

How the Norwegian research system could cope with grand societal and economic challenges

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1. Introduction: Grand Challenges

New constellations of actors are emerging in knowledge, research and innovation systems (KRIS), aiming to address societal and economic challenges. This can be seen as part of ongoing transformations of KRIS. There are broader changes going on in our societies, for example the request by publics to organize research and innovation in a more inclusive manner. Conscious and pro-active KRIS policymakers can draw upon emerging actor constellations, and they can also stimulate and shape new configurations intentionally. In practice, this will often require nudging and modulating what is happening already. Various forms of public-private-societal partnerships are an example of such dynamics.

Grand Challenges induce system transformation - a challenge in itself

This is the context within which so-called Grand (societal) Challenges must be addressed. As we have argued before (Kuhlmann and Rip 2014), Grand Challenges cannot be treated simply as a matter of setting priorities, or as traditional mission-oriented programmes.

Grand Challenges are ambitious, but not in the way the Manhattan project to build the atom bomb or the Apollo project to put a man on the moon were. Those challenges were technical and organisational, and the goal unambiguous. In contrast, grand challenges involve many different players and perspectives. As a result, policy on grand challenges has to cope with contestation, non-linearity and bifurcations. Designing research policy for grand challenges requires a long-term perspective and a broader notion of innovation than is usual. Standard policies tend to be defined and studied in terms of the existing research and innovation system. But that system evolves, sometimes undergoing transformative change. Indeed, the focus on Grand Challenges is itself a driving force of the evolution of research and innovation systems.

Each Grand Challenge has its own characteristics, based on what the various interested parties consider to be the main points of concern and leverage. Understanding each challenge's nature requires strategic intelligence, such as the use of scenarios to explore potential changes.

The transformation of KRIS represents a major challenge in itself: it means reconsidering the roles of science, technology and innovation policy and accommodating a wide range of

viewpoints. We need appropriate tentative policy mixes that facilitate system changes where needed. These mixes may draw on classical priority-setting and implementation approaches, on transformation in science or breakthrough innovation, or on particular varieties of policy instruments. But they will have to focus on system-oriented strategic interventions, tentative and experimental in design, including out-of-the-box approaches such as novel combinations of actors and alliances

The Lund declaration

The term Grand Challenges became used regularly (at least in Europe) after the Lund Declaration in 2009. In December 2015, a revised Lund Declaration was formulated. It noted the impact of the 2009 Declaration, as setting changes in the KRIS in motion, and enhancing ongoing developments. It also developed requirements on the system, and thus on key actors in European KRIS:

- A “clear political commitment to step-up efforts to align strategies, instruments, resource sand actors at national and European level in order to address the grand societal challenges”.
- “an excellent science base, world-class research infrastructures and a new generation of researchers with the right set of skills, notably creativity, entrepreneurship and innovation”.
- “to connect with partners around the world, in advanced, emerging and developing countries”.
- “to address the grand societal challenges in partnership and to attract the world’s best researchers and innovators and private sector investment”.
- “Greater impacts on the challenges have to be achieved through involvement of the public sector and industry in knowledge creation, with a stronger focus on open innovation and the role of end-users”.

These requirements, however well intentioned, are discussed in quite traditional ways, in terms of priorities and funding, so continuing with existing institutions, their roles and division of labour. Achievements, e.g. of research funding agencies, have been considerable, and should be built on. But they are not enough. New constellations of actors and interactions should be explored and exploited.

Concertation

We have introduced the notion of ‘concertation’, the work that goes into eventually achieving concerted efforts (Kuhlmann and Rip 2014). Orchestration by a central actor with some legitimation to do so is only one form of concertation. There are also varieties of more horizontal concertation. One interesting example is the Responsible Care Program of the chemical industry, which addressed the challenge of reducing environmental pollution, at the same time regaining some credibility and thus safeguarding their social licence to operate. (See King and Lenox 2000) In this example, the actors are quite homogeneous (all chemical firms) even if their interests may diverge. For the Grand Challenges, the relevant actors are very heterogeneous, but the principle point is the same, that horizontal concertation is possible and desirable (definitely because it is closer to the actors involved in the actual implementation). Governments and government agencies are still important, but as one of the actors in the concertation.

Open-ended challenges

A further limitation of the requirements proposed in the Lund 2015 Declaration is that they do not address the actual nature of Grand Challenges, which are open-ended and cannot be solved in a linear problem-solution manner because they are about transformative changes at the system level.

