordic area and the scientific output seems to be of good quality, since it is highly cited. Some Nordic countries produce many patents; others fewer. However, the White Book complains that the Nordic countries win few Nobel prizes. So, the Nordic area tends to do well on indicators of research performance that are normalised by the size of the economies involved, but less well where size matters. Critical mass is therefore a central issue and a key factor in thinking about Nordic cooperation.

Like most developed countries, those in the Nordic region face a series of challenges in research and innovation. These include

- The need for better alignment between the national research effort and the needs of society, including industry, in order to avoid the “paradox” that research results fail to be translated into innovation, wealth and the ability to tackle key social issues (such as poverty, health, global warming). In most countries, this is leading to a change in the unwritten “social contract” between science and society and clearer expectations that society should see the social benefits of its investments in research
- Maintaining national and regional strength in research and innovation in the face of the globalisation of industry. This means that knowledge markets are becoming global and makes both production and R&D more footloose and competitive. Increasing international ownership of previously Nordic multinationals is an especially important aspect
- The specific competitive threat posed by the rapid development of India and China, not only in industries where low cost labour is a

significant advantage but also increasingly in knowledge intensive activities, based on a massive production of new graduates and research-trained personnel

- The emergence of “hyphen technologies” (bio-informatics, nano-technology, etc) that demand an interdisciplinary approach and hence reconfiguration and development of national research resources

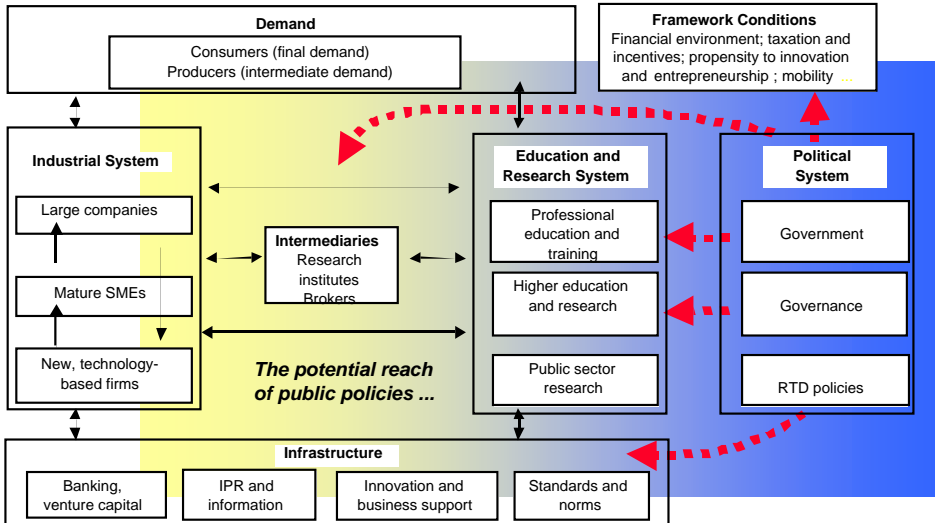
The small populations of the individual Nordic countries mean they suffer a special risk of marginalisation – both in global terms, as their proportion of total knowledge production continues to decline in a rapidly developing world, and within an expanding Europe. Even the biggest of the Nordic countries accounts for well under 1% of the world’s investment in R&D.

2.2 A Modern View of Research and Innovation Policy

The right policy for research and innovation depends to a great extent on how we understand the relationship between the two. Over the past twenty years or so, there has been a revolution – a “paradigm shift” – in the way we understand the relationship between research, innovation and socio-economic development.

The current orthodoxy is that economic well-being is founded on well-functioning national research and innovation systems, in which not only the actors shown in *Exhibit 1*, but also the links between them, perform well. Earlier views focused on entrepreneurs and scientists as individual heroes – a view that was built into the original design of the Funds, as funders of individual scientists and firms. Innovation and learning are now seen more as *network* or collective activities. This has been strongly reflected in the policies of innovation funders internationally, who increasingly fund *networks* of innovators – often comprising a mixture of companies and institutions in the knowledge infrastructure.

Exhibit 1 An Heuristic: The National Research and Innovation System



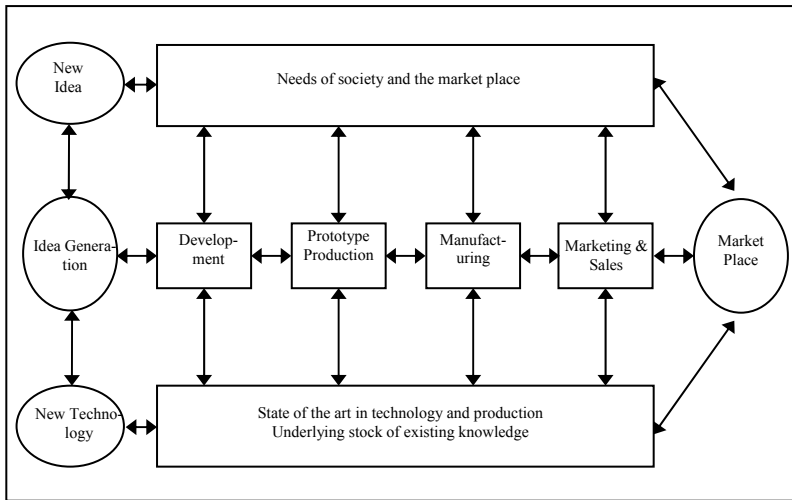
Source: Erik Arnold and Stefan Kuhlman, *RCN in the Norwegian Research and Innovation System*, Background Report No 12 in the Evaluation of the Research Council of Norway, Oslo: Royal Norwegian Ministry for Education, Research and Church Affairs, 2001

This innovation systems perspective contrasts strongly with the popular mental model – the so-called “linear model” – of the relationship between research and innovation, which suggests that basic science *leads to* applied science, which causes innovation and wealth. While there was some limited research support⁴ for this “technology push” or “science push” view in the 1950s, in its crude form it does not stand up to much scientific scrutiny. Already in the late 1970s, Mowery and Rosenberg⁵ largely laid the one of the foundations of the new view by stressing the importance of *coupling* between science, technology and the marketplace. This is shown schematically in *Exhibit 2*. Subsequent innovation models tend to be variations on this theme. Innovation processes do not always “start” at a particular place (“basic” science, or the market) but can be prompted by changes anywhere.

⁴ This account of successive generations of innovation model is partly based on Roy Rothwell, “Successful Industrial Innovation: Critical Factors for the 1990s”, *R&D Management*, :3 , p 221-239, 1992

⁵ Mowery, D.C. and Rosenberg, N., ‘The Influence of Market Demand upon Innovation: A Critical Review of Some Recent Empirical Studies’, *Research Policy*, April 1978

Exhibit 2 Modern “Coupling” Model of Innovation



Discussions of the relationships between research and innovation have increasingly adopted terms like “strategic basic” and “translational” research as funders grapple with the need to link research to its social uses. Stokes has pointed out that a lot of “basic” research is in what he calls “Pasteur’s Quadrant” – use-inspired basic research – which has huge economic importance (*Exhibit 3*) and reminds us that in fact very large amounts of fundamental scientific knowledge have been generated through use-oriented work.

Exhibit 3 Sources of Research Inspiration

Quest for fundamental understanding	Yes	Pure basic research (Bohr)	Use inspired basic research (Pasteur)
	No		Pure applied research (Edison)
		No	Yes
		Considerations of use	

Source: Modified from Donald Stokes, *Pasteur's Quadrant*, Washington DC: Brookings Institution, 1997

At the same time, the growth in R&D funded by industry, compared with that funded by the taxpayer, in developed countries is an important symptom that the *mode* of knowledge production is changing. Michael Gibbons and colleagues⁶ offer a useful simplification⁷ of a complex reality, distinguishing between

- *Mode 1*, disciplinary science, whose logic comes from its internal organisation and control mechanisms. Its institutions tend to be centralised and stable. In terms of education, Mode 1 tends to provide “basic training” and a disciplinary “entry ticket” (such as a PhD) for people to qualify as credible researchers in either Mode. However, Mode 1 is not the same as “basic science.” Research that is in some sense fundamental or long-term can be done in either Mode
- *Mode 2* generation of problem-orientated, research based knowledge elsewhere in society. Mode 2 work tends to be transient. It forms and

⁶ Michael Gibbons, Camilla Limoges, Helga Nowotny, Schwartzman, S., Scott P. and Trow, M., *The New Production of Knowledge*, London: Sage, 1994

⁷ Gibbons and colleagues also get their history wrong, claiming that Mode 2 is new. In fact, it is Mode 1 that is historically new, while Mode 2 is the traditional form of science, as practised for many hundreds of years

re-forms around applications problems. Calling on different disciplines and locations at different times, it is hard to centralise

R&D funding structures must be able to cope with fundamental knowledge production in both Modes. In particular, they must deal with a world of constantly changing networks of knowledge producers, spanning not only the knowledge infrastructure of universities and research institutes but also many other parts of society.

The now orthodox National Innovation Systems⁸ approach to understanding the generation and use of knowledge in economic and social production implies that society needs to tackle the complex interactions and variety of modes of production on knowledge in a holistic way.

It stresses the idea that firms and other actors have “bounded rationality” and this makes knowledge, learning and institutions key to overall performance. Learning means there is “path dependency”: what you can do tomorrow depends upon what knowledge and resources you have today and what you can do to adapt these. Interventions to improve knowledge and capabilities can change the trajectory of the innovation system and therefore its performance. Correspondingly, R&D funding is increasingly concerned to improve participants’ capabilities, promoting learning or “behavioural additionality” and not only to “help firms” or “fund science.”

Cumulated capabilities and experience can “lock in” parts of the system to configurations that perform badly. “Unlearning” as well as learning may be needed. Successful innovators (and, since we increasingly conceive science as a collective and not an individual enterprise, also successful researchers) are not successful solely because of their personal qualities and actions but also as a result of their interplay with the research and innovation systems they inhabit, and the quality of those systems.

The idea that “market failure” leads to under-investment in research⁹ has been the principal rationale for state funding of R&D since the early

⁸ See Christopher Freeman, *Technology Policy and Economic Performance: Lessons from Japan*, London: Frances Pinter, 1987; Bengt-Åke Lundvall, *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London: Pinter, 1992; RR Nelson, *National Innovation Systems*, New York: Oxford University Press, 1993

⁹ Ken Arrow, “Economic Welfare and the Allocation of Resources for Invention,” in Richard Nelson (Ed.) *The Rate and Direction of Inventive Activity*, Princeton University Press,

1960s. In the innovation systems perspective, the presence of bottlenecks or other failures that impede the operation of the innovation system can constitute crucial obstacles to growth and development¹⁰.

- *Capability failures.* These amount to inadequacies in potential innovators' ability to act in their own best interests
- *Institutional failures.* Failure to (re)configure institutions so that they work effectively within the innovation system
- *Network failures.* These relate to problems in the interactions among actors in the innovation system
- *Framework failures.* Effective innovation depends partly upon regulatory frameworks, health and safety rules etc as well as other background conditions, such as the sophistication of consumer demand, culture and social values

These failures justify state intervention not only through the funding of research, but more widely in ensuring that the innovation system performs as a whole. Because systems failures and performance are highly dependent upon the interplay of characteristics in individual systems, there can be no simple rule-based policy as is possible in relation to the static idea of market failure.¹¹ Rather, a key role for state policy making is "bottleneck analysis" – continuously identifying and rectifying structural imperfections.¹²

Since behaviour and learning are key to the innovation systems perspective, then so are the ways in which these are institutionalised and their *governance*. This question of governance has attracted a lot of attention in the last few years within the OECD, in an effort to understand how to make best use of public research and innovation resources. Our studies of research and innovation governance suggest that there is not a single

1962; see also Richard Nelson, "The simple economics of basic scientific research," *Journal of Political Economy*, 1959, vol 67, pp 297–306

¹⁰ Erik Arnold, "Evaluating research and innovation policy: a systems world needs systems evaluations," *Research Evaluation*, Volume 13 Number 1, April 2004

¹¹ Johan Hauknes and Lennart Norgren, *Economic Rationales of Government Intervention in Innovation and the Supply of Innovation-Related services*, STEP Report 08 1999, Oslo: STEP Group, downloadable from www.step.no

¹² Erik Arnold, Stefan Kuhlmann and Barend van der Meulen, *A Singular Council: Evaluation of the Research Council of Norway*, Oslo: Ministry of Education, Research and Church Affairs, 2001

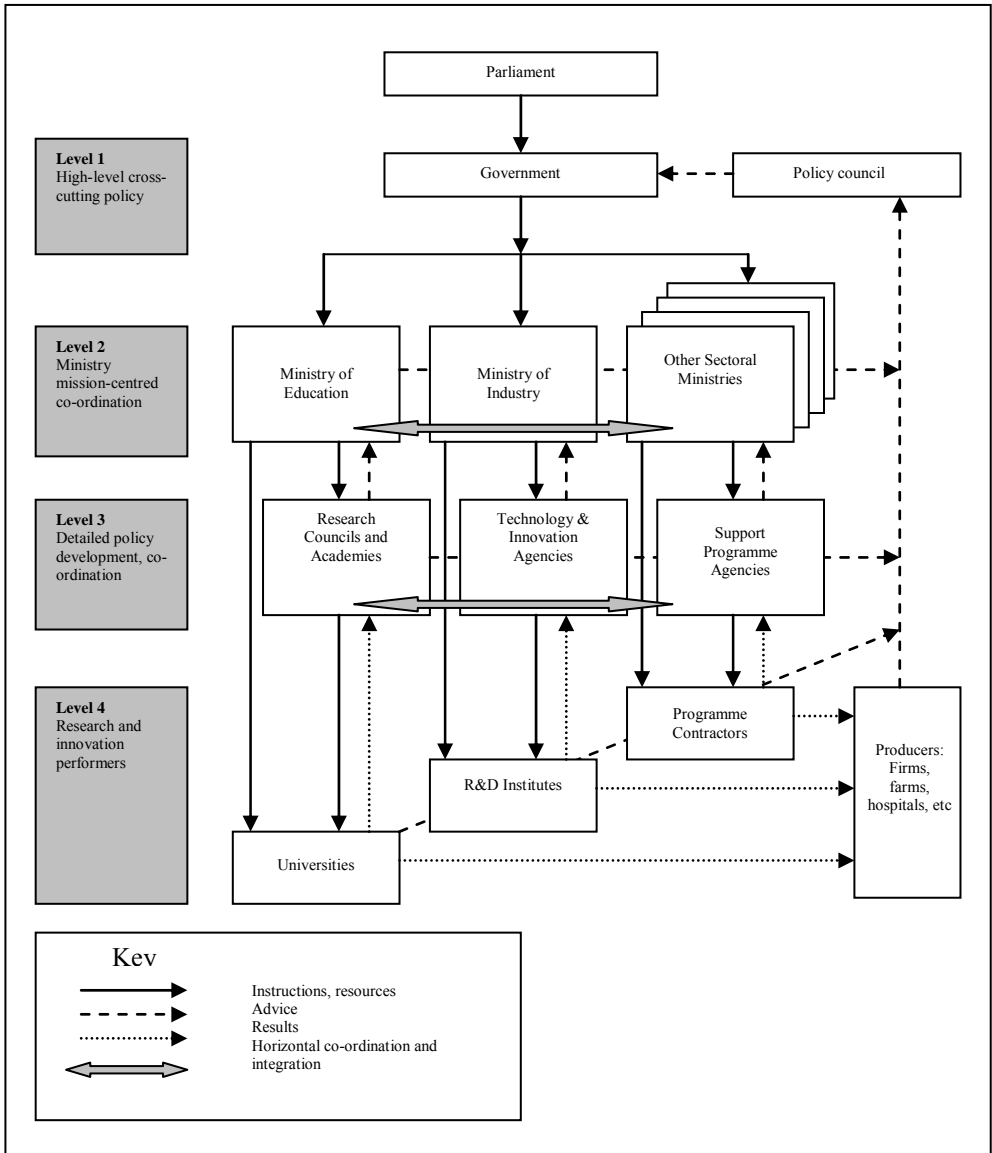
“optimal” pattern of research and innovation governance. We use a simple model¹³ of research and innovation organisation and governance (*Exhibit 4*). This is ideal-typical, rather than representing any particular national practice. In this scheme, there are four levels of policy co-ordination

- *Level 1* is the highest level. This involves setting overall directions and priorities across the whole National Innovation System. It may be achieved through advice to government or by more binding means, such as decisions of a cabinet sub-committee
- *Level 2* is co-ordination among ministries, whose sectoral responsibilities otherwise encourage them to pursue independent policies. In practice this level of co-ordination may involve administrative aspects, policy issues or both. Sometimes an inter-ministerial group also functions as the Level 1 co-ordination mechanism
- *Level 3* is more operational, in an attempt to make the actions of funding agencies into a coherent whole. This level, too, can involve administrative co-ordination as well as more substantive co-ordination of funding activities, such as co-programming
- *Level 4* involves co-ordination among those who actually perform research and innovation. Co-ordination at this level tends to be achieved through self-organisation rather than using formal mechanisms

Despite the apparent complexity of *Exhibit 4*, the network of flows of information and resources shown is actually very simplified compared with what happens in reality.

