

Siri Brorstad Borlaug and Magnus Gulbrandsen

Centre for technology, innovation and culture

University of Oslo

PO Box 1108, 0317 Oslo

Corresponding author: s.b.borlaug@tik.uio.no

Organisational and institutional challenges and tensions in innovative and excellent research units

Introduction

‘Innovation’ and ‘excellence’ are two buzzwords in today’s research and innovation policy that receive enormous attention from both policymakers and research organisations. Funding schemes with an explicit aim of enhancing excellence and innovation seem to be the new fashion. Rip (2001) contends that we are now in the era of the *strategic science regime* which combines the quest for relevance with the demands for excellence. This quest has amongst others resulted in policies and programmes promoting collaborations that span organisations and institutions (Boardman and Bozeman, 2007) resulting in multi-organisational and institutional research units bringing together participants representing different disciplines and diverse organisations such as universities, industry, and public agencies.

Both ‘excellence’ and ‘innovation’ are fuzzy and ambiguous concepts. The complexities and hidden aspects in the concepts may manifest themselves as tensions *within* research units set up to support both innovation and excellence. Although policy documents and universities’ strategic plans tend to emphasise the many synergies between academic excellence and (potential for) innovation, this seems to be more difficult to achieve in practice resulting in both institutional and organisational challenges and tensions.

The quest for excellence and innovation is clearly articulated in the Nordic countries where funding schemes such as Centres of Excellence and Centre of Excellence and Innovation are popular. These centres intend to foster collaboration that are multidisciplinary and/or multiorganisational, depending on the goal of the centre (Boardman and Corley, 2008). This paper utilises a multiple case study approach, comparing eight research centres located in Sweden and Norway, created with the purpose of excellence or a combination of innovation and excellence, to i) probe the tensions embedded in the endeavour to produce both innovative and excellent research, focusing on the individual researchers attitudes and practices and ii) to analyse organisational challenges in research

units set up to achieve innovation and excellence. We focus on tensions and challenges related to cross-sector collaboration and argue that there are synergies between innovation and excellence but that structures such as the design of the research organisation, and institutions such as works practices and researchers understanding of their role, are inhibiting factors to achieve a fertile combination of these two goals.

Excellence, innovation and multiorganisational collaboration

Neither the concept of excellence nor innovation are new to the researcher society. Among others did Merton in 1973 problematize the concept of excellence, pointing at the difficulties of explaining the concept by emphasising its intangibility. And as early as the 1970s the term innovation had more than 100 definitions in the literature (Zaltman et al. 1973). What is new now is the utilitarian and economic guise of these concept, especially excellence, marked by increased attention and development of financing mechanisms branded as 'Centre of excellence' and 'Centre of excellence and innovation' (Tijssen, 2003).

Both excellence and innovation function as *boundary objects* in today's science policy discourse. Boundary objects are characterised by plasticity in terms of being adaptive to local needs and constraints of several parties and robustness i.e. they maintain a common identity across sites (Star and Giesemer, 1989). They thus create a space where political and cognitive values might coexist. Excellence and innovation are then concepts that both the political and the scientific community can relate to. Moreover, individuals depending on their viewpoint can also connote different meanings and standards to the concepts. In academia a general conception of 'excellence' seems to relate to a fairly traditional form of basic research (Gulbrandsen and Kyvik, 2010, Hollingsworth, 2008). Excellence is further often associated with high quality research, measured as scientific reputation based on peer judgment (see e.g. Lamont, 2009). 'Innovation', on the other hand, is related to research of applied character, linked to such concepts as commercialisation (Hollingsworth, 2008). We can track these interpretations or associations back to early writings on the norms of science (Merton, 1973; Mitroff, 1974), which emphasise how basic and applied research settings often are dominated by conflicting norms and values. Many research organisations will be required to balance tensions such as universalism versus particularism (contribution of research to a specific or limited domain or single actor), communalism (open sharing of results, research feeding into more research) versus private property (often protecting research-based knowledge from general free use), disinterestedness versus personal interests (e.g. through researchers owning shares in patents, spin-off companies and the like) and more.