Their open-endedness implies that we cannot simply derive what to do from a specification and attendant diagnosis. Not only are there different viewpoints, and contestations (as in climate change), but also learning over time what the challenge is about (this is clear, for example, in the issues of ageing societies). Priority setting will thus be provisional, and should be accompanied by regular evaluation of what has been learned about the Grand Challenge and ongoing transformations.

While existing policy instruments can still be used, and new policy instruments might be developed, for example to involve the public sector and industry (as the Lund 2015 Declaration has it, but we would add civil society), it is also a matter of identifying openings in the system and pursuing them. Then, institutional (and always embedded) entrepreneurs are important (cf. Garud et al 2007). This is a general point about renewal and change, but definitely important to be able to address Grand Challenges.

Assembling a working whole

A further key consideration is that addressing Grand Challenges is more than just coming up with research and innovation based solutions to specific problems. There can be many such contributions, but the key point is how to assemble them into a working whole. This requires other competencies than doing solid research in its own right. In innovation, one can see examples, e.g. when motor car companies become assemblers, and not just of motor cars, but also as mobility providers. Research funding organizations are now occasionally moving in this direction when they cobble together innovation or community oriented programs. While interdisciplinarity is important here, it is not about interaction between disciplines and specialties as such, but about how various contributions can be assembled into a working whole. This can be a competence of individuals, but should also be integrated in institutions in the KRIS.

In this short report to RCN, we cannot be comprehensive. We will first discuss the Norwegian Knowledge, Research and Innovation System and interesting openings for concertation. Then, we focus on the role of RCN as an actor in the system, who is responding as well as possibly taking initiatives. In the conclusion, we tie the various strands together.

2. Constellations and concertation of actors in the Norwegian Knowledge, Research and Innovation System

The Norwegian KRIS is a patchwork: key organisations in the system have their own

mandates and pursue them somewhat independently. There are struggles about who is responsible for what (so “turf struggles”), but this cannot be avoided in the real world. At the same time we see also reinforced and pro-active collaborations, as between Innovation Norway, SIVA and RCN. There is also fragmentation, linked to the role of many different Ministries, pushing their interests in how they intervene in the KRIS. And there are occasional attempts at concertation, one example being the “21 Strategies”. (cf. Norwegian Ministry of Education and Research 2014; Technologirådet 2015).

There is also a general sense of challenges that have to be addressed, on the one hand the Grand Challenges, often of a global character, and on the other hand national challenges of value creation (also in the longer term, for a post-oil Norway) and employment. While their urgency is widely recognized, it is not always easy to address them, partly because there are different views on how to do so. Still, spaces can occur or be created where the challenges can be mutually articulated.

Collaboration arenas

The Long-term plan for research and higher education 2015-2014, submitted to the Storting by the Norwegian Ministry of Education and Research in October 2014, is interesting in this respect. The long-term nature of the plan is intended to provide “opportunities for the business community, academia and the public sector to mobilize for cooperation” (p. 7). Rather than going for top-down coordination, the Long-term plan envisages “collaboration arenas for coordination and implementation” (p. 46).

The “21 Strategies” are one example. These are strategies for research and innovation in a broad sense, tied to sectoral policies, business development and service provision. They are normally initiated by ministries, and prepared by a broad group of stakeholders from business, research and public management (cf. Norwegian Ministry of Education and Research 2014; Teknologirådet 2015). The assessment by the Norwegian Board of Technology (Teknologirådet 2015) was positive overall, but did note that the emphasis on consensus building led to a focus on short-term priorities rather than long-term and cross-sectoral developments.

Openings can be formatted as brainstorming, as for example in the interesting Dream Commitment Process (2014-2015) of Innovation Norway: this process aimed to encourage companies and organisations to think about potential solutions that could help revitalize the Norwegian economy and overall situation without relying on oil and gas industries, and the government had proposed additional support. Still, the challenge is in embedding such openings in a sustainable way in the evolving KRIS. That is why the notion of “collaboration arenas” is promising.

Bottom-up cooperation initiatives

Collaboration arenas also occur bottom-up. One example is Abelia, the business association of Norwegian knowledge- and technology based enterprises, associated with Norway’s largest employers’ organization NHO. Abelia offers services to its members, and it lobbies for their interests, including attempts to influence policy - the classical role of such an

association. But it also facilitates meetings, and can support initiatives of its members. Also, the variety of its members, including the Red Cross, and Science Parks and FFA, the Organisation of Research Institutes, could contribute to addressing Grand Challenges.