¹³ This was developed in collaboration with Martin Bell, SPRU, in a project for the National Science and Technology Development Agency of Thailand during 2002

Exhibit 4 Generic Organisational Structure for Research and Innovation Policy



Most of the vertical flows shown are formal. The exception tends to be flows into the policy council, which tend to be people-based rather than paper-based, and therefore to be informal. In many systems, especially

among the smaller countries, informal co-ordination is also achieved through members of institutions sitting on each other's governing or internal advisory committees. Such networks and interrelationships allow governance to play a number of important roles within the state's rather complex activities in funding and managing aspects of research and innovation. Our surveys suggest that key research and innovation governance functions include¹⁴

- Setting directions
- A referee
- Horizontal co-ordination
- Co-ordinating knowledge production
- Intelligence
- Vertical steering
- Enhancing the profile of research and innovation

Strikingly, however, these kinds of functions are weak or missing at the Nordic level.

2.3 Nordic Research and Innovation Policies

In contrast to this lack of integration in research and innovation governance at the Nordic level, individual Nordic countries all strive to have "holistic" or "third generation" innovation policies¹⁵ that emphasise horizontal coordination, whether it is focused at levels 3, 2 or 1 in *Exhibit 4*.

¹⁴ Erik Arnold and Patrix Boekholt, *Research and Innovation Governance in Eight Countries: A Meta-Analysis of Work Funded by EZ (Netherlands) and RCN (Norway)*, Brighton: Technopolis, 2003 (available at www.technopolis-group.com)

¹⁵ Per Koch, *A Nordic Innovation Strategy: Innovation policy structures of the Nordic countries*, (mimeo) Nordic Council of Ministers (undated)

Other broad themes recur in the policies of all the Nordic countries¹⁶, notably those that the Danish Research Policy Council, set up from 1 January 2004, has taken as its three principal priorities¹⁷

- Strengthening the national research effort in both qualitative and quantitative terms
- Strengthening the relationship between the national and the international research effort
- Increasing the social benefits of the research efforts, among others in the form of industrial and commercial growth and increased numbers of jobs

Realising these priorities involves

- The need to build and maintain critical mass in research, despite internal tendencies to fragmentation, both in order to generate knowledge and in order to provide necessary national absorptive capacity
- A tension between such critical mass at the national level and the desire for knowledge-based regional development and the creation of regional knowledge clusters
- An intention to devote more money to state funding for R&D (even in those countries that already exceed the Barcelona goal)
- Growing agreement that RTD policy should be committed to fundamental research but must also be focused on promoting innovation as a motor of economic development. Correspondingly, a focus on ways to increase the amount of public-private partnership and cooperation between industry and the knowledge infrastructure in

¹⁶ *Fremgang, fornyelse og tryghed: Strategi for Danmark i den globale økonomi*, Udkast til brug for Globaliseringsrådets møde den 21 marts 2006, Regeringen marts 2006; Arbejdsgruppen vedr. barrierer for en forskerkarriere, *Forskning uden barrierer*, rapport til Videnskabsministeriet, Copenhagen, 2006; *Knowledge, innovation and internationalisation*, Helsinki: National Science and Technology Policy Council, 2002; Undervisningsministeriet, *Utbildning og forskning: Utvektlingsplan 2003-2008*, Helsinki, 2004; Undervisningsministeriet, *Utbildnings- og forskningspolitisk regionstrategi 2013, 2003:42*, Helsinki, 2004; Iceland, Science and Technology Policy Council, resolution June 8 2004; Prime Minister's Office, Science and Technology Policy Council, *Science and Technology Policy Iceland*, Reykjavik, 2004; Regeringens proposition 2005/5:80, *Forskning för et bättre liv*, Stockholm, 17 March 2005; St melding nr 20 (2004-5), *Vilje til forskning*, Oslo 18 March 2005

¹⁷ Danmarks Forskningspolitiske Råd, *Årsrapport 2004*

order to overcome what some countries describe as a “paradox” or inability economically to exploit the research “base”

- The need for improved prioritisation of strategic research funding to focus on areas of national opportunity and need. Correspondingly, a need to increase the role of user-driven research
- A commitment to research of high, international quality
- A commitment to the production of increasing numbers of research-trained people, able to work in either the knowledge infrastructure or in industry. Correspondingly, a need to make research careers more attractive and researchers more mobile
- Internationalisation as a response to the wider pattern of globalisation, including improvement of the conditions for international collaboration. This internationalisation focuses not only on the EU but also on N America, Japan and Asia more generally. There is limited mention of Nordic cooperation beyond that this should be “maintained”

The Nordic countries therefore suffer few illusions about their ability to be autonomous in science and research. However, there are also important differences among the countries, reflecting their differing sizes, industrial and institutional structures. All the countries see the “three hump model” of universities as doing “basic” research, institutes as applying research and industry as gratefully receiving the fruits of the knowledge infrastructure’s labour as increasingly inaccurate. The institutes and universities need to internationalise their activities to a greater extent. Closer integration of universities and institutes is seen as desirable in Denmark and Iceland, while such links are seen as already being present in Norway and are being extended in Sweden and Finland. But funding models for the institutes remain very different among the Nordic countries. Opportunities for amalgamating parts of the institute systems across borders are not much discussed, although STFI has already demonstrated the benefits of close links with institutes in Norway and Finland.

However, the focus of national policy discussion is at the national level. The only clear commitment we saw to the idea of opening national

programmes¹⁸ was in the Norwegian government's last research White Paper.

2.4 Implications

Both the theoretical and the national policy perspectives clearly indicate that research is not (and should not be) something isolated from the rest of knowledge production and use. Rather, if economies are to be successful, research policy needs to be integrated with a much wider set of policies that run right across individual ministry responsibilities. Existing Nordic structures remain compartmentalised along ministry lines. Structural reform will be needed if there is to be at Nordic level anything approaching the holistic approach to policy that the Nordic countries believe is crucial at the national level.

¹⁸“Forskningsrådet skal styrke arbeidet med å få til økt samspill mellom nasjonale og internasjonale programmer med sikte på gradvis åpning av nasjonale programmer.” St melding nr 20 (2004-5), *Vilje til forskning*, Oslo 18 March 2005

3. The Nordic and EU Cooperations in Research and Innovation: NORIA and ERA

Since 2000, both the Nordic region and the European Union have taken important initiatives to increase internal cooperation in research and innovation. The small scale of the Nordic area means that it has limited influence over the European level but can strengthen Nordic actors in playing a part in the bigger European and global scenes. In the past, a key difference between Nordic and EU cooperation has been the bottom-up approach of the former (often based on informal as well as formal mechanisms) and the top-down approach of the latter, based on large calls for proposals. With the creation of stronger Nordic structures (NICE, NordForsk) and the use by the European Commission of greater self-organisation by participants in the ERA-NETs and Technology Platform, this distinction has become less clear.

In this chapter, we review the recent changes in cooperation arrangements at both levels.

3.1 Nordic Cooperation

The ties within the Nordic area are strong, long-standing and close. Cooperation is a long accomplished fact and so self-evidently part of being Nordic that it barely attracts attention. As the so-called “Committee of Wise Men” (in fact, in the best Nordic tradition, half of them were women) that looked at the future of Nordic cooperation in 2000 remarked

Nordic societies have for centuries developed in such a way that they have decisive similarities and in many respects differ from other countries in Europe and elsewhere in the world. Common history and language and a common cultural heritage combined with rich diversity are the foundations of cooperation. Based on these and on similarities in social structures, the Nordic area has been a natural base for internationalising society and the economy.¹⁹

In the area of research and innovation policy, these ties are evident not only in the formal activities associated with the Council of Ministers and its agencies but in a range of other bi- and multilateral activities as well as in unrecorded things – such as the tendency of the Nordic countries to caucus before taking positions in EU meetings.

At the same time, there appear to be strong limits to the desire for integration. According to Guðmundur Hálfðanarson²⁰ (Professor of History at the University of Iceland) “the Nordic cooperative model has been based on strong empathy and sense of common identity, but it has also been characterized by apparent reluctance to surrender any of the national sovereignty of the individual nation-states. Their collaboration has been built on consensus, but also on aversion for homogenization of any form.”

The Nordic cooperation is based not only upon geography but a long history of both cohabitation and strife, and even a period of partial monetary union (1873–1914). Europe as a whole had to repeat much of this history during the Twentieth Century – more quickly, more bloodily and on a much larger scale – before settling on political and monetary union as remedies for the problems of being neighbours. The long established nature of the Nordic relationships probably explains the apparently high level of comfort that Nordic citizens have with belonging to the Nordic cooperation, while at the level of many citizens the idea of belonging to a European Union is neither comfortable nor self-evident.

The entry of three of the five Nordic states into the EU, however, led to a debate in the mid-1990s about what constitutes “Nordic added value” (*Nordisk nytte*) and to greater attention being paid to it as a precondition for intervention. Based on a renewed vision of Nordic Research and Innovation Area, the Nordic structures for cooperation in R&D have been

¹⁹ Jón Sigurðsson (chair), *Öppet för världens vindar – Norden 2000*, Copenhagen: Nordic Council of Ministers, 2000 (Our translation from the Swedish)

²⁰ Guðmundur Hálfðanarson, *The History of Nordic Collaboration*, Reykjavik: Sigurður Nordal Institute (undated; available at www.nordals.hi.is/solofile/1007494)

dramatically simplified, and now focus on the domains of the industry (innovation) and education (research) ministers. In monetary terms, the Nordic states spend many times as much on EU-level R&D cooperation as they do on the Nordic institutions.

In research and innovation policy – as in a number of other areas – the partial integration of the Nordic area into the European Union has been a strong and disturbing factor in the Nordic cooperation. While Denmark's entry into the Union in 1973 had no strong effect on Nordic cooperation, the build-up to the entry of Sweden and Finland in 1995 led to intense debate about the usefulness of the Nordic level in the context of a uniting Europe. The debate was the more intense because the economic crisis of the early 1990s put pressure on national budgets (especially, for different reasons, in Finland and Sweden) and because the collapse of communism had re-opened the issue of how the Nordic countries should relate to their Eastern neighbours, especially the Baltic States.

Prior to the *Nordisk nytte* debate, Nordic cooperation on research had not been problematised. In effect, it was seen as an obvious part of cultural cooperation, even if in practice most of it was in areas with high potential social relevance (such as energy and innovation), rather than the kind of curiosity-driven research that is more typically seen as having a cultural component (for example, astronomy, particle physics). The reform report of 1995²¹ defined *Nordisk nytte* as

- Activities that otherwise could be undertaken at the national level, but where concretely positive effects are achieved through common Nordic solutions
- Demonstrating and developing Nordic solidarity
- Increasing Nordic capabilities and competitiveness

A working group was established, to analyse the 47 Nordic institutions in the light of this definition. However, it interpreted the definition in a rather narrowly economic way, and its analysis had little impact on practice.²² A report on Nordic cooperation in innovation in 1998 introduced

²¹ Nordiska Rådet och Nordiska ministerrådet, *Nordiskt samarbete I en ny tid. Det nordiska samarbetet i ljuset av folkomröstningarna om EU-medlemskap för Finland, Norge och Sverige*, Copenhagen: Nordiska Rådet och Nordiska Ministerrådet, 1995

²² Karl Erik Brofoss, Inge Ramberg og Vera Schwach, *Felles nordisk Forskningsstøtte: Styling og nytte*, NIFU skriftserie nr. 23/2003, Oslo: NIFU, 2003, p 15

the idea of “subsidiarity” into the definition, though without using the word, by including the idea that the desired results of Nordic initiatives “should not better (ie more efficiently) be achievable via national or European-level action”.²³

The “Committee of Wise Men” that looked at the future of Nordic cooperation in 2000 took a very general perspective. In relation to research and innovation, relevant recommendations include

- The need to improve Nordic cooperation in international policy fora
- Within the Nordic area to ensure that research and education support the development of new technology to a greater extent
- In relation to technology at the international level, to take more initiatives on common standards, promote coordination of resources across national boundaries
- In relation to technology in the Nordic area, to coordinate education and research, among other things through budgeting and invest in common on leading technology branches
- Develop common centres of excellence within the knowledge infrastructure
- Establish Margarethe-professorships (Nordic funded chairs)
- Be willing to operate with “variable geometry” to a greater extent in Nordic actions

Despite the changes introduced following the *Nordisk nytte* debate, 80% of the Council of Ministers’ R&D budget was still tied to the Nordic institutes in 2002.²⁴

Since then, there has been a drastic simplification of the instruments of Nordic R&D cooperation. The driving force has been a response by the Nordic level to the idea of a European Research Area²⁵ (ERA), launched by European Commissioner Busquin in 2000. The Nordic Research and Innovation Area idea – discussed in “green” and “white” books in 2002²⁶

²³ PLS Consult, *Hele Norden som base: Utredning om nordisk erhvervs-/næringsrettet innovationssamarbejde*, Copenhagen: PLS Consult, 1998

²⁴ Karl Erik Brofoss, Inge Ramberg og Vera Schwach, *Felles nordisk Forskningsstøtte: Styling og nytte*, NIFU skriftserie nr. 23/2003, Oslo: NIFU, 2003, p 65

²⁵ *Towards a European Research Area*, Communication from the Commission to the Council, COM(6), January 2006

²⁶ Nordiska forskningspolitiska rådet, *Norden som en internationellt framstående forsknings- och näringsregion*, Copenhagen: NMR, 2004

and 2004²⁷ – offers a vision of NORIA as comprising: more Nordic Centres of Excellence (NCoEs, distributed across Nordic states), increased researcher and student mobility within the Nordic region, more Nordic graduate schools, coordination among the research councils, more research-related networking (especially using ICT to share data and work) and more efficient creation and use of common research infrastructures. As a result, the Nordic region should have greater influence on future Framework Programmes and become a more attractive international research cooperation partner.

NICE and the Nordic Council of Industry Ministers have also been active, developing the “Innovation Book”²⁸ as an innovation counterpart to the NORIA documents. It proposes three priority areas on which the Council of Industry Ministers should focus

- International cooperation at the strategic policy level
- Cross-border interaction between the “operative” parts of the innovation system, especially companies and the institutions that support them
- “Spearhead actions” involving highly visible industrial clusters and networks

The Innovation Book carefully respects the boundaries of the Industry Ministers’ competence, however. We will go on to argue that the boundaries of individual Councils of Ministers’ competence themselves represent important obstacles to achieving a strong Nordic research and innovation area and that there is a need for horizontal coordination and action if the Nordic area is to have a coherent policy.

The new energy injected into the Nordic cooperation is typified by a recent survey²⁹ of Nordic opinion formers, which stresses the need for the Nordic region as a whole to tackle growing international competition, the protection and exploitation of common Nordic values and the need for

²⁷ Gustav Björkstrand, *NORIA Vitbok om nordisk forskning och innovation*, TemaNord 2004:502, Copenhagen: NMR, 2004

²⁸ *Innovationsboken. Nordisk styrka, nationell nytta och global excellence: Förslag till nordiskt innovationspolitiskt samarbetsprogram 2005-2010*, ANP2004:748, Copenhagen: Nordic Council of Ministers, 2004

²⁹ Huset Mandag Morgen, Nordisk Råd, Nordisk Ministerråd, *Norden som global vinderregion. På sporet af den nordiske konkurrencemodell*, ANP 2005:777, Copenhagen, Nordic Council and Council of Ministers, 2005

common Nordic leadership. It points to the need to establish positions of *Nordic strength*, rather than to base cooperation solely on lowest-common-denominator problems or issues that can *only* be tackled at the Nordic level.

The implementation of NORIA amounted to the idea that the two main pillars of research finding – research and innovation – should be reproduced at the Nordic level, and that research performance should become a more nationally based affair. As a result, operation of many Nordic research institutions was pushed down to the national level, leaving two major cooperation agencies answering directly to the Nordic Council of Ministers: the Nordic Innovation Centre (NICE), answering to the Industry ministers; and NordForsk, responsible to the education ministers.

The Nordic Innovation Center (formerly the Nordic Innovation Fund) has a central budget into which the member states contribute and from which the agency pays grants. Under this “common pot” arrangement, there is in principle no requirement for *juste retour*³⁰. NICE’s governance is not directly linked to the ministry or agency level in the member states, so it has considerable freedom to set its own priorities. At the same time, this means that NICE actions are detached from national strategies and priorities.

NordForsk (the Nordic Research Board), functions both as a research policy advisory board to the Council of Ministers and as a cooperation agency between the research councils of the Nordic countries. It has taken over the role of the former Nordic research policy council and runs the Nordic centres of Excellence programme that was originally started by the three joint committees of the Nordic research councils (the so-called NOS committees).

NordForsk has identified three roles for itself in its strategy 2006–9³¹

- *Coordination*, by identifying important research priorities suitable for joint Nordic projects, focusing on international positions of strength in research and strategically important areas, participating in the

³⁰ That is the principle, valid in many international collaborations, that member country organisations should expect to benefit from the same proportion of the total budget as their government contributes

³¹ NordForsk, *NordForsk strategy 2006–2009*, Oslo: NordForsk, 2006

planning of key infrastructures and working towards common Nordic calls and the partial opening of national research programmes

- *Funding* of a range of feasibility studies and joint programmes, including finding common-pot solutions co-funded with at least three national actors
- *Policy advice* to the Nordic Council of Ministers and the member states

It has a modest common budget that covers administration and allows it at the maximum to fund one third of the costs of collaborations among research performers in member states, but the bulk of its funding has to be agreed case by case by the member councils. It is expected to achieve some measure of policy coordination among its member councils. Its strategy says that it intends to coordinate also with NICE and with sectoral research activities under the auspices of the Nordic Council of Ministers.

NordForsk accounts for 12% (DKK 101m) and NICE 8% (DKK 69m) of the Council's proposed 2007 budget, and the majority of the budgets of their respective Councils of Ministers: Education/Research and Industry³² for 2007. (These amounts spent at the Nordic level are of course intended to stimulate a larger amount of co-funding from the national level.) Education and Research is itself the largest line within the proposed budget for 2007, reflecting the comparatively low degree of politicisation of these issues, which are therefore often easy to agree upon in international relations.³³

At the same time, it is important to note the low priority – in financial terms – that the Nordic countries give to Nordic cooperation in general and therefore also to R&D cooperation – even though that makes up such an important part of the Nordic cooperation in total. Perhaps it is symptomatic that Håkan Gergils recently visited all the Nordic countries and wrote a two-volume description of their innovation policies³⁴ that does

³² Secretary-General, Nordic Council of Ministers, *Förslag till Nordisk Ministerråds Planer och Budget, 2007*, ANP 2006:740, Copenhagen: Nordic Council of Ministers, 2006

³³ Symptomatically, when negotiations began earlier this year over Turkey's application to join the EU, the issue of research cooperation was resolved on the first day. A further 35 issues were identified for negotiation, that were collectively expected to be resolved over the coming ten years.

³⁴ Håkan Gergils, *Dynamic Innovation Systems in the Nordic Countries? A Summary Analysis and Assessment*, Stockholm: SNS Förlag, 2005

not even once mention Nordic cooperation. Collectively, the Nordic countries devote about 0.1% of their governments' expenditure on R&D to Nordic collaboration. In contrast, EU member states devote 4–5% of government R&D to cooperation via EU programmes³⁵, plus a smaller amount through multilateral initiatives such as the European Science Foundation, COST, EUREKA and the various multilateral research facilities such as CERN, EMBL, etc. In other words the Nordic countries – including Iceland and Norway, which participate in the EU Framework Programmes despite being outside the Union – spend many times as much on European R&D cooperation as they do at the Nordic level.

3.2 Progress in the European Project

The European Research Area (ERA) idea represents a marked change in European R&D policy with profound implications not only for Europe but also for policymaking at the level of the member states and other countries involved in the EU Framework Programme. Until that point, the EU programmes had provided an additional and complementary funding source to national initiatives, providing opportunities (especially networking opportunities) not available at the national level. From 2000 on, the ERA project involves not only adding to but coordinating, “structuring” and trying to open national R&D programmes and policies.³⁶ Among the benefits expected were

- A stock of material resources and facilities optimised at the European level
- Networking of centres of excellence and the creation of virtual centres
- Definition of a European approach to research facilities
- More coordinated implementation of national and European R&D programmes

³⁵ Gustav Björkstrand, *NORIA Vitbok om nordisk forskning och innovation*, TemaNord 2004:502, Copenhagen: NMR, 2004

³⁶ Stefan Kuhlmann and Jakob Edler, “Changing Governance in European Research and Technology Policy”, in: Edler, J.; Kuhlmann, S.; Behrens, M. (eds.): *Changing Governance of Research and Technology Policy – the European Research Area*. Cheltenham: E. Elgar, 2003

- Application of the principle of mutual opening of national programmes
- Establishment of information mechanisms on the objectives and content of programmes
- Support for initiatives to evaluate national activities by international panels³⁷

The attempt to build a European Research Area (ERA), the Lisbon declaration by the European Council of Ministers that Europe should become the world's most innovative and dynamic economy and the Barcelona goal of devoting 3% of the Union's GDP to R&D are all as well known as they are extravagant. The widespread belief (based, not least, on the conclusions of Five Year Assessments) that the scale of the Framework Programme is too small to tackle these kinds of policy goals, coupled with the budget decision for the 7th Framework Programme, which did not produce the massive increase in funding desired by the Commission, suggest that these goals are over-blown in relation to the resources available. Soete points out³⁸ that there is a huge gap between the concentrations of research and educational capability in the USA and their fragmented equivalents in Europe and argues that present policies are so incremental that they have little chance of achieving the desired restructuring needed to generate a system with the scale and clout of the USA.

While there are therefore grounds for scepticism about the literal achievement of current EU R&D policy goals in the short term, the forces marshalled by the Union in order to try to achieve these goals are nonetheless very significant. It may be especially important that the Commission is promoting ERA in ways that build upon allowing the bottom-up formation of networks and interest groups with cross-border needs – harnessing the self-organisation of these stakeholders to the European project, rather than trying to devise and implement a design top down.

This approach of “coordinating” member state activities, specifically R&D programmes, was discussed by CREST already in 2000 and has a legal basis in Article 165 of the European Treaty, as well as Article 169,

³⁷ *Towards a European Research Area*, Communication from the Commission to the Council, COM(6), January 2006

³⁸ Luc Soete, *Activating Knowledge*, Discussion paper produced for the UK presidency of the EU, October 2005 (mimeo)

which additionally empowers the Commission to fund programmes and projects with variable geometry. At their informal meeting in Gerona in early 2002 the European Research Ministers acknowledged the importance of the progressive opening of national RTD programmes as an important next step towards the construction and further development of the European Research Area. CREST therefore launched 5 pilot ERA-Nets, in part in order to gain experience and clarify to a greater extent what was involved in “opening” national programmes.

According to a 2004 progress report,³⁹ “ERA-NET is designed to encourage the creation of close, long-term links between national research programmes with shared goals. In the short term it will facilitate to exchange views and good practices on regional, national and European research programmes in specific fields. In the long term, ERA-NETs are expected to lead to more sustained forms of collaboration, including the strategic planning and design of joint research programmes, the reciprocal opening of national research programmes to researchers from other member countries, and the launch of fully trans-national programmes jointly funded by more than one country.” ERA-Nets should undertake

- Systematic exchange of information and good practices on existing programmes
- Identification and analysis of common strategic issues
- Development of joint activities between national or regional programmes
- Implementation of joint trans-national research activities

They are intended to allow member states to identify, from the bottom up, areas where it is interesting to cooperate – allowing the Commission and member states to learn.⁴⁰

The 6th Framework Programme was something of a departure from previous FPs in being much more explicit about its ambitions to “structure” the European research and innovation system. Its new, large-scale instruments – especially the Networks of Excellence – provide a way to crystallise large communities of research performers across borders, so that they can begin to act as cross-border interest groups and to lobby for

³⁹ “Coordination of national RD activities,” (mimeo) Brussels: EC, version Spring 2004

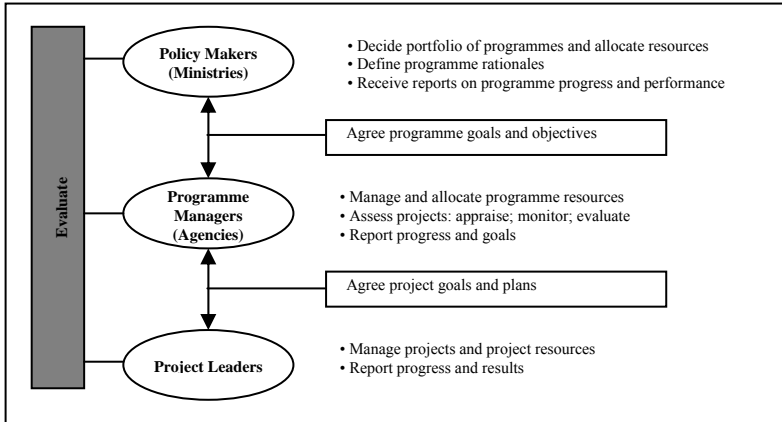
⁴⁰ CREST, 1211/1/01, minutes 12 September 2001, Brussels

resources for themselves. The Open Method of Coordination and the research policy activities of the CREST committee are explicit attempts to harmonise R&D policies across the Union. The ERA-NETs and Article 169 provide ways to generate new, cross-border funding agency structures. The ERA-Nets are continued into the 7th Framework Programme, as are the Networks of Excellence, while collaborative projects are being defined in a way that allows a range of sizes. More effort will be devoted to Article 169 projects and the technology Platforms are to be boosted by funding a handful of Joint Technology Initiatives, which in effect will part-fund the strategies defined by some of the more successful Technology Platforms. New components include

- A European Research Council (ERC), funding individually excellent proposals from the Framework programme budget with no expectation of *juste retour* and no requirement for cross-border cooperation
- New measures to fund research infrastructures
- Opening of the Framework programme to third countries (on bases that have not yet been well defined)

Technopolis has had a long-standing interest in understanding and evaluating R&D policy systems and their governance. We have found it useful to think of these as having three inherent levels (*Exhibit 5*): the policy level, generally institutionalised in ministries; the programme level, typically institutionalise in agencies; and the project level, made up of funded projects and those who perform them. Inspired by the new public management, these three levels are increasingly connected via performance contracts and evaluative processes.

Exhibit 5 Policy, Programme and Project Management with Evaluation



Source: Erik Arnold, Patries Boekholt and Patrick Keen, *Good ideas in Programme Management for Research and Technological Development Programmes*, Project HS-02 report to the EC VALUE Programme, Brighton: Technopolis, July 1996

The effect of the recent Commission measures is to co-opt each of these three levels, as distinct from the pre-2000 measures and FPs which mostly operated at the bottom level – and then not very strongly, since the networks built were of limited scale and impermanent. Our recent meta-evaluation of the Framework Programmes⁴¹ found little evidence that the Commission was making much progress in “structuring” the European research and innovation system, but it did point to the growing evidence that multiple FPs have led to the emergence of key players like the Fraunhofer Society, which is highly present in the programmes and whose institutes function as important nodes in European research networks. There is no evidence that these networks have yet become self-sustaining without continuing subsidy by the Commission, but they nonetheless represent important changes in power among research performers and are therefore a structural feature to which Nordic R&D policy will need to respond.

Exhibit 6 classifies recent EU instruments according to the three levels discussed. At the level of opening up national programmes, the ERANETS are the most important instruments to date, seeking to achieve a

⁴¹ Erik Arnold, John Clark and Alessandro Muscio, “What the evaluation record tells us about Framework Programme performance”, *Science and Public Policy*, Vol 32, No 5, 2005, pp385–397

degree of administrative integration across borders. They offer varying constellations of research funders the chance to work towards thematically limited cross-border R&D funding programmes. The rationales for ERA-NETs offered by the Commission (in ERA-NET programme documentation – we have not been able to identify a programming document for the ERA-NETs) – are to

- Access more funding, since the Commission will top up national funds committed to an ERA-NET
- Enable national systems collectively to take on tasks they cannot individually address
- Provide common answers to common problems (as in the Baltic ERA-NET BONUS)
- Provide thematic coordination across Europe (as ERA-NET TRANSPORT intends for certain transport and traffic related issues)

In the coming ERA-NET+ form, the Commission may top up their common budgets by as much as 20% to provide a greater incentive to move towards “single pot” funding.

Exhibit 6 EU “Structuring” Instruments Since 2000

Level	FP6	FP7/CIP
Policy/Ministry	Open Method of Coordination CREST R&D Policy Actions RTD-OMC-NET Trend Chart on Innovation	Open Method of Coordination CREST R&D Policy Actions INNO Policy Trend Chart ERAWATCH “Support to the coherent development of research policies”
Programme/Agency	ERA-NET Article 169	ERA-NET+ Article 169 European Research Council Research Infrastructures
Project/Performer	New Instruments: IPs, STREPs, Networks of Excellence Technology Platforms	New Instruments: Collaborative Projects; Networks of Excellence Technology Platforms + JTIs

* These include agencies as well as performers

Article 169 provides a mechanism to create a funding organisation with “variable geometry” under Commission auspices and with a financial contribution from the Union. The European and Developing Countries Clinical Trials Partnership remains the only instance of its use, owing to the time-consuming and complex nature of the “co-decision” procedure involved. In effect, it is as complex as setting up a multilateral international treaty each time the instrument is used.

An interesting trend in Commission instruments tends to blur the distinctions between the three levels used in the preceding Exhibits. That is, the increasing delegation of assessment and funding decisions within a given theme. Thus, for example, the Networks of Excellence themselves organise internal calls for proposals for projects relevant to their areas of work – something that is normally the business of an agency.

The essence of the Commission strategy for opening R&D funding borders is therefore

- To operate simultaneously at policy, agency and research performer levels
- To use variable geometry as a device to bypass objections and objectors and enable those who want to cooperate and to open programmes to do so unimpeded
- To build constituencies bottom up around needs and problems in the research and innovation system, which are likely both to produce valid grounds for intervention and to act as a lobby group for cross-border action
- To devolve at least some of the new administrative burdens created to the beneficiaries

The Technology Platforms are devices for organising beneficiaries and funders across borders to build constituencies in research and industry policy. They may contain Industry, Public authorities, Research institutes and the academic community, the financial community, Civil society, including users and consumers. These may make use of other EU instruments; they are not at this stage themselves funding organisations. Rather they are intended to bring together stakeholders, to define a strategic research agenda and to implement that agenda. They may over time evolve into Joint Technological Initiatives under Article 171, which says “The

Commission may set up joint undertakings or any other structure necessary for the efficient execution of Community research, technological development and demonstration programmes.”

The Technology Platforms are partly a response to the member states targeting the Barcelona Goal and then finding themselves unable to fund all the required increase – especially that expected from the private sector.⁴² The Platforms aim to improve the integrated functioning of the European Research and Innovation System by targeting non-R&D as well as R&D policies – echoing the calls in the Nordic states for “holistic innovation policy”. They are supposed to tackle “challenging issues where Europe’s future growth, competitiveness and sustainable development depends on major research and technological advances in the long term.”

3.3 Nordic and EU Cooperation

As this chapter has shown, the long-established Nordic research and innovation collaborations have been given an impetus to reorganise recently – in part by the Busquin declaration, but in part also in order to respond to the nagging doubts about the value of the Nordic level that were introduced in the *Nordisk Nytte* debate. The Nordic cooperation has very modest means at its disposal, compared with the European one and lacks the power of European legislation. At the same time, it is much more strongly based in a history and culture of collaboration than anything the European Union can yet attempt.

The ERA policies of the European Union aim to optimise at a European level. They are indifferent to whether this has any effect on Nordic strength as such. The instruments involved are not adapted to operating at Nordic level, since they aim in various ways to achieve continental-level objectives, so they cannot be adapted or “hijacked” for Nordic purposes. There is a fundamental asymmetry here. Nordic instruments can build Nordic platforms and strengths that complement and support those at the European level. However, EU instruments cannot be used to build Nordic positions.

⁴² Technology Platforms from Definition to Implementation of a Common Research Agenda, EUR21265, Brussels: European Commission Directorate-General for Research, 21 September 2004

The strategic question for the Nordic area is therefore: Is it useful to invest in building Nordic strengths in an European and a global context, since Europe will not do this for us? Our scenario analysis later in this report suggests that the answer is clearly “Yes”.

4. Some Experience of Opening Research Programmes

Opening research programmes across borders is an objective both of the EU and at the Nordic level – certainly to the extent that this is one of the aspects of NordForsk strategy. In this chapter, we discuss, first, Nordic experiences of opening R&D programmes and, second, experience from the rest of Europe. We draw some lessons at the end of the Chapter.

4.1 Nordic Experience

Nordic experience comprises a mixture of bottom-up initiatives outside the Council of Ministers, activities within the remit of the Council and a number of bi- and trilateral cooperations launched by individual Nordic countries. The experience is positive but also suggests that past and present Nordic institutions are not always best adapted to cooperation.

4.1.1 The Nordic Energy Research Cooperation

The Nordic area has had common energy research programmes since 1985. These are operated on a “real common pot” basis by the Nordic states and had a budget of NOK 43m in 2005. Originally a committee within the Council ran the cooperation but since 1999 the Nordic Energy Research agency has operated it at arm’s length. The cooperation has succeeded in pooling small-scale research resources across the Nordic area to build bigger common scale in areas of energy technology of Nordic interest. In this way, small research teams in the Nordic area have been able to have an influence out of proportion to their limited size. On the

basis of these, it has for instance been possible to establish Nordic positions in EU instruments such as the Hydrogen and Fuel cell Technology Platform and to participate in the management of an ERA-NET concerned with fuel cell technology⁴³.

4.1.2 NOVA

NOVA – the Nordic Forestry, Veterinary and Agricultural University Network – was set up in 1995, as a network among the agricultural and veterinary universities in the Nordic area. It built on discussions among the rectors that had been in progress back to the 1970s and largely funds its own activities. Its aims were to

- Develop means of and tools for cooperation in scientific areas where the resources of each individual university member are too limited
- Enhance the quality and broaden the scope of research, research education, teaching and the learning experience of the students
- Deal more effectively with the ongoing expansion of the field of scientific knowledge and the need for further specialization
- Promote greater resource efficiency and to reduce teaching costs
- Increase the international competitiveness of member institutions in their spheres of competence
- Become a more proficient partner for dialogue with relevant sectors, including industry

It has successfully modularised parts of the universities' MSc and PhD programmes, so that students spend some time travelling between the universities and these modules can be more efficiently delivered. One successful joint MSc on agro-ecology has expanded into a wider European cooperation programme, while another (on Aquaculture) brings large numbers of non-Nordic students to study at NOVA. At the same time, it has proved difficult in practice to allocate responsibilities for subjects not broad enough for each country to develop their own expertise or to focus resources on the institutions with the greatest strength in cer-

⁴³ Birte Holst Jørgensen, "Transnationalt energiforskningsamarbejde – hvor går grænsen?" in Hanne Foss Hansen (ed), *Den organiserede forvaltning: Politik, viden og værdier i samspil*, Copenhagen: Forlaget Politiske Studier, 2006

tain specialisations, since the member universities are completely autonomous.⁴⁴ "... students are not always abundant, implying that universities may be reluctant to transfer economic resources, competence and learning to another NOVA university, as they thereby lose students and, eventually, a subject area."⁴⁵ There is some variable geometry within the network, such as a Danish-Swedish horticultural programme, which appears highly successful.