Another example, now of concertation through linking-pin actors, through border-spanning simultaneous membership in distinct organizations rather than overall concertation, is the Norwegian Cancer Society. It is broader than a patient association, even if patient support is one of its functions. And its role in mobilizing funding for cancer research evolved into also discussing strategic directions with relevant actors, including universities and RCN, and of course, relevant Ministries, and being part of the 21 Strategy exercise on Health. It is now also part of the Oslo Cancer Cluster. Its flexibility, compared with the institutionalized actors in the knowledge, research and innovation system, allows it to create new linkages. Of course, its activities are predicated on its overall goals of reducing cancer incidence, and improving survival rates and quality of life, but in working towards these goals it also contributes to the evolution of the Norwegian KRIS. Thus, it is an example of the role that active civil society actors can play.

Similar linking-pin concertation can be initiated by other actors, including universities or groups within universities. There are interesting examples from the University of Oslo, including the project “BioVerdi”, aiming at advancing innovation and value creation in all four bio sectors: health, marine, agro and industrial biotech. Fifty central actors within these four sectors have put forth a knowledge strategy as well as a series of recommendations to strengthen Norwegian innovation.

The way forward

Openings in the evolving KRIS are important to allow renewal and learning. Sometimes, openings emerge because of new scientific and technological findings, at other times they emerge due to external changes, like the drop in oil prices.

Mariana Mazzucato’s message at the Lerchendal Conference in February 2016 is pertinent in this respect; falling oil prices can be seen as a crisis, but also create an opportunity to become more concrete about alternatives to oil-income dependency. A key general point we want to draw out of her suggestions is not that states can pick winners, and should be allowed to do so (this is important but will always be precarious, in spite of the success stories that Mazzucato tells), but that state governments are then just one of the (important) actors in a concerted effort, rather than orchestrating everything.

In our scan of the present situation and developments in Norway up until today, we found no dedicated effort led by non-governmental actors like charitable foundations to address the Grand Challenges, as we envisaged in our 2014 Report. But we are witnessing relevant movements in the Norwegian KRIS (openings, *de facto* concertation) that would allow addressing Grand Challenges, not head-on, but as a rider on what was happening anyway. This could become more explicit. The “21 Strategies”, initiated by Ministries, but in some cases with a broader scope, would be another input into the mix.

Rather than being pessimistic because of the absence of dedicated approaches to Grand Challenges, we are optimistic about the potential to work towards them. Still, this

potential has to be realized. That is where an organization like RCN could and should play a role, in a conscious and explicit way.

3. RCN as an active broker for Grand Challenges?

Funding agencies everywhere are adding to their traditional function of dispensing government funding to the research performing actors, by operating on a market of strategic science and pursuing new challenges (see scenario 4, in Rip 2000). Funding agencies need not be exclusively focused on the state as sponsor, and can draw on a variety of funding sources, to become a broker for R&D programmes. This perspective is particularly interesting for Norway because of the dependence of RCN on a variety of government ministries. Other ‘brokering’ actors move on the same market for strategic research, but funding agencies have as their asset that because of the refined and well proven selection processes they can offer a promise of scientific quality. But they should learn to offer packaged products to their customers, and develop new competencies.

Transformation capabilities

To support RCN becoming pro-active, as a broker and more generally as a change agent, relevant capabilities and capacities to “navigate” transformation processes have to be established (see related principles offered by the “Responsibility Navigator”, Kuhlmann et al. 2015). To identify and articulate Grand Challenges there must be some competence in diagnostic and prospective studies (“Strategic Intelligence”, Kuhlmann et al. 1999), and of course competencies in networking, consulting stakeholders, deliberation, moderation of negotiations, and the ability to package and perform.

A specific challenge (and opportunity?) for RCN is its responsibility for both scientific research and innovation stimulation. This is a challenge, because these are located differently in the system, and they have different dynamics of development. So they require different approaches, e.g. nurturing innovation rather than just the traditional approach of selecting from research proposals that are submitted. RCN could pro-actively take responsibility for addressing Grand Challenges (shared with other actors), and there would be a need to identify the kind (or genre) of appropriate research and innovation actions. We already mentioned the importance of “assembling” rather than just sequences of specific research and innovation and their utilization.