There appear to be two important challenges to progress towards the original NOVA vision. One is internal. "We have learnt that our member universities are conservative institutions. They do not easily transform themselves into a synchronised organisation. This fact has caused much of the frustration experienced in the early NOVA years. Therefore the vision of a university without walls has faded into the background and the idea of a network of independent universities has emerged."⁴⁶ The other comes from the strengthening of the EU programmes at a faster rate than the Nordic ones: "... especially with regard to EU programmes, Nordic cooperation and aid from NOVA need to increase markedly if we are to sustain the interest of our teachers and researchers in the NOVA programme."⁴⁷

4.1.3 A Nordic Research and Education Area in Agriculture and Forestry

The Nordic climates and soils are unusual (though not unique) and the geography of the region means that the national borders run North-South while the common problems lie East-West, with different problems at different latitudes. Over time, as agriculture's importance declines as a proportion of GDP, less research and education funding is available. Nordic collaboration is the most natural way to concentrate resources and maintain the critical mass needed to do education and research. NOVA is the spontaneous demonstration that such collaboration makes sense, for

⁴⁴ Roger K. Abrahamsen, "Responsibilities and Competence", in *NOVA University Network 10 Years*, Lund: Paul Jensen, 2005

⁴⁵ Flemming N. Frandsen, "Development of MSc cooperation in NOVA: Growing conditions in the NOVA greenhouse," in *NOVA University Network 10 Years*

⁴⁶ Ágúst Sigurdsson, "NOVA in an Icelandic perspective: Nordic collaboration with or without NOVA", in *NOVA University Network 10 Years*

⁴⁷ Hannu Saloniemi, "NOVA in a Finnish veterinarian perspective: Nordic cooperation comes naturally", in *NOVA University Network 10 Years*

example by enabling PhD teaching in some areas that would be sub-critical at a national level.

Several studies have been made of the problem in recent years. One reported in 2002 on the status of cooperation to that point, and said that the number of goals for Nordic cooperation was increasing, but the goals were themselves not becoming any clearer. The institutions themselves got no clear signals about what to do from their owners, so had to tackle cooperation on their own initiative. Researchers and national bureaucrats dominated the institutions. Foreigners and industrial representatives, who would be more likely to press for closer cooperation, are largely absent. National education and policy responsibilities got in the way of cooperation. National research institutions were barely active in each other's markets and had neither the ambition nor the strategic means to operate on competitive Nordic contract research market. Both research institutions' structures and national priorities were highly duplicative. The research councils retained responsibility for Nordic cooperation, despite the fact that they no longer provide the largest part of the finance for the field. Proposal assessment is done nationally. The assessors share an interest in preventing funds from going abroad and need give no reasons for rejecting foreign applications. Research councils' states required them to work in the national interest. As a result, there were many substantial administrative obstacles to cooperation. The research community defined successful international cooperation as that which provides it with additional marginal resources. Initiatives by researchers were insufficiently strong therefore to trigger new ways of working

While the existing cooperation mechanisms had very few resources, they dominated perceptions of cooperation, "crowding out" potential new initiatives⁴⁸.

The study went on to suggest needs that should be satisfied, in order to realise a common research and education area. These included more operational goals, analysis of available resources and needed synergies, opening contract research markets in order to foster competition and transferring funding responsibility away from national actors such as the research councils whose interests were to impede cooperation and rationalisation.

⁴⁸Nordisk Ministerråd, *Et nordisk forskings- og utdannelsesrom for jord- og skogbruk*, ANP 2002:742, Copenhagen: Nordic Council of Ministers, 2002

The subsequent study⁴⁹ – intended to consider how to implement the idea of a Nordic research and education area in agriculture – produced a similar list of problems. It recommended adjustments to national rules, increased cooperation within the NMR secretariat and among the individual Nordic council and, a planning exercise followed by the creation of a Nordic research fund for agricultural cooperation with a view to creating a Nordic research and education area for agriculture, forestry and food. Our interviewees suggest that the subsequent failure to establish more cooperation in this field results from inability to generate the needed cooperation among multiple Nordic councils.

Many of the ideas in the 2002 report built upon a review of policy relating to Nordic agricultural research institutes⁵⁰. One prominent idea in this report was that Nordic research funders should progressively open their programmes to citizens from other Nordic countries, and that there was a need to explore mechanisms to achieve this. That idea was present, if less prominent, in the 2002 main report and – by the time it reached the NORIA White Book – it was diluted to a suggestion that Nordic graduate schools should admit students from the entire Nordic area.

These somewhat frustrated efforts to increase Nordic cooperation suggest that the fragmentation of responsibilities at the Nordic level among the Nordic councils that bring together national ministries but fails to provide an overall research and innovation perspective tends to prevent the kind of joined-up research and innovation policymaking that Nordic countries seek at the national level and that is implied by the National Innovation Systems perspective.

4.1.4 The Nordic Centres of Excellence

The Nordic Centres of Excellence (NCoE) were launched in collaboration with the NOS Joint Committee of the Nordic research Councils committees in pilot form in 2002 at the initiative of NOS-N: the Joint Committee of the Nordic research Councils for the Natural Sciences for the natural sciences. They provide 5 years of funding to real or virtual centres of

⁴⁹ Ad hoc gruppe opprettet av Ministerrådet for fiske-, jord- og skogbruk- og næringsmiddelsspørsmål, *Implementering av et nordisk forskinga- og utdannelsesrom på jord- og skogbruk-sområdet*, (mimeo), May 2003

⁵⁰ O Henrik Akeleye Braastad, *Landbruksinstituttene: Nordifisering Nå!* report to the Nordic Council of Agriculture Ministers, 2002

excellence in the Nordic area, at a level of about 2–4 million kroner per year, so in international terms they are rather modest in size. They are about one-third funded from the Nordic level, using a common pot (now part of the NordForsk budget) with no *juste retour* and the balance of the money coming from the national level. The centres are selected by open competition within the Nordic region in areas agreed by the respective NOS committees. The first one was in basic science in the field of global change in the context of ecosystem processes within climate change.⁵¹ More recent centres are more widely dispersed across the humanities, natural sciences and medicine, but the broad topics are defined “top down” by the respective NOS committees.

Since the creation of NordForsk, the NoCE centres have been administered by that organisation. Based on our interviews with participants and observers, the centres appear to have reinforced Nordic research positions, especially in the university sector. (An evaluation is planned for 2007, so there are no more definitive conclusions yet available about the success of the centres.) They appear to have been awarded to established researchers and to have increased their power in establishing wider international cooperations.

4.1.5 Nordic Cancer Union

One of the few international R&D arrangements in the Nordic area that uses a genuinely “common pot” is the Nordic Cancer Union, which currently (2006–10) has a research budget of about €1m per year. This is contributed by its six national member cancer research organisations, using a formula based on their respective incomes. Projects have to be cancer-relevant, apply to the Nordic area and involve fieldwork or data collection at the Nordic level. Applications are assessed first by the national organisations and then again by a joint international scientific committee. There is therefore no *juste retour* to the member countries’ research communities. However, citizens should in principle benefit from the knowledge generated in all projects, since their focus is Nordic.

⁵¹ NOS-N, *Nordic Centre of Excellence Pilot Programme 2002-2007*, (mimeo) Copenhagen: NOS-N and Nordic Council of Ministers (undated)

4.1.6 Technology Cooperations

There are a few R&D programmes in the Nordic area that represent examples of cross-border funding set up at the national level. Finland has been most active in launching such Nordic collaborations, and is also extremely active in leading EU ERA-NETS, based both on the strong tradition of technology programmes run by TEKES (some of them coordinated with more fundamental research activities funded by the Academy of Finland) and of the national strategy to internationalise Finnish industry and research.

There is a tradition of small cooperative technology programmes between TEKES and VINNOVA (and its predecessors), especially in telecommunications but more recently also in forest materials. In telecommunications, the INWITE programme ran in 1996–99, EXITE in 2000–03 and most recently the bilateral collaboration has been extended by adding the Research Council of Norway (RCN) into NORDITE in 2005–10. These all involve cooperations among research institutions, rather than industry. Proposals are jointly assessed but funding is national, so that each agency involved pays for the participation of the applicants from its own country. The EXITE telecommunications programme has been evaluated, and the report⁵² concludes that the selection of projects has been relevant for industry, and it conforms well to international development. The programme strengthened co-operation between Finnish and Swedish researchers. It also strengthened the contacts between the Finnish academic research community and Nokia, many of which had already been established in earlier programmes. Unfortunately, the evaluation provides little operational detail.

The wood materials cooperation between Finland and Sweden has its roots in two Nordic Wood programmes run by the Nordic Industry Fund in the latter 1990s and the Wood Wisdom programme (1998–2001), which addressed technology needs of the entire supply chain from raw materials in the forests to paper and timber products and was funded together by TEKES, the Academy of Finland and the Ministries of Agriculture and Forestry and of Industry. (Some observers argue that the networks on which the Nordic Wood programmes built were partly established via the activities of the COST Technical Committee for Forest

⁵² Risto Louhenperä and Olle Nilsson, *Evaluation of the Finnish-Swedish R&D Programme EXSITE, 2001–2003*, Helsinki: TEKES, 2003

Products, Pulp and Paper.) The national programme coexisted alongside a Centre of Expertise supporting the wood cluster in Finland and the national Wood Finland technology network, both of which continue today. The Finnish-Swedish Wood Materials Science and Engineering programme involves the Academy of Finland and the Swedish FORMAS research council in funding 8 rather fundamental research projects and TEKES and VINNOVA handling 8 pre-competitive but innovation-focused projects, with further financial contributions from the Finnish Ministry of Agriculture and Forests. Like the other Finnish-Swedish programmes it is small – only 20 MSEK over the three years – and tackles common needs in the context of wider R&D and innovation policies nationally (especially in Finland). However, the Finnish initiative has also involved driving the creation of a Wood Wisdom ERA-Net, with 18 participants from 8 countries and led by TEKES. Participants from the Finnish and Swedish industries have been especially active in setting up the Forest-Based Sector Technology Platform, which extends the partnership to more countries within the EU, with much heavier industrial involvement.

Our own evaluation⁵³ of the Danish-Swedish Øresund Contracts programme suggested that there were many positive project outcomes but also highlighted a number of difficulties that need to be considered in the future design of cross-border R&D programmes. The Øresund Contracts were launched as one module of the activities celebrating the opening of the Øresund Bridge. The programme was hastily designed in response to a political need. It essentially took the design of the existing Danish Centre Contracts programme (which involves companies, universities and institutes in joint R&D projects) and added a requirement that projects should have participants from each of these three categories in both Sweden and Denmark. The programme did not, therefore, have its roots in the needs of the Innovation System of the Øresund area but in political expediency. It turned out that what had made sense in Greater Copenhagen did not make sense in the context of Skåne (where there were no research institutes). The requirements for *juste retour* at the programme level and the presence of all categories of actor in both countries were obstacles to

⁵³ Sven Faugert, Erik Arnold, Alasdair Reid, Annelie Eriksson, Tommy Jansson and Rapela Zaman, *Evaluation of the Øresund Contracts for Cross-Border R&D Cooperation between Denmark and Sweden*, VINNOVA Rapport 2004:12, Stockholm: VINNOVA and VTU, 2004

designing “natural” projects and the rush meant that it was really only established networks that were able to generate proposals and get funding. A central message from this experience is the requirement for cross-border programmes – like national ones – to address the needs of their beneficiaries rather than of politicians or administrators.

4.2 European Experience

The European Union has, of course, long experience with the Framework Programmes as means to increase European cooperation in R&D. However, these do not in any sense involve opening national funding schemes. Rather, they are additional and complementary to those national schemes. Experience with opening R&D funding programmes in Europe comes mainly from the multilateral organisations such as the European Science Foundation (ESF) and via the new instruments innovated by the European Commission, notably the ERA-NETs and Technology Platforms.

4.2.1 Cross-Border Opening in Europe

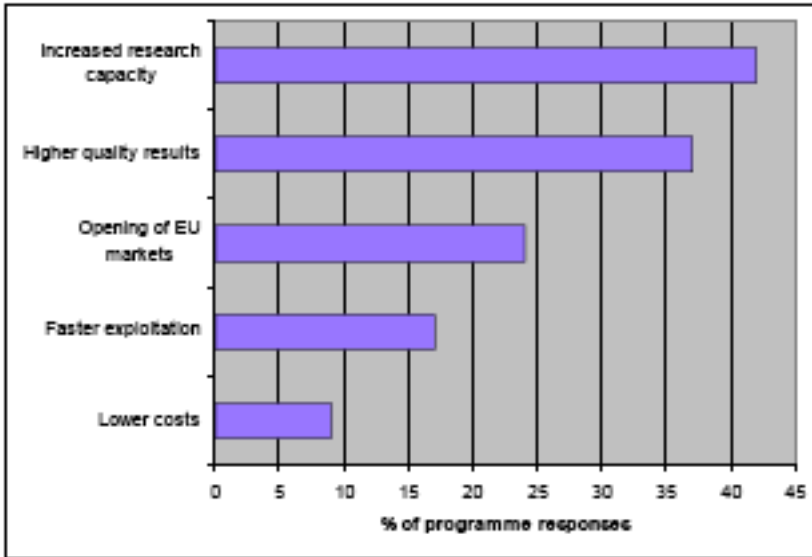
Our own study⁵⁴ showed that there was only a minimal level of cross-border cooperation taking place in national R&D programmes within the EU in 1999. An update of this work⁵⁵ in 2005, which surveyed 127 national programmes within Europe, shows that the situation has changed only to a limited extent. While 80% of the programmes now spend some money across borders, this chiefly involves sponsoring national participation in international programmes. Almost none of them are open to funding foreign participants. Where they *are* open, this is (Exhibit 7) in order to

⁵⁴ Technopolis, VDI/VDE-IT, IKEI and Logotech, *Cross-Border Cooperation within National RTD Programmes*, report to the European Commission D0G XII, Brighton: Technopolis, 1999

⁵⁵ Optimat and VDI/VDE-IT and Technik, *Evaluating the Design of National RTD Programmes*, report to the European Commission, Brussels: European Commission 2005

- Make up shortfalls in the quantity or quality of national research capacity
- Bring in foreigners to foster the international competitiveness of the research community
- Match aspects of the internationalisation of business

Exhibit 7 Benefits of Transnational Aspects of R&D Programmes



Source Optimat and VDI-VDE-IT, Op Cit, 2005

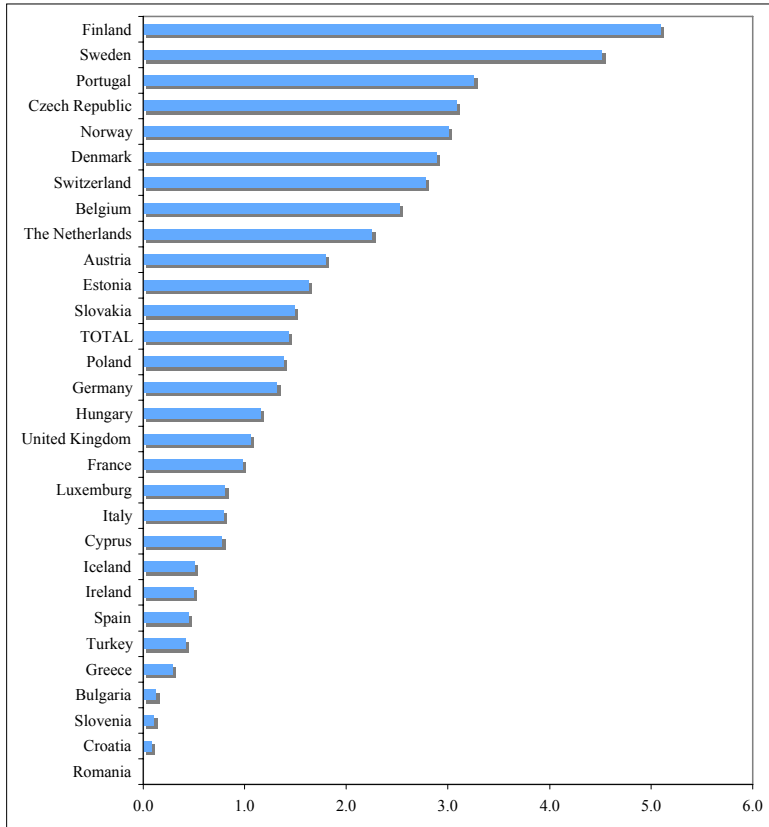
Nordic participation in the European Science Foundation’s (ESF) programmes illustrates well the importance of international cooperation to the Nordic countries and their ability to contribute both to “single pot” and multilateral schemes. ESF currently has 78 Member Organisations spread across 30 countries. About a third of these are academies or research performers whilst the rest are research funders, typically research councils. They contribute to ESF’s traditional networking instruments (Exploratory Workshops or Networks) via ESF’s General Budget and also participate “à la carte” in the larger (so-called Programmes), where member organisations decide case by case whether to contribute funds to a virtual common pot.

Germany, the United Kingdom, France and Italy are the largest contributors to the ESF , accounting for 64% of the total between 1997–

2004. They also provided almost half (48%) of all à la carte contributions over the same period.

Exhibit 8 plots the ratios of à la carte to general budget contribution by country, showing that there is a wide range of ratios involved. Sweden and Finland – the two most R&D-intensive economies in the world also have the highest ratio of à la carte to general funding. Other countries with high ratios are also small, open economies. All the Nordic countries except Iceland are near the top of the Exhibit. The large European economies have ratios closer to 1:1, while those with limited participation in à la carte Programmes tend to be small, not very research intensive economies, including a number of new EU members and candidate countries.

Exhibit 8 Ratio of à la Carte to General Budget Funding, 1997-2004



Source: ESF data; Technopolis estimates and analysis

It appears, therefore, that small but comparatively wealthy countries use both General Budget and à la carte funding to extend the reach of their research communities. Having small scientific communities, their need for international networking is correspondingly large in order to maintain breadth. Other small countries logically have the same need, but may be constrained by lack of money from following suit in investing heavily in Programmes. Larger countries with correspondingly large scientific communities appear to be more self-sufficient.

4.2.2 Nordic Experience from the ERA-Nets⁵⁶

The ERA-Nets represent a large-scale attempt to provoke mutual opening of national R&D programmes. Unlike the Nordic cooperations, the European Commission has insisted that the ERA-Nets be rather large, often with 15 or more participants. Since there are limited numbers of ministries and agencies to which the Nets are relevant, this also means that many of them are involved with a large number of ERA-Nets. The Research Council of Norway is an extreme example, participating in 33, but it follows from this heavy engagement that the early idea of the Nets bringing together senior managements and triggering strategic consideration of common interests and the opening of programmes could not be realised. Different countries have taken different approaches to ERA-Nets. Sweden has been eclectic, aiming to observe and learn. Strikingly, no ERA-Nets are Swedish-led. Norway has similarly joined in a large number, extending its well-established principle that it is willing to fund foreign researchers and activities where these can strengthen the Norwegian research base and capacities. Finland has used – and often led – ERA-Nets proactively to pursue its internationalisation goals by establishing shared-interest activities and platforms with others.

In practice, programme managers mostly handle ERA-Net participation alongside their normal duties. However, while the ERA-Nets scheme pays for administrative resources and travel, it does not increase the numbers of people in post or the hours in the day. Interviews suggest that the ERA-Nets have very much been driven by the enthusiasm of the pro-

⁵⁶ This section is drawn from a combination of our interviews with EA-Net leaders and participants and conclusions at a workshop of Nordic ERA-Net participants organised by NordForsk and held at the Swedish representation in Brussels on 13 June 2006

gramme managers involved. The overall pattern of ERA-Net-induced cooperation and programme opening to date has emerged in a rather bottom-up way. A common message from participants is that it takes a great deal of effort to identify areas of common interest and more to deal with the administrative barriers involved. One participant at the Nordic ERA-Nets meeting said, “We’ve been working for two and a half years and have hardly achieved anything yet.” (The Appendix contains a discussion the includes the type of barriers encountered here.)

Some of the ERA-Nets have adopted ambitious “real single pot” funding models, rejecting *juste retour*. Others worked with virtual common pots, where authorities funded their own nationals’ participation. Safe Food ERA has two pots – one of each type – with the more fundamental work being funded through the real common pot.

ERA-Nets brought important benefits. They enabled cooperative priority setting by sharing strategic intelligence to identify areas of common priority. They encouraged the synchronisation of national research programmes. Existing bilateral funding schemes were being extended to become multilateral. Small countries like Norway found that ERA-Nets enabled them to fill gaps in the national research portfolio. They increased the exposure of national research performers to competition.

Some of the stronger ERA-Nets were built upon pre-existing networks and collaborations. For example, the iMERA metrology ERA-Net built on the EUROMET network set up in 1987, while the NORFACE network was a superset of the Nordic NOS-S cooperation in social science.

Success-factors for the ERA-Nets appeared to include

- Champions (people) in the participating institutions, who had a strong commitment to cooperation
- Flexible national decision-making processes – based on a perception that administrative obstacles could usually be overcome if there was a real desire to do so
- Accepting patchwork solutions
- Devising and sharing practical and flexible standards for agreements among the ERA-Net participants
- Role models

- The availability of a limited amount of financing “sugar” to sweeten the medicine

There appears to be some disagreement about the desirability of real common pot models. While they have an attractive simplicity, they involve a lot of negotiation in order to persuade people to give up control over some of their budgets. Some argue that paying your own way is quicker and easier.

4.2.3 Technology Platforms

Technology Platforms are at a much earlier stage of development than ERA-NETs, so the extent to which lessons can be drawn is correspondingly limited. According to an EC staff document,⁵⁷ key success factors for the Technology Platforms are

- Strong leadership
- Openness – they must not function as “closed shops”
- They should individually be structured in response to needs. One size does not fit all
- They should have a clear operational focus from an early stage
- They require the commitment of the national authorities
- They should be proactive in identifying sources of funding

4.3 Lessons from the Available Evidence

Based on experience both in Nordic cooperations and in the early stages of ERA-NET, TAFTIE has produced some useful observations⁵⁸ about how to organise cooperation between national programmes. An absolute prerequisite for successful cooperation is that there is an objectively shared interest, which agency management is committed to fulfil. “Transnational collaboration between national programmes only really works well if there are real, strong, perceived needs for collaboration. Where there is

⁵⁷ Brussels 10.6.2005, SEC (2005) 800

⁵⁸ TAFTIE (The Association for Technology Implementation in Europe), *Framing Collaboration Models Between National Research and Technological Development Programmes*, 2005 www.taftie.org

a strong will to cooperate, practical ways to cooperate can often be found.”

TAFTIE sees cooperation as often being relevant between *parts* of different programmes or policies. For example, Finnish-Swedish cooperation on research into fundamental aspects of telecommunications technology has been implemented through a series of short programmes (INWITE , EXCITE and most recently NORDITE, with additional Norwegian participation), but more applications-oriented work is done in separate national programmes. Creating a centralised common pot, managed by a separate legal entity, is the “cleanest” solution and is useful for programmes aimed at fairly fundamental research over a long period of time. But such organisations are difficult to build. For time-limited cooperations, where IPR ownership may be an issue, multilateral alternatives are more practical.

The ESF data confirm what common sense suggests: namely, that cooperation and co-funding in research are more important for small countries than for large ones. We would therefore expect to find cooperation and “opening” issues higher up the agenda in the Nordic area than in the EU as a whole, especially as the Nordic countries can by and large afford the costs involved. This is especially the case since the Nordic area has a great deal of experience that demonstrates the benefits of cooperation and mutual opening of programmes.

The evidence further suggests

- There are real synergies available through Nordic cooperation that could be exploited through more open funding mechanisms to provide higher leverage for Nordic taxpayers’ investment in research funding
- The ERA-NETs are too large to be efficient. In practice, each network contains a handful of active collaborators and a larger number of organisations interested in learning or observing. An ERA-NET-like model that concentrated only the “volunteers” in cooperation and mutual opening of programmes would be likely to have a more significant effect on changing real collaboration patterns and building strength in research
- Cooperation and opening funding works best on the basis of enlightened self-interest. It works when those involved know what

they are doing, why they are doing it and what benefits they expect to get as a result. Their involvement in planning can be an important contribution to the success of the project. It does not necessarily work if it is done to please the politicians

- Stakeholders therefore need to be involved in the design and planning of cooperations and measures that open funding programmes. These are not necessarily the same as the interests that communicate most easily with the NORIA “pillars” and their national counterparts, the education and research ministries
- Self-interests do not always coincide across the whole Nordic area. Variable geometry is therefore an important principle
- Opening research funding programmes works where it is done in a gradual way. It does not always seem to be important whether there are one or many pots. In long-term opening, a single pot is more efficient but it is harder to achieve than multilateral arrangements
- Accomplished cooperations show that it *is* possible to work with real common pots when opening research programmes
- Programme definitions do not necessarily match between different agencies so whole programmes are not necessarily the right level for cooperation. The rational approach may be to open *parts* of R&D programmes, where a common interest can be identified
- Lack of administrative capacity can be an important obstacle to cooperation and opening in research programmes. It is therefore an advantage to work with a fairly stable set of partners, as is the case in the Nordic cooperations, so that previous learning, routines and procedures can be re-used
- There is scope for more open procurement mechanisms in the Nordic contract research markets in order to increase competition in national markets with few suppliers. Opening research programmes can also help provide this increased competition
- Administrative rules can be barriers to cooperation and opening, but these barriers *can* be overcome
- Opening programmes often requires the engagement of people willing to act as “project champions” and push new ideas and ways of working past institutional rigidities

- The availability of “sugar” or “grease” (according to taste) in the form of a special budget to pay at least some of the costs of opening significantly eases the process

5. Four Scenarios

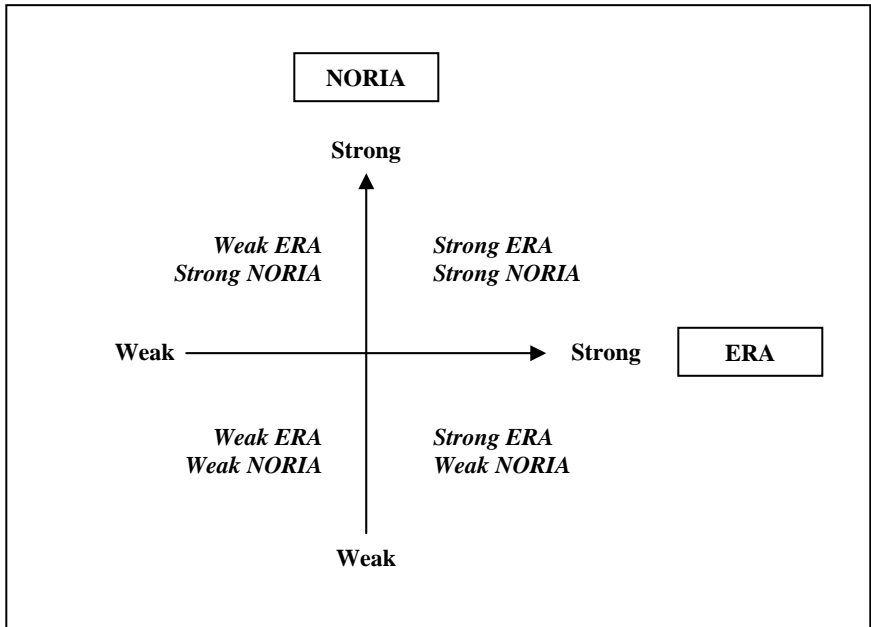
This chapter presents our findings about the implications of opening – or not opening – R&D funding borders within the Nordic region using a “thought experiment” to structure our thinking about the potential implications of various degrees of “opening” of cross-border funding in the Nordic region.

We have constructed four scenarios as a basis for thinking about future opening of research programmes. The dimensions of the scenarios relate to the way NORIA and the ERA respectively are implemented. For each we consider a “weak” and a “strong” implementation. These dimensions are described in *Exhibit 9*. They are not predictions. Rather, they are ways of asking “what if things develop like this”? The combinations of these possibilities form the scenarios (*Exhibit 10*). The scenarios are therefore

- Strong implementation of ERA, strong implementation of NORIA
- Strong implementation of ERA, weak implementation of NORIA
- Weak implementation of ERA, strong implementation of NORIA
- Weak implementation of ERA, weak implementation of NORIA

Exhibit 9 Alternative Futures for NORIA and ERA

	Weak	Strong
NORIA	<ul style="list-style-type: none"> • The budget at Nordic level for NORIA activities stays flat or increases only by a modest amount • NORIA functions as envisaged in the White Book, as an umbrella over the activities of national funders with the national authorities having a veto over what is done • The modest amount of NORIA activity means few strong constituencies are built for increased funding at Nordic level • The tie to national funders and the Nordic Council means that participation in NORIA is strictly limited to the Nordic countries • The lack of Nordic resources for NORIA means that heavy use has to be made of EC instruments • There is little or no increase in mutual opening of programmes 	<ul style="list-style-type: none"> • The budget at Nordic level for NORIA activities increases very significantly – partly at the Nordic level and partly by increased availability of national funds for NORIA-related activities • A key effect of NORIA is that researchers can apply for and receive funding across the national boundaries in the Nordic area, in addition to being able to use Nordic resources • Strong constituencies are built in the research and industrial communities for increased funding at Nordic level • NORIA becomes permeable so that ad hoc participation of non-Nordic participants can be accommodated • The availability of Nordic resources for NORIA means that use of EC instruments is opportunistic • Agencies and ministries are significantly more willing to cooperate, plan and open their activities
ERA	<ul style="list-style-type: none"> • The Framework programme continues to be the major funding channel for EU R&D, reverting to some extent back to more traditional instruments in response to the ineffectiveness of the Networks of Excellence in building active research and lobbying communities and the high administrative burdens imposed on beneficiaries by the new instruments • Limited numbers of ERA-NETs beyond those already in place, possibly owing to their complexity and the time-consuming nature of their administration • Few Technology Platforms beyond those already envisaged, owing to their inability to attract significant resources beyond those already available and their failure to get privileged access to EC instruments • Use of the available instruments reflects existing geographies and constellations within the Union, notably regional alliances such as the Nordic countries, Baltic states, SE and Central Europe, etc • Budgets for EU R&D and innovation policy are flat • The Barcelona goal is quietly abandoned as unrealistic or met only by “reinterpreting” the goal or the data used to measure its attainment • The EC instruments do not create radical changes in the concentration of research capacities in Europe, so that the pattern remains more or less as fragmented as it is today 	<ul style="list-style-type: none"> • More new instruments start to displace the traditional role of the FPs, so that outcomes shift from networking and intermediate results towards structural changes • Concentrations of stakeholders and beneficiaries create strong lobbies for R&D support policies that favour them. As a result, EU funding shifts towards supporting more fundamental research and more industry- and research-theme-focused groupings in areas of actual and potential European strength. This may leave gaps in areas of regional, as opposed to continental, importance • ERA-NETs increase significantly in scope and number, issuing calls for proposals and evolving towards “one pot” funding schemes. As a result there is widespread opening and coordination of national R&D programmes • A moderate increase in the number of Technology Platforms takes place, limited mainly by the fact that these groupings are generally successful at attracting large amounts of resources for major European themes. There are important gaps in the extent to which the Platforms cover the regional economies • Use of the available instruments becomes pan-European with large numbers of members and little scope for regional groupings

Exhibit 10 The Four Scenarios

5.1 Effects of the Scenarios on the Nordic Research and Innovation System

How would we expect various parts of the Nordic Research and Innovation System to behave under the different scenarios? In this section, we summarise how we expect various parts of the system to act under the various alternatives. We tested these arguments with about half our interviewees, and found general agreement about them. The importance of cooperation and opening programmes will nonetheless vary and needs to be considered case by case. We start by considering different types of actor then move on to think about four generic types of research.

Individual Researchers

Doing research involves a lot of individual competition, so researchers tend to be ruthless in pursuing their own self-interest. Surveys⁵⁹ as well

⁵⁹ ref RCN Evaluation, FFF/FWF Evaluation ; others?

as anecdotes tend to show that they have a high opinion of the quality of their own work and a low regard for research funding bureaucracies. Their experience of applying for research funds in competitions where the losers outnumber the winners to a large (and – as success rates continue to fall in many places – growing) extent naturally makes them cautious about proposals that could reduce the amount of money for which they compete or that give new competitors access to it. New sources of money are always welcome, and this is probably one of the factors underlying the general enthusiasm for the new European Research Council within the European scientific community, despite the fact that most researchers will never themselves benefit from it.

The general support, or lack of it, from the research community for opening programmes and for stronger versions of ERA and NORIA is likely to be a function of whether members of that community see themselves as winners or losers from the changes. Since it is the more successful and senior researchers who dominate the decision-making committee structures, especially in research councils, we would if anything expect the influence of the research community on opening to be positive, since the decision makers tend also to win funding competitions. We would expect researchers to be largely indifferent between Nordic and ERA cooperation (except in so far as their Nordic relationships may be better established) and rationally to support any cooperation that increases their perceived personal probability of receiving funding.

Universities

The Nordic universities are generally small, by European standards, but face the same set of forces for change as others. These include⁶⁰

- The declining role of the central state as a customer and controller of the universities and, correspondingly, the opening up of new regional, international, social and industrial markets
- The importance of competitiveness in increasingly competitive markets. As with companies, failure to improve leads to organisational failure over time

⁶⁰Erik Arnold, Jasper Deuten and Rapela Zaman, *Four Cases in University Modernisation: KU Leuven, Twente, Manchester and Loughborough*, report to the IVA Framtidens Universitet project, Brighton: Technopolis, 2006

- The important opportunities provided by the “third task” and the need to act centrally and to change university culture in order to grasp them
- System changes such as the UK Research Assessment Exercise, which enable improved university performance and help destabilise traditional university “lock-ins”
- The need for a more managerial rather than democratic style, in order to develop and implement strategy
- At the same time, a respect for the inherently bottom up nature of strategy formulation, so that strategy *enables* good work and good performance
- Increasingly use of strategic partnerships, not least with industry

The discussions about merging Chalmers and KTH into a larger technical university and the Øresund University project that aims to generate a virtual university in the Øresund region demonstrate awareness of the needs and opportunities of restructuring. The fact that neither has resulted in major changes yet also points to how difficult that restructuring is. Iceland is currently trying to recombine its somewhat fragmented higher education system into a single institution, while the process of transforming regional colleges into research universities has largely stopped in Sweden.