Three roles for RCN in addressing grand challenges

Grand Challenges may require a cultural shift in the KRIS (in agendas and how these are set, in ways of working), and concerted action is necessary (cf. Kuhlmann and Rip 2014). The role of research funding agencies like RCN could be in **defining and/or managing the concerted action**, perhaps as a contractor for specific jobs. This will play out in a world where public-private consortia are increasingly important. And for the challenge of Grand Challenges, charitable foundations can and should play a key role, because they are free to move, and tend to go for public interest (Kuhlmann and Rip 2014).

“Assembling” research and innovation inputs is important to address the complexity of Grand Challenges, and this requires competencies of research and innovation actors, as well as organizations like RCN, which are not always in place at the moment. Required competencies could be seen as a further mode of “translational” knowledge production (a sort of macro-level and complex version of translational research as it is practiced in the pharmaceutical world, cf. Rip 2011). They have to be learned, by experience and through considering models, and must be recognized for their importance and rewarded. Economic and social aspects/changes are a key part of addressing Grand Challenge, so social innovation must be included. RCN, with its broad scope, is in a good position to handle the assembling necessary to address Grand Challenges. The four Divisions of RCN could work towards this, directly in the case of Society and Health, and Energy, Resources and Environment, and indirectly in the case of Science, and of Innovation.

In addition, **RCN would create spaces** where various relevant actors would work together on future directions and societal agenda building. (This is recognized already, also concretely when their new location in Lysaker is introduced on their website as allowing better for such meetings.) RCN would enable and stimulate such work, structure it a bit, but not be responsible for the content of the outcome.

RCN could also provide a way to **ensure occasional assessments of how far the work towards Grand Challenges has come**, including a better understanding of the nature of the various Grand Challenges.

Thus, RCN can play a substantial role in addressing Grand Challenges, even if this role cannot be formulated as a dedicated overall mandate.

4. In conclusion: RCN as a reflexive and embedded change agent

We have already indicated what RCN could and should do (in section 3), as part of an evolving Norwegian KRIS (section 2). It can become a change agent, based on its core competencies and position in the system. But it will be embedded in, and thus to some extent constrained by, the system at the same time. (Cf. Garud et al. 2007) Thus, it has to be reflexive about its own situation, not just setting goals and trying to realize them, somehow.

Bridging research and innovation

One challenge is the difference between research worlds and innovation worlds, already inside RCN. Outside, in the wider world, these tensions are visible, but they can be bridged in specific domains. RCN already supports such “bridging” efforts, for example across its divisions. In addition, our argument has been that addressing Grand Challenges requires more than a challenge-orientation of research, and of innovation. It is also about assembling, requires new “translational” competencies.

Excellence vs. challenge-orientation

Another challenge is the contrast construed between an excellence-orientation and a challenge-orientation. Lund 2015 sees excellence as an essential requirement to address Grand Challenges, but if pursued for its own (disciplinary) ends, it will be counterproductive. This problem is compounded by the tendency to present excellence in terms of comparative indicators, rather than the substance of what is excellent. RCN encompasses excellence-orientation as well as challenge-orientation, so is in a position to develop a productive integration of the two. At the level of research performing groups, this happens already (cf. Stokes 1997 on Pasteur's Quadrant). Thus, if there is a contrast it is not about what can actually be done, but about the incentives that are created and how these impinge on the freedom of researchers.

Carving out a new role

This creates a conundrum for RCN: its traditional role is to dispense funding according to criteria, but in its brokering role, it can do more. But in its dispensing-funding role, which is the role research-performing actors in the system expect of RCN, it is limited to work with stipulating criteria, which can then be seen as constraining rather than opening opportunities. Thus, there is an additional challenge for RCN to reposition itself. This is important for its contribution to addressing Grand Challenges, but might be important more generally. The issue of Grand Challenges would then be an occasion for RCN to renew itself (within the constraints it has to work in and sometimes negotiates).

An overall vision is needed

Finally, RCN and the Norwegian networks it moves in have a global dimension. As a small country and KRIS, Norway is surrounded by, embedded in and to some extent driven by larger social and economic developments, in Europe and globally. This is recognized widely, and taken up in concrete interactions of research performers, and occasionally, of agencies. What is lacking perhaps is an overall vision on larger developments, including science and innovation (which goes much deeper than just comparing Norway on various indicators): for which Grand Challenges would Norway claim to become a global forerunner, a leader, or a strong contributor? Of course, such visions and diagnoses can be contended. But any agent aiming to transform the Norwegian KRIS needs to draw on European and global efforts to address Grand Challenges while actively contributing to them.

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