Movement towards larger scale and greater specialisation among the Nordic universities would be accelerated if it were easier to take common actions across borders, as the NOVA University Network has illustrated. While English is increasingly used for internationally orientated university teaching, Nordic language commonalities still matter. More integration and division of labour among other specialist universities (such as art, music and sport as well as the technical universities) would both allow the Nordic system to cope with limited budgets in specialised areas and build more robust European positions. In this sense a stronger NORIA works in favour of the Nordic universities.

The Bologna process, which aims to standardise course lengths and quality levels across Europe and enable increased mobility for students and faculty (including within degrees), may over time increase specialisation by increasing competition for students at the course/module level rather than at the degree level, but will not necessarily help universities address the structural challenges. Indeed, all the opportunities provided to

the universities by the European level focus on research funding or human mobility; none addresses the structural issues directly, although large research concentrations under a strong ERA scenario could provide some incentives for universities to adapt their strategies and structure on a European level.

Research Institutes

The research institute sector is rather heterogeneous, spanning missions from measurement and testing, doing research to support policy, doing applied research in support of industry and state-owned productive organisations (such as hospitals), helping SMEs develop capabilities to fundamental research. Industrially oriented institutes in all countries are faced with contract research markets where the industrial customers are globalising, yet they themselves are largely locked into their national positions by their legal forms and their national core funding. Recent years have seen internal restructuring within the Nordic applied research institute systems, forming larger entities and defining their missions in terms of technologies rather than branches. However, they have few incentives to internationalise, despite the mismatch with their customers' structures. In contrast, there has been surprisingly little internationalisation of the contract research market that supports policymaking, though there is a growing number of cases where such work is tendered internationally.

As with the university sector, the EU research markets can over the longer term affect the concentration of resources, and may well lead to increased strength in those institutes that already form key nodes in the network of research relationships associated with the Framework Programme, such as the Fraunhofer institutes. But the EU interventions so far have not involved trying to change national institutional structures – and doing so would be politically difficult under either ERA scenario. On the other hand, in a strong NORIA scenario, there are fewer obstacles to redivision of labour and restructuring among the institutes if the institutes themselves, industry and the national funding organisations see advantages. These would include reducing overlaps and redundant work, exploiting joint infrastructures, reducing fragmentation and building critical mass. Our policy suggestions below address how this can be done in a voluntary way.

Research Councils and Innovation Agencies

Traditionally, agencies are very defensive about their budgets and often view the idea of reallocating some of “their” resources with hostility. Successful bi- and tri-lateral joint programmes and ERA-Nets focus on overlapping areas of interest, so there is a “win-win” for the funders involved, irrespective of whether they use a real or a virtual common pot to fund the joint action. There are therefore substantive reasons why agencies should seek synergies and joint infrastructure investments, as well as using cooperation to influence and optimise the structure of the research performing sectors.

Trade theory would imply that complete opening of all programmes in the Nordic area to all applicants would result in increased competition, quality, specialisation and critical mass. However, agencies view with caution any kind of “opening” of funding mechanisms that allows applicants to send the same or similar applications to multiple funders because this would raise the total burden of application, administration and proposal assessment. It would further increase the demands on the research community to peer review proposals – a practice that already risks breaking down from overload.

The strong traditions of cooperation among Nordic agencies mean that the barriers to mutual programme opening should be lower among them than in relation to new, non-Nordic partners in the short term, but ERA-Nets are likely to be increasing the number of non-Nordic agencies they regard as trusted partners. In principle, it should not matter to agencies whether programme opening is part of NORIA, ERA or both, since their mission is to address R&D needs of the national research and innovation systems. A “weak NORIA, strong ERA” scenario, however, carries the risk of disrupting traditionally close Nordic inter-agency relations, so that the Nordic cooperation advantages built up in the past start to slip away. Increased cooperation and joint programming by the agencies would be helpful in using the other opportunities discussed in this section to build a strong NORIA.

Nordic specialist fields

There are a number of specialist fields that are important in the Nordic area but are rather unique on a global basis. A number of fields in the humanities are obvious cases (literature, language and history). There are

also scientific and technological challenges that are particular to the Nordic area yet which are of low priority or unimportant elsewhere. These include aspects of Nordic agriculture and many issues involving the type of forests that predominate in the Nordic countries as well as less obvious issues such as the stability of certain types of clay slopes in relation to railway embankments.

Precisely because they are so special to the Nordic area, some of these areas are the subjects of well-established Nordic cooperations. To some degree these cooperations will survive, irrespective of whether NORIA develops further or not, although the absolutely small amount of money and organisation devoted to Nordic research and innovation cooperation today does form an important obstacle to the effectiveness of these cooperations. Sharing infrastructure is an obvious tactic, as is the division of labour practised by the NOVA University Network. In areas where knowledge users are increasingly international within the Nordic area there are especially strong reasons to coordinate research activities in some way. These areas will find new opportunities under a “strong NORIA” scenario but will do reasonably well under a weak one. Pressure on budgets and opportunities to share infrastructure can both encourage cooperation and the creation of common programmes. They also provide ways to increase the amount of competition within these fields, where quality assurance in small national communities can be difficult. The European dimension is not very important for these areas.

Semi-specialist areas

Other areas such as pulp and paper, temperate forest-based biofuels, aspects of the North and West Atlantic fisheries, circumpolar science, Baltic issues and so on are important to parts of the Nordic area as well as to some other countries, but are not necessarily important to a large number of actors worldwide. In some cases, the interest is shared with EU member states; in others it is not. The relevance of a “Nordic opening” strategy to these areas varies.

Where there is clear advantage in building a strong common Nordic position, then Nordic opening would be advantageous. For example, the Nordic users of pulp and paper research have largely internationalised, within the Nordic area and beyond, with a strong interpenetration of the Swedish and Finnish industries. It is not obvious that having three nodes

of research capability – in Trondheim, Stockholm and Helsinki – is the best way to develop knowledge or to support the Nordic innovation system in this area. At present, the incentives to restructure are weak, even if the Swedish STFI has bought the Norwegian Paper and Fibre Research Institute. Industry-led efforts to coordinate the activities of KCL in Helsinki with those of STFI have been constrained by the fact that these two institutes have different types of ownership and operate in different incentive systems. A strong NORIA scenario would generate opportunities to restructure this area that are not available today. Under the current “weak ERA” scenario, there are not enough nodes for European action to be operative. (Germany is active in pulp and paper, and the UK has a small capability – though these have less commonality with the Nordic industry than one would imagine, because these countries use a lot of recycled fibre, while it is more economic to focus on virgin fibre in the Nordic area.) Under a “strong ERA” scenario it is also hard to imagine strong coordinating action being attractive to the European authorities. Globally, the other capabilities in pulp and paper research are in the USA, Canada and Japan. Some sort of network cooperation is feasible (and in fact the research community is so small that informal cooperation works rather well) but the prospects for more active collaboration or sharing funding at the global level seem remote.

Other semi-specialist areas may be contended between the Nordic and the EU level. Already, the Nordic countries are very active in research and other issues across the Baltic area – both via the NMR and (notably in Sweden) at national level. Yet combining the Nordic states with the new EU members in and around the Baltics brings the number of countries involved up to a level where EU actions based on variable geometry are possible, as the BONUS ERA-Net shows. A strong NORIA scenario would allow the Nordic states to build Nordic platforms that embrace or effectively subsidise Baltic participation, and provide a countervailing force to the Europeanising force of the EU. A “strong NORIA, strong ERA” scenario might best serve Nordic interests, if a strong ERA does indeed involve refocusing on federal issues and leaving the member states and regions to handle other questions. Under either strong or weak ERA scenarios, however, a strong NORIA will better serve Nordic interests than a weak one.

As with the Nordic specialist areas, pressure on budgets and opportunities to share infrastructure can both encourage cooperation and the creation of common programmes. They also provide ways to increase the amount of competition within these fields, where quality assurance in small national communities can be difficult.

Large areas of wide international interest

A large number of research areas fall into this category, as much of science and technology is global – especially the more fundamental parts of the research agenda. Nordic researchers need actively to be engaged in the global research communities and therefore to make best of EU and other networking opportunities.

A central argument for ERA is the need to concentrate European research capabilities into fewer, larger groupings in order to compete on a global scale. A weak ERA implies little change from the current fragmented situation. Under this scenario, clustering Nordic capabilities would bring advantage compared with the rest of Europe. Under a strong ERA scenario, failure to cluster resources – whether within the Nordic area or in another configuration – would disadvantage Nordic researchers. This applies both in terms of Nordic researchers' position in the scientific community and in terms of the knowledge infrastructure's ability to interact with industry. Without strong research nodes in the Nordic area, it is difficult to build strong innovation systems that involve local and international companies, so it is especially important to be able to build strength in subjects relevant to Nordic and Nordic-based industry. Nordic cooperation may be especially useful in fields where infrastructure is expensive, as has been demonstrated by the success of the Nordic telescope. A strong NORIA creates opportunities to build Nordic positions irrespective of how ERA develops. There is anecdotal evidence that one of the NoCE centres has already built up enough strength and reputation to alter the competitive dynamics in Framework Programme team building.

Of course, the Nordic area is unlikely to build up strong research nodes in everything. There are fields where an individual Nordic country already competes strongly on the world stage, so that the Nordic community needs to consider whether increasing the size of the Nordic cluster adds value, whether there is scope to create a second Nordic cluster or

whether non-Nordic alliances would better serve the interests of the smaller research communities.

New and emerging fields

Rapidly identifying and investing in emerging fields can be an important source of advantage, both within the research community and in the linkages between research and the wider innovation system. There are many examples where, with hindsight, we can see that slow reactions impede progress. For example, the FUGE functional genomics initiative in Norway was a reaction by the research community to the inability of the Research Council to match the kind of investments being made in other countries. A counter-example is the early recognition and funding of biotechnology in Sweden by the innovation agency, STU, at a time when it was hard to get support from the research councils.

EU funding mechanisms are not nimble, and those involving opening move rather slowly at present, since they constantly confront administrative barriers and the need to negotiate among large numbers of changing partners. This will improve over time. However, the smaller number of partners in the Nordic area and the fact that they already have tight links should mean that the Nordic area can more quickly launch cooperations than the EU – especially once Nordic funders have built experience of opening some initial funding activities. Cooperative mechanisms are of course by no means the only way to tackle new opportunities – often only an individual action can be fast enough. However, the two examples in the last paragraph show that it is useful to have alternative ways around blockages in the funding system. Creating the opportunities to set up open initiatives in a strong NORIA scenario would therefore make the Nordic system more robust under either scenario for ERA.

5.2 Conclusions

Exhibit 11 complements the discussion above by systematically considering six aspects of Nordic actors' performance under the scenarios. Overall, it suggests that Nordic stakeholders do better under a strong than a weak NORIA scenario and that the best possibility is complementarity between a strong NORIA and a strong ERA. In most (but not all) cases, a

strong ERA does not detract from but rather reinforces a strong NORIA. For some actors, the aspects “Infrastructure investments and division of labour in the Nordic area”, “Building Nordic-level platforms” and “Increasing quality in the Nordic region” involve some risk of a fragmented Nordic effort if there is both a strong ERA and a strong NORIA. The aspects “Access to funding opportunities” and “Building global platforms” (as distinct from EU ones) benefit from the expected ability of the Nordic region to act more quickly to establish cooperations and/or mutually open funding programmes than is the case within the EU.

For the narrow Nordic Specialist areas of research and the great bulk of Large General areas it seems more decisive that NORIA is strong than that ERA is. Semi-specialist area stakeholders may do well under either strong scenario, as do the research performing institutions, which would be strengthened both by a strong NORIA and by a strong ERA, but potentially in different ways. The research community – especially its more senior members – also benefit from the combination of strong scenarios.

All of this supposes, first, that our arguments are correct and, second, that people in the various areas and institutions make use of the opportunities provided by ERA and NORIA. However, the clear message is that strengthening NORIA through more collaboration and at least partial opening of programmes in the Nordic area is the winning strategy. It allows the Nordic stakeholders to build stronger positions within, or independently of, ERA.

The worst case is a “weak NORIA, weak ERA” scenario because this limits the opportunities for the Nordic stakeholders to strengthen their positions on either a Nordic or a wider European dimension. It would lead to Nordic disadvantage, fragmentation and weak Nordic negotiating positions within wider coalitions.

Exhibit 11 Under Which Scenarios Will Nordic Stakeholders Perform Best and Worst?

Nordic Actors in:	Infrastructure investment and Nordic division of labour	Access to funding opportunities	Building Nordic-based platforms	Building global platforms	Increasing research quality in the Nordic region	Sustaining Nordic national and common positions
Researchers	N/A					
Universities and Research Institutes						
Research and Innovation Agencies						
Nordic Specialist Fields				N/A		
Semi-specialist Fields						
Large, International Fields						
New and Emerging Fields						

Key: ● Best ○ Medium ○ Worst

6. A Bottom-Up Approach to Mutual Opening of Programmes

This chapter draws conclusions based on the arguments set out in the report and makes a policy proposal. A modest, incremental approach to opening R&D programmes and activities in response to signals about opportunities generated bottom-up has promise for strengthening the Nordic area. The element of co-planning is probably more important than the details of how these common opportunities are funded. However, the “two pillar” Nordic agency system based on NICE and NordForsk lacks the horizontal structures needed to identify and exploit all the opportunities. We therefore propose that the Council of Ministers starts to develop a more holistic approach to research and innovation by creating joint activities between different Councils of Ministers’ spheres and funding the planning of “Nordic Platforms” that can propose specific measures for mutual opening of R&D funding and other cooperation measures among Nordic countries.

6.1 What Do We Mean by “Opening”?

The most radical way to “open” Nordic R&D programmes would simply be to allow citizens from all Nordic countries to apply for funding schemes in the Nordic area, irrespective of where they live and work. We found little or no interest in such an idea among the policymakers and practitioners, with whom we spoke. Rather there was strong opposition to the suggestion from a number. The most vocal of our discussants described it as “political suicide” because it would detach taxpayers from the benefits of policy in a way that would be impossible politically to explain

or justify. It is perhaps worth noting that opening R&D programmes is not so unthinkable in some other systems. The US National Science Foundation of course accepts proposals from all the United States and also provides some funding abroad. Similarly, where US Departments and their agencies fund mission-oriented research, they are comfortable with spending money outside the USA in order to obtain the knowledge they need.

However, the people we interviewed were widely in favour of a way to bring a greater “bottom up” element to bear on stimulating Nordic cooperations. The European level illustrates the potential elements of an approach. The Commission has created two new types of arena for dialogue and policy development that operate across the breadth of the continent: ERA-Nets and Technology Platforms. These both function as *arenas* and unleash the power of *self-organisation* – bringing together interested parties to define and organise the solution of problems. In the same way, it is striking how major calls for proposals for public-private partnerships reveal the pattern of scientific opportunities, industrial problems and needs and nascent networks in an economy. We have been especially struck⁶¹ by the way the call for proposals for the Swedish Competence Centres programme in the mid-1990s allowed NUTEK Teknik to identify and fund a collection of centres that in effect provide a “flash photograph” of what was exciting and interesting in potential university-industry research collaboration in the 1990s that is more detailed and practical than anything that could be created via “top-down” planning.

Preparing a proposal for this type of programme is a major exercise in planning and negotiation, so the proposals also much more reliably represent problems and potential realities than the ideas that can be collected from a conventional call for proposals to individual researchers or companies. Similarly, the ERA-NET and Technology Platform experience emphasises the benefits of common strategic intelligence and planning. Thinking together, as a basis for deciding whether there are common interests and then to address them, is seen by many as the most valuable parts of using these instruments.

⁶¹ Erik Arnold, John Clark and Sophie Bussillet, *Impacts of the Swedish Competence Centres Programme 1995–2004*, VINNOVA Analysis 2004:03, Stockholm: VINNOVA, 2004 (available at www.vinnova.se)

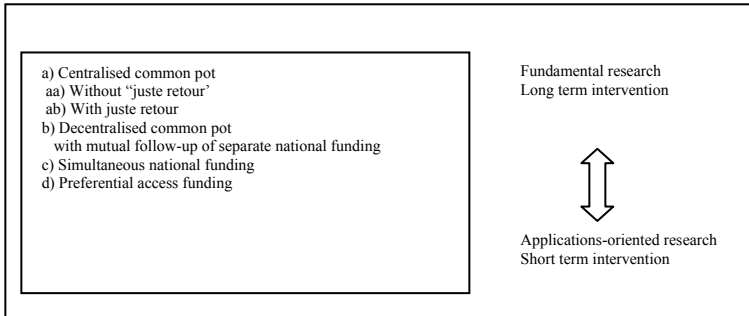
A more modest form of opening therefore seems to make a lot of sense, using

- Joint needs analysis and planning among funders and other stakeholders across the Nordic area, either instigated by the funders (as in ERA-NETs) or by other stakeholders bringing cooperation proposals to the funders
- Where relevant, moving to parallel but separate calls for proposals in Nordic countries, as an outcome of this planning
- Eventually using joint calls for proposals, where these best serve the common interest. These can easily be financed on a “virtual common pot” basis, so that funders fund their own nationals only, or they could eventually lead funders to create real common pots, with no *juste retour*

This will involve moving beyond the individual spheres of research and innovation in the sense of the parts of these activities that fall within the competence of either the education or the industry ministers, in order to adopt the more holistic approach implied by both the innovation systems perspective and by national practices in the Nordic area. The Nordic system will need mechanisms for horizontal coordination across different Ministers’ responsibilities and, preferably, some sort of arena in which policy relevant to research and innovation in the broad can be discussed.

TAFTIE points out that there are several financing models in use for opening programmes (Exhibit 12). The more radical forms involving real common pots are most appropriate for longer-term cooperations that focus on rather fundamental types of research. The view that emerges from our study is that the choice of funding mechanisms can be opportunistic. The most important aspect of opening is the strategic discussion and alignment that results from making plans together.

Exhibit 12 TAFTIE Model of Financing for Inter-Programme Collaboration



Source: TAFTIE (The Association for Technology Implementation in Europe), *Framing Collaboration Models Between National Research and Technological Development Programmes*, 2005 www.taftie.org

In the European instruments, such plans are made by funding agencies (in the ERA-NETs) or industry (in the Technology Platforms). We see no reason to restrict the opportunities to think together in this way. Rather, there are excellent examples – for example in the COST and ESF network collaborations – of researchers planning and proposing international collaborations that are immensely useful and that would not necessarily be funded at national level.⁶² Some useful collaborations focus on infrastructures and institutional change, so we would also expect institutions – including, but not limited to, universities and research institutes – to propose collaborations based on a redefinition of roles and a sharing of responsibilities. The examples we have earlier of the frustrated Nordic agricultural research area and the potential for rationalisation and re-division of labour among the pulp and paper research institutes suggest there is some latent demand for this type of opportunity.

Crucially, we think that our collective inability to predict or plan all such opportunities speaks for a bottom-up, permissive approach to defining potential cooperations, whether based on mutual opening of programmes or on other forms of action. There is therefore a strong case to complement the important existing Nordic cooperation structures with a

⁶² Erik Arnold, Rapela Zaman and Barend van der Meulen *Analysis of the impact of ESF Instruments*, Strasbourg: ESF, 2005 (available at www.esf.org); Juan Rojo (chair) et al, Erik Arnold and Rapela Zaman (secretariat), *Review of COST Domains in the Chemical and Physical Sciences*, Brussels: COST Office, 2004

channel that provides opportunities to plan and bring such ideas for extending the Nordic cooperation to the table.

6.2 The Structure of Nordic Research and Innovation Cooperation

The current implementation of the NORIA White Book is taking the Nordic-level R&D funding system towards a simplified version of the Finnish system (Academy of Finland plus TEKES), with the “two pillars” referred to in the NORIA book. This refreshing simplification of the system is no doubt useful as a first step. However, it re-institutionalises the age-old division between the spheres of the industry and education ministries and is likely to get in the way of the “holistic” innovation systems thinking that has been spreading across the Nordic countries in the last few years.

If we return to the Finnish system again for inspiration, we find it is not a system with two, isolated “pillars” but one where there is constant and increasing dialogue within and between the industry and education spheres, and where there is a joker in the pack: SITRA, which answers to parliament and can intervene wherever the system needs help. Further, Finland’s research and innovation funding system is not a *planned* system with remote and separate “pillars” but one where there is incessant communication and discussion. This is possible because there are both formal and informal *arenas* in which dialogue can happen.

The “two pillars” of Nordic research and innovation cooperation – NICE and NordForsk – are both rather new. There is not enough experience to evaluate the ways in which they pursue their missions, and we do not attempt to do such an evaluation here. In the context of the Innovation Systems heuristic concerning research and innovation policy and the need for holistic approaches to research and innovation policy, it is refreshing to see that the NordForsk strategy includes ambitions to reach beyond the realm of the education ministries and to try to build links to innovation policy at both Nordic and national level.

However, NordForsk and NICE live in different ministry fiefdoms (Education and Industry, respectively). Their links to the grass roots at national level are limited and their links to each other at present seem

largely confined to sharing office space. There is no common governance or coordination channel, and there is no mechanism for the type of horizontal policy coordination among ministries or the individual Councils of Ministers that we described in the section of this report that deals with research and innovation governance at the national level. The Nordic level therefore lacks key *structural* ingredients of good research and innovation governance practice that would be necessary to develop the holistic research and innovation policies, which the Nordic states individually see as crucial to good performance. There is little strategic intelligence available that is structured at the Nordic level, so the ability to assess needs and design interventions is correspondingly restricted. They have poor governance links to non-state stakeholders, especially industry. Crucially, their overall size is very modest – possibly even under-critical for performing a significant international role.

As they stand, these structures do not have the mechanisms or the defined role that would be needed to coordinate the kind of bottom-up cooperation initiatives that historically have resulted in many successful Nordic cooperations and that could in the future create the joint programmes and platforms that will strengthen Nordic actors in the Nordic and international R&D arenas. The problem lies not necessarily within but *between* the two pillars of NORIA. This is why we propose that an extension of the scope of NORIA is necessary. This will work both at strategic and operational levels. Both NICE and NordForsk have recognised the need for Nordic-level strategic intelligence. At present, several of the Nordic national R&D funders have impressive analytical capabilities, but their efforts focus at the national level. A clearer understanding of strategic needs at Nordic level is needed in order to support holistic research and innovation policy. At the operational level, our experience with innovation systems is that an increasing number of measures are needed that go beyond the traditional responsibilities of industry and education ministries. The Nordic level therefore needs mechanism for programming beyond the individual territories of NICE and NordForsk, for example by establishing a Nordic competence centres programme that would involve both industry and education. Under the current structure, these institutions are largely locked into measures that are consistent with the perspectives of individual ministries.

6.3 A Modest Proposal

In our view, the Nordic Council of Ministers – like individual member states – needs to find ways to improve cross-ministry coordination in research and innovation, otherwise Nordic policy will risk being locked in a fragmented form or a form that is irrationally influenced by the prevailing structures of the Council. Further, it needs to be able to respond to emerging opportunities for cooperation – especially those that will build Nordic positions of strength, either to address the needs of the Nordic region directly or to create stronger platforms from which actors in the region can address European and global opportunities.

Experience suggests that it is easier to cooperate in research than in innovation, so it is natural for the research and education ministers to take the initiative and to propose mechanisms that will eventually allow increased cooperation to spill over from research into innovation policy. To a degree, this amounts to extending the perceptions at NordForsk about the need to link research with innovation (and other) policy and giving them an institutional form that goes beyond the world of the education ministers.

Given the novelty of the NICe and NordForsk structures and the fact that these have yet to be evaluated, this is not the time for a further radical restructuring at the Nordic level. The scope of our proposal is therefore modest. But it is important as a first step towards recognising and addressing the need for holistic policy and for structures that can generate such policy. We suggest in the first instance therefore that the Nordic Council of Ministers, and its secretariat should propose mechanisms to do two things

- First, to invite the individual Councils of Ministers into a process of horizontal coordination that can build the needed Nordic-level policy arena
- Second, it should find a way to run a pilot programme to encourage bottom-up initiatives across the whole of the research and innovation area. The pilot programme should initially aim to provide planning funds to 5–10 projects per year, that should result in concrete proposals for new cooperations, including proposals for limited mutual opening of national Nordic programmes.

In this way, the Nordic Council would help stakeholders to build *Nordic platforms* in response to needs identified by stakeholders themselves. Nordic platforms should be intended to have Nordic added value and to involve cross-border opening of funding or sharing of common resources in some way.

Building a Nordic platform has two stages: (1) a planning stage; (2) a funding and operational stage. Some level of Nordic funding should be available for (1) and for bootstrapping (2) initiatives. Some Nordic platforms will evolve into bigger international activities (in Europe and/or in cooperation with other partners, eg USA, China). We could over time envisage a variant – *Nordic Platform Plus* – that explicitly subsidises favoured partners, such as the Baltic States.

The normal Nordic principle of variable geometry should apply: at least 3 Nordic countries should be involved in any Nordic platform. The stakeholders should be self-selecting, acting in their own interests. This means that industry – which is rather absent at the Nordic research policy level – can be involved, and it moves NORIA beyond the current dominance by ministries and agencies. For example, the pulp and paper research institutes might want to consider a Nordic merger, and could use the activity to explore planning alternatives. The Nordic community that studies medieval literature might want to do a foresight exercise about the role of medieval literature in binding together the Nordic culture and go on to plan a unified medieval literature research and dissemination programme across the whole Nordic area. Research and innovation agencies may also want to build Nordic platforms as extensions of their own planning activities. Molecular biologists may want to explore the value of the commonalities in the Scandinavian gene pool in connection with connecting genetics to epidemiology and to build a virtual centre of excellence. We suspect some of the most important platforms will be in areas that are not high priorities at national level but where there is potential to build critical mass.

The key contribution of a “Nordic platform” activity at Nordic level is that it would *enable* self-organisation as a way to identify and cement Nordic value and that it would do this at the Nordic level. The acid test of the relevance of the Nordic level in R&D policy is not whether it can be imposed on reality by five countries sending money to Copenhagen, but whether – given the chance – it reveals itself. To implement this proposal

requires agreement from at least some of the national ministries, research councils and innovation agencies. (It is not clear that every one of them has to be involved.) It further needs an allocation of, perhaps, a handful of millions of kroner per year for three years to pay for the joint planning projects ahead of an early evaluation to determine the usefulness of the scheme.

The principle of research funding across Nordic borders using a common pot and without *juste retour* is already established. Researchers are voting with their feet to support it. This scheme will extend that principle and allow the research and innovation communities themselves to identify where Nordic Strength is to be found, where cooperation and co-funding makes sense at the Nordic level. We would like to see this idea taken up and implemented by the council of Education Ministers and its secretariat.

In short, we believe the Nordic Council of Ministers needs to act along two dimensions in order to continue to build Nordic strength in NORIA. The Council of Ministers reproduces at the Nordic level many of the barriers between Ministers' responsibilities that individual countries in the region have had to overcome in order to adopt more appropriate and holistic policies for the production and use of knowledge. It should therefore tackle these obstacles by creating structures that coordinate among the Ministries' areas of competence and create a policy arena for the Nordic region as a whole. And it needs to put into practice a mechanism, such as the Nordic Platform programme we propose, that attracts ideas and opportunities across all stakeholder groups for increasing Nordic strength in knowledge production and use.

APPENDIX A – Legal and Administrative Issues

Experience with ERA-NETs and some of the Nordic R&D collaborations has shown that a rich variety of legal and administrative obstacles can be proposed to the idea of opening national borders in R&D funding. The only systematic review of barriers in connection with the opening of R&D borders that we have been able to find is a paper⁶³ by Christian Hambro, which explores potential legal and administrative barriers, which can be explored in the main study. That paper and our interviews are the sources for this Appendix.

Hambro points out that the idea of “opening borders” can mean either mutual opening of equivalent schemes by two or more countries or that one country opens a programme to citizens of another country, which does not have an equivalent programme. “Opening” is not necessarily symmetrical. He also points out that experience with opening programmes is limited so that unforeseen problems are likely to arise and concludes that a deliberate effort to understand and learn from these over time is needed.

A1. Legal Obstacles

Some barriers are legal in character.

At the most fundamental level, it is not clear that giving money to beneficiaries outside the individual countries is legally allowable in all cases. Hambro, for example, argues that opening the programmes of the Research Council of Norway to people abroad would require the agreement of parliament. Where there are such barriers, they tend to be defined in the statutes or missions of research councils and agencies, rather than being set out in legislation. Some countries have tackled such barriers by using money from other sources that do not face these constraints. For example, where an agency is only allowed to spend its budget on national beneficiaries, it is possible for the parent ministry to define a separate budget for international cooperation. Sometimes, too, the importance of

⁶³ Christian Hambro, *Åpning av forskningsprogrammer: Juridiske og administrative spørsmål*, notat til Forskningsrådet, 13 sept 2005

this kind of barrier is a matter of interpretation. Many R&D funding agencies are expected to work in the national interest, leaving administrators with a choice as to whether to regard international cooperation as being in the national interest or not.

Some research councils are prevented by statute from “top-down” programming. They are only allowed to respond to proposals from researchers. Like the cases where funding people outside the country appears to be forbidden, it is possible to allocate a separate budget line at ministry level in order to overcome this problem.

Mixing different national legal systems can raise questions about whose laws govern the work of funding agencies and ministries. This needs to be set out in a contract among cooperating funding institutions. Less clear is the extent to which countries can make agreements about whose national audit office would be responsible for auditing the funding. It is harder for applicants to appeal unfavourable decisions or to sue for maladministration in cases where funders work together across borders. Intellectual Property Rights and ethics frameworks can differ among countries. Data protection issues can also arise, where the usual permission for funders to hold the personal data of beneficiaries does not apply to people resident abroad.

A2. Practical and Process Questions

Differences among institutions can cause barriers to cooperation. For example, in some of areas research, equivalent activities may be funded through university block grants, government research institutes or research and innovation agencies. Opening national research funding across borders in such cases can involve overcoming quite difficult barriers, finding fair ways to value and account for the work of people who are funded in incompatible ways and agreeing how to make contracts about the activity. Even where programmes are opened to people working in similar institutions – for example, universities – differences in overhead rules and the treatment of costs can lead to big differences in the costs and prices used to fund them in different countries. Opening programmes can involve either resolving such issues or deciding to live with the differences, despite any inherent unfairness that may be involved.

The way R&D funding is programmed and the life cycle of programmes is a second important source of incompatibility and obstacles. The length of programmes and the period of time for which projects are funded can differ. Some funders are not able to commit funds more than a year forward in time, so that all projects in principle have to be re-approved each financial year, while other funders can sign multi-year contracts. The extent to which funding approvals are delegated to agencies or others from the ministry level also varies internationally. Within the Nordic region agencies generally handle such questions themselves, but decisions are often made by academic committees in the research councils and by civil servants in the innovation agencies. Not all agencies operate with fixed programme budgets, instead responding to changes in demand by altering the balance between different types of projects funded over time. This can complicate the allocation of a fixed budget to open or cooperative activities. There can also be differences in the ways programmes define the subjects that they will fund: by theme, discipline, problem, technology and so on.

Incompatibilities in proposal assessment practices can also be problematic. Some institutions insist that proposals are in English, so that they can be refereed internationally, while others prefer the local language. Times allowed for refereeing and processes for selecting projects may be incompatible, producing a need to align processes (and to make the applicant community aware of any changes) in any common call.

A3. Implications

Both Nordic and ERA-NET experience shows that these kind of barriers can be surmounted, but that that process can be long-winded and frustrating, involving substantial work in every case of cooperation. Clearly, almost any degree of standardisation would reduce the transaction costs of opening R&D programmes. Another way to reduce transaction costs would be for Nordic funders to work together to approve a common set of procedures and processes that would apply in cases where programmes open mutually.

Resumé

De nordiske lande står over for store udfordringer inden for forskning og innovation. Såvel de nordiske erfaringer som erfaringerne inden for EU viser det værdifulde ved samarbejde byggende på de berørte parter egne behov og egen selvorganisering. NORIA kan styrkes med anvendelse af begrænsede omkostninger ved hjælp af en selektiv, gensidig åbning af de nationale forsknings- og udvikling programmer, således at de der finansierer og gennemfører forskning og innovation kan opbygge nordiske platforme. De institutioner, der ville kunne koordinere noget sådant på nordisk plan, er imidlertid utilstrækkelige. Der er behov for at styrke disse vha. en forbedret koordination mellem ministeriernes kompetenceområder og etableringen af en nordisk arena til diskussion og skabelse af nordiske politikker, der er mere helhedsprægede end dem, som Nordisk Ministerråd alt for opsplittede strukturer åbner mulighed for.

De nordiske lande står over for store udfordringer inden for forskning og innovation

På forsknings- og innovationsområdet har miljøet været under gradvis forandring rundt om i de nordiske lande. Mens den gensidige afhængighed mellem innovation og forskning afspejles i de nordiske landes nationale politikker, er der kommet forbløffende få reaktioner politisk og institutionelt på nordisk plan. Videnskaben har i nogen grad været globaliseret gennem mange år. Globaliseringen af andre dele af forsknings- og innovationssystemet er tiltaget hastigt, hvilket fx kan iagttages i de dramatiske forandringer, der har fundet sted i ejerskabet til de store nordisk ejede multinationale selskaber i løbet af de seneste 20 år, flytningen af FoU inden for og ud af Norden og de deraf følgende forandringer i forholdet mellem erhvervslivets og universiteternes forskningssystemer.

Der er ligeledes sket forandringer i den måde, hvorpå den specialiserede forskning og grundforskningen interagerer med samfundet og med økonomien. Vi erkender disse forandringer under overskrifter som »Mode 2 vidensproduktion« og »Triple Helix« og diskuterer den »foranderlige sociale kontrakt mellem videnskaben og samfundet« – hvilket i praksis betyder, at de fleste lande ønsker at se større sociale fordele som resultat af forskningsfinansieringen og ikke længere er indstillet på blot at finansiere forskning og så *håbe* på, at der kommer noget godt ud af det. Vi opfatter nu forsknings- og innovationsverdenen som »innovationssystemer« – et begreb som danske, norske og svenske forskere har været centrale i udviklingen af. Denne innovationssystemsheuristik fortæller os, at alle de aktører, der er indblandet i forskning og innovation, må levere en god præstation og at deres indsats bør være stærkt indbyrdes forbundet. Der findes ikke noget enkelt »politikhåndtag«, som vi kan trække i for at få systemet som helhed til at præstere bedre. Vi har behov for en helhedspræget tilgang. Disse ændringer udgør et delvis paradigmeskift: vi forstår nu verden på en anden måde. Men de synes delvis at afspejle en virkelighed i forandring. De højere uddannelsers eksplosive vækst betyder, at vi skaber og bruger viden i flere dele af samfundet end tidligere. Mens vi har udviklet nye instrumenter på projektforskningsniveauet til at håndtere disse forandringer, påvirker disse kun i ubetydelig grad de strukturer og institutioner, vi bruger inden for forsknings- og innovationspolitikken bortset fra etableringen af samlede forsknings- og innovationsorganer i Island og Norge. Til trods for NORIA-reformen har disse ideer endnu ikke påvirket forsknings- og innovationsstrukturerne på nordisk plan.

Den Europæiske Union har erkendt betydningen af globaliseringen og af at koncentrere sine forsknings- og innovationsressourcer. EU har iværksat en række politikker med henblik på at skabe europæisk kritisk masse og styrke under overskriften European Research Area (ERA). Med dette mål for øje har man sat sig ambitiøse mål, man har ændret den måde, hvorpå politikken udformes, omdefineret sin rolle i forhold til forsknings- og innovationspolitikken på medlemsstatsniveau, og man har omstruktureret sine finansieringsinstrumenter. I modsætning hertil har den nordiske reaktion på globaliseringens enkle aritmetik været passiv. Denne aritmetik tilsiger, at de enkelte lande tæller mindre end før; at dette har en særlig betydning for små lande så som de nordiske, og at skabelsen af og adgangen til kritisk forskningsmasse på mange områder vil udgøre en

afgørende forudsætning for at kunne spille en meningsfyldt, international rolle. Mange af de traditionelle nordiske samarbejdsområder imødekommer disse behov. De nye nordiske Centres of Excellence skaber en kritisk masse, der bidrager til at styrke de nordiske positioner. Men tilvejebringelsen af ressourcer og begejstring for disse nordiske bestræbelser er i dag temmelig begrænsede.

Den overordnede udfordring for de nordiske lande er derfor at gennemføre en »sammenhængende« forsknings- og innovationspolitik, der bygger på individuelle og kollektive stærke sider i en verden, hvor Norden som helhed ellers vil blive marginaliseret. Et aktivt svar vil gøre brug af fælles stærke sider til at opbygge platforme, der styrker nordiske positioner i verden. Et passivt svar vil efterlade det nordiske samarbejde som et halvhjertet forsøg på at løse de nordiske landes særlige problemer. Nordiske fællesaktiviteter er ikke en erstatning for aktiviteter på europæisk plan, men et nødvendigt supplement til at opbygge nordisk styrke i det europæiske samarbejde og derudover.

Et stærkere NORIA er godt for Norden, uanset hvad der sker i Europa

Hidtil har tempoet i gennemførelsen af ERA været lavt. De store ændringer har fundet sted på holdningsområdet. I det store og hele accepterer EU's medlemsstater nu behovet for ERA, og at der er behov for mere samarbejde på det nationale såvel som på europæisk plan i fastlæggelsen af forsknings- og innovationspolitikken. De accepterer endog, at Europa-kommissionen bør spille en rolle i koordinationen af politikken på nationalt niveau. Mens der i marken kun er sket få fremskridt, kan det hævdes, at holdningsændringer er en nødvendig forudsætning for mere radikale politikker, der fokuserer ressourcerne uden at tage hensyn til *juste retour*. Der vil derfor både være tabere og vindere inden for EU's forsknings- og innovationspolitikker. I voksende omfang vil »Mattæus-princippet« (at de rige bliver rigere, og de fattige mister det lidt, de har) komme til at gælde for EU-samarbejdet. Det vil koste de nordiske lande dyrt, hvis de ignorerer denne ændring.

I vor analyse har vi set på, hvad der sandsynligvis ville ske med de nordiske landes interesser under en række forskellige omstændigheder. ERA kan etableres hurtigt eller langsomt (stærk eller svag). NORIA kan udvikle omfanget og arten af forsknings- og innovationssamarbejde i

Norden, opbygge styrken i både nordiskfokuserede og mere internationalt interessante forsknings- og innovationsemner, eller det kan forblive nogenlunde, som det er (stærkt eller svagt). Vi så derfor på alle de fire mulige kombinationer af en stærk eller svag implementering af ERA og NORIA. Vi fandt, at en stærk implementering af NORIA i alle tilfælde skabte den bedste position for de nordiske aktører. Tilsvarende medførte den aktuelle (svage) gennemførelse af NORIA konsekvent suboptimale positioner for de nordiske aktører. Den kombination, der var værst for de fleste, var kombinationen af et svagt NORIA med et svagt ERA.

- De enkelte forskere, og da navnlig dem, der forsker med størst succes, drager tendentielt fordel af enhver stigning i finansieringsmulighederne, og da navnlig den type, der fremmer etableringen af stærkere positioner mht. kritisk masse, fælles udnyttelse af udstyr osv. Deres interesser fremmes bedst ved hjælp af en kombination af et stærkt NORIA og et stærkt ERA.
- Den internationale universitetssektor bliver presset til at specialisere sig og etablere større enheder. Også på dette punkt viser det nordiske samarbejde, hvordan man kan håndtere et sådant pres på sin »hjemmebane«, og et stærkt NORIA ville gøre det lettere at opbygge platforme på et nordisk grundlag.
- På linje med andre steder har de nordiske forskningsinstitutter gennemført omstruktureringer med henblik på at blive større og på at gøre deres kompetencer bredere. NORIAs mekanismer, der gør det lettere for dem at planlægge og samarbejde, vil styrke deres positioner i forhold til konkurrerende nationale systemer, hvoraf nogle er større end hele det samlede nordiske institutsystem.
- Forskningsrådene og innovationsorganerne i Norden samarbejder i forvejen i forskelligt omfang. Flere eksplicite samarbejds mekanismer, helst med en vis finansieringsramme der giver dem mulighed for en bedre fælles planlægning, ville styrke de nordiske positioner og skabe stærkere platforme til håndtering af et bredere, internationalt samarbejde uafhængigt af, om ERA gennemføres stærkt eller svagt.
- De emner og problemstillinger, der er særlige for Norden, blev ikke i væsentlig grad påvirket af ERA, men ville sandsynligvis blive bedre håndteret med et stærkt end med et svagt NORIA. Mulighederne for at

deles om faciliteterne og opnå international kvalitetskontrol styrker sådanne områders position som resultat af »et stærkt NORIA«.

- Emner og problemstillinger som pulp og papir eller miljøet i Østersøen, der er betydningsfulde for Norden og en begrænset række af andre lande i Europa, får ikke nødvendigvis en høj prioritering i EU's programmer eller koordinationsbestræbelser. En stærk nordisk platform på sådanne områder støtter de nordiske interesser og udgør samtidig et godt grundlag for yderligere samarbejde – inden for og uden for EU's strukturer.
- Inden for store emneområder af bred international interesse (genomik, IT osv.) gør et stærkt NORIA det lettere at opnå kritisk masse og at få en stærk stilling i et bredere samarbejde. Nogle af deltagerne i de nye NCoE Centres of Excellence har allerede konstateret, at deres forhandlingsposition inden for de konsortier, der arbejdes under rammeprogrammerne, har ændret sig som følge af den samlede nordiske styrke. Sådanne fordele er ikke altid nødvendige eller tilgængelige, men i de tilfælde hvor de er nyttige, giver en stærk udgave af NORIA de nordiske deltagere de bedste udsigter til at opbygge stærke forskningspositioner.
- På de nye og hurtigt fremvoksende områder ville en styrkelse af de eksisterende forbindelser mellem de nordiske aktører gøre det muligt på en hurtigere og lettere måde at etablere uformelt og formelt samarbejde, hvilket ville fremme skabelsen af nordiske platforme i de tilfælde, hvor dette er relevant.

Såvel de nordiske erfaringer som erfaringerne inden for EU viser det værdifulde ved samarbejde byggende på de berørte parters egne behov og egen selvorganisering

Vellykket nordisk samarbejde tenderer mod at bestå af en blanding af formelt tilrettelagte og selvtilrettelagte aktiviteter. Fx opstod NOVA-samarbejdet mellem landbohøjskolerne, fordi rektorerne erkendte et behov og simpelthen gik i gang. Forsøg på at etablere et bredere landbrugs-samarbejde kørte fast, da man stod over for Nordisk Ministerråds strukturer. Det nordiske energisamarbejde har sine rødder i en tilsvarende udvikling nedefra og op, og det lever i praksis uden for de nordiske strukturers hovedforløb. De nordiske Centres of Excellence, der blev initieret af

NOS-udvalgene, er skabt af forskere, der etablerede forskningsalliancer nedefra og op og dernæst fremsatte forslag over for det nordiske niveau. I mange tilfælde er det en nøglefaktor, at de aktører på græsrodsniveau, som ønsker at samarbejde, har besluttet sig til at gøre det, og dernæst har de søgt støtte på nordisk niveau.

I de seneste år har Europakommissionen fremmet nye strukturer – især ERA-NET og Teknologiplatforme – der går udenom de etablerede programmer og gør brug af selvorganisering til at identificere og organisere de fornødne FoU-aktiviteter samt de tilknyttede aktiviteter. ERA-NET leverer en begrænset sum penge, der gør det muligt for dem, der finansierer forskning og innovation, at udforske de fælles behov, planlægge hvordan de skal gribes an samt begynde at implementere mere åbne metoder til projektf finansiering. De vigtigste lektioner at lære heraf er, at planlægningsdelen skaber de største fordele, og at implementeringen af fælles projektdokumentation og aktioner er bureaukratisk kompliceret, men dog mulig. Dette ville også være lettere, hvis der fandtes faste rutiner.

Teknologiplatformene gør det muligt for et bredt udvalg af interessenter at arbejde sammen om at definere fælles behov og at samle en finansieringsportefølje på grundlag af disse behov. Resultatet er forskelligt fra platform til platform, men tillader tydeligvis, at der opstår konfigurationer, det ville have været vanskeligt at forudse eller konstruere i form af et program.

Disse og andre eksempler hentet i politikken på nationalt niveau viser, hvor god en organisation, der er opstået nedefra og op, er til at identificere og gennemføre et effektivt samarbejde.

NORIA kan styrkes ved anvendelse af begrænsede omkostninger ved hjælp af en selektiv, gensidig åbning af de nationale FoU-programmer til skabelse af nordiske platforme

I princippet kunne de nordiske lande beslutte sig til at gøre deres FoU-finansieringsprogrammer tilgængelige for hinanden ved simpelthen at acceptere finansieringsansøgninger fra personer i alle de nordiske lande. Der er ingen, der for alvor ser dette som en mulighed. Mere realistiske muligheder for at åbne op er at etablere nordiske platforme ved hjælp af:

- Fælles behovsanalyser og planlægning mellem dem, der finansierer og andre interessenter på tværs af de nordiske lande enten på initiativ af financiererne (på linje med ERA-NET) eller ved at andre interessenter fremsætter samarbejdsforslag over for financiererne.
- Parallelle men separate indkaldelser af forslag i de nordiske lande, og som resultat af denne planlægning
- Fælles indkaldelser af forslag. Disse kan let finansieres ved hjælp af en »virtuel fællesfond«, således at financiererne kun finansierer deres egne landsmænd, eller man kunne med tiden få financierer til at oprette fællesfonde uden nogen *juste retour*.
- Variationen i strukturer og ressourcer blandt de nordiske lande betyder, at en sådan åbning må gennemføres med en variabel geometri. Mindst tre nordiske lande skal deltage i hvert enkelt tilfælde, og det bør ikke kræves, at alle fem lande deltager. Der skal stilles et beskedent beløb til rådighed, der kan fungere som »smøremiddel« ved at støtte den fornødne planlægning. Gennemførelsen kan stort set gennemføres på basis af de eksisterende budgetter.

Der findes store juridiske og administrative forskelle samt forskelle mht. til tidsfristerne for indkaldelse af forslag etc. de nordiske lande imellem. Erfaringerne med ERA-NET viser imidlertid, at den form for vanskeligheder kan overvindes. Indhøstningen af erfaring og etableringen af rutiner til håndtering af disse spørgsmål vil medføre en fordel for Norden i sammenligning med andre former for samarbejde internt i EU, hvor geografien er mere ad hoc-præget og partnerskabet varierer fra sag til sag. Et klart signal fra ministrene, om at disse barrierer bør reduceres og styres, ville være en nyttig opmuntring for de berørte organer og ville *de facto* øge deres autonomi ved at give dem ret til at følge internationalt koordinerede såvel som nationale strategier.

Imidlertid er de institutioner, der ville kunne koordinere dette nordiske niveau utilstrækkelige

NordForsk og NICE er de aktuelle institutionelle søjler i det nordiske system til diskussion og gennemførelse af forsknings- og innovationspolitikker på nordisk plan. NordForsk er en meget ny konstruktion og har

endnu ikke fundet sin form, men tegner til at kunne samle forskningsrådene og til at kunne bygge på det arbejde, der er gjort i de eksisterende NOS-udvalg. Men NordForsk og NICE hører hjemme under forskellige ministerielle ressortområder (hhv. undervisning og erhverv). Deres forbindelse til græsrødderne på nationalt niveau er begrænset, og deres indbyrdes forbindelse synes at begrænse sig til, at man har fælles kontorer. Der er ingen fælles styrings- eller koordinationskanal. Det nordiske niveau mangler således de centrale ingredienser på området god forsknings- og innovationsstyringspraksis, som ville være nødvendige for udviklingen af de helhedsprægede forsknings- og innovationspolitikker, som de nordiske lande individuelt ser som afgørende for den vellykkede indsats. Der er ikke megen strategisk viden til rådighed, struktureret på nordisk niveau, hvorfor evnen til at bedømme behovene og tilrettelægge foranstaltningerne er tilsvarende begrænset. De har ringe styringsforbindelser til de ikke-statslige interessenter, her navnlig erhvervslivet. Det er af afgørende betydning, at de har en meget beskedne størrelse – måske endda så lav, at størrelsen bliver kritisk for at de kan spille en signifikant international rolle.

Som de er i øjeblikket, er disse strukturer ikke i besiddelse af de mekanismer eller de definerede roller, der ville kræves for at kunne koordinere den form for samarbejdstiltag nedefra og op, der historisk set har ført til et vellykket nordisk samarbejde, og som i fremtiden kunne skabe de fælles programmer og platforme, der vil styrke den rolle, de nordiske aktører spiller på de nordiske og internationale FoU-arenaer.

De nordiske strukturer må blive bedre til at udvikle helhedsorienterede forsknings- og innovationspolitikker og til at reagere på pres nedefra og op til fordel for samarbejde og åbning af programmer

Regelmæssige møder og etablering af et fælles sekretariat mellem EK-NE og EK-U, hvor man indkalder og finansierer planlægningsinitiativer nedefra og op, ville være et egnet skridt i retning af at muliggøre samarbejde drevet nedefra og op og skabelsen af fælles finansieringsinitiativer på tværs af de eksisterende forsknings- og innovationssfærer.

Den gensidige afhængighed, som findes mellem innovation og forskning, anerkendes bredt inden for de nationale politikker. Det nordiske niveau må, på linje med de enkelte stater, skabe strukturer, der kan hånd-

tere denne virkelighed. Erfaringen tyder på, at det er nemmere at samarbejde inden for forskning end inden for innovation, så det er naturligt, at forsknings- og undervisningsministrene tager initiativet, og at der fremsættes forslag om etablering af mekanismer, der i sidste instans vil åbne mulighed for at forøget samarbejde kan smitte af på innovationspolitikken fra forskningspolitikken. Vi foreslår derfor, at Nordisk Ministerråd og dets sekretariat i første omgang bør stille forslag om mekanismer, der har to formål:

- For det første at opfordre de enkelte ministerråd til at deltage i et forløb med horisontal koordination, der kan etablere den fornødne politikarena på nordisk plan
- For det andet bør der findes en metode til at gennemføre et pilotprogram med henblik på at fremme initiativer nedefra og op på tværs af det samlede forsknings- og innovationsområde. Pilotprogrammet bør til at begynde med sigte mod at yde planlægningsmidler til 5–10 projekter om året, der bør resultere i konkrete forslag om nyt samarbejde, herunder forslag om en begrænset gensidig åbning af de nationale nordiske programmer.

Gennemførelsen af et sådant program kræver accept i det mindste fra nogle af de nationale forskningsråd og innovationsorganer. (Det er ikke klart, at de alle bør være med.) Desuden er der behov for allokering af måske en håndfuld millioner af kroner om året igennem tre år til at dække udgifterne ved de fælles planlægningsprojekter forud for en tidlig evaluering med det formål at bestemme ordningens nyttevirkning.

Princippet om forskningsfinansiering på tværs af de nordiske grænser med anvendelse af en fælles fond og uden *juste retour* er allerede etableret. Forskerne stemmer med fødderne til fordel for det. Denne ordning vil udstrække dette princip og give forsknings- og innovationsgrupperingerne selv mulighed for at finde frem til, hvor den nordiske styrke ligger, hvor samarbejde og medfinansiering er fornuftige på nordisk plan.