In spite of these tensions between excellence/basic and innovation/applied, the strategic science regime of Rip (2001) – with its emphasis on perceived synergies between excellence and innovation – finds support in much of the conceptual and empirical literature. Stokes (1997) in particular has made forceful arguments that some of the best research and researchers have been inspired by both practical needs and fundamental contributions to the stock of knowledge, naming this academic mindset after Louis Pasteur. The innovation literature in general has emphasised how (excellent) basic research may fuel innovation or become inspired by it, and that there is no necessary tension between them (Salter and Martin 2001; Balconi et al. 2010). This research further emphasises the role of formal and informal cross-sector collaboration, pinpointing that cross-sector collaboration

enhances and does not necessarily limit the quality of the scientific output or the number of academic publications. For instance, several studies underline that there is a positive relationship between patenting and faculty quality (Geuna and Nesta, 2006, Van Looy et al, 2006), and star academics with high publication and citation rates often have an entrepreneurial orientation, at least in certain disciplines (e.g. Zucker and Darby, 1997). Furthermore, academics with extensive collaboration with industry often have high rates of publications compared to their peers (Larsen 2011).

Other studies of excellent and innovative research environments have found that extra-mural collaborations play a great role for research excellence within nanotechnology and genetics (Heinze et al. 2009). Successful research groups have large collaboration networks and more often link disconnected peers (ibid.). Due to this communication pattern, these scientists publish in a wide range of journals and possess a great variety of perspectives and knowledge which enable them to reach out to different audiences and stakeholders. As such, research groups fuel their research through extensive cross-sector collaboration.

However, researchers engage in cross-sector collaboration only if it complements their research (Perkmann et al 2011) and thus their decision to affiliate with a centre, that is designed for cross-sector collaboration, is a value-laden one (Boardman and Bozeman, 2007). The tendency to engage in cross-sector collaboration is also highly dependent upon the discipline (Perkmann et al 2011). For instance there is a well-known university-industry link in technology disciplines (Gulbrandsen and Smeby 2005) while this is less pronounced and studied in disciplines characterised as 'basic sciences' such as medicine and physics (Perkmann et al 2011, Bozeman and Gaughan, 2007). Thus, researchers' propensity to collaborate with industry will vary depending on the discipline since they are embedded in an institutional work environment that provides powerful incentives to perform according to its norms and values (Merton 1973). Cross-sector collaboration must thus meet the demands of academia and the discipline and result in output valued by the academic (epistemic) community.

There are good reasons to believe that researchers experience tensions between their perceived researcher identity and the overarching goals of for instance innovation. So even though successful research can be both innovative and excellent at the same time, the very notion of 'innovation' and 'excellence' can create tensions for the individual researchers occupying boundary-spanning position – depending on their own researcher identity. Atkinson–Grosjean (2006) has identified researchers' roles in a large government sponsored program aimed at enhancing innovation and excellence in life science as respectively 'settlers' and 'merchants'. The first category describes researchers that conform to the fairly traditional conception of an academic – occupied by undertaking free and basic research, whereas the latter describes the researcher that unites the world of science with industry. Studying the identity of these researchers, Atkinson–Grosjean finds that having a position as a 'settler' in academia is relative unproblematic and tension free, whilst a 'merchant' position is a common source of conflict and resentment. Similarly, Gulbrandsen (2005) find that entrepreneurial academics most often are liminal, i.e. they operate in the boundary between university and industry resulting in buffering processes towards both 'worlds' rather than an insider position.

The researchers' different roles and identities can thus create challenges for cross-sector collaboration that incorporate diverse researcher identities and representatives from other sectors. Furthermore, the character of the relation between the collaborating sectors and structuring factors

also influence the collaboration. Thune and Gulbrandsen (2011) analyse the relation between formal structures and institutionalisation processes. They find that formal structures, such as funding schemes which opt for a centre form, do not necessarily contribute to institutionalise collaboration. Rather, the length of the existing partnerships is a better indicator of institutionalisation. Comparing informal versus formal collaboration Boardman (2009) found that affiliation with both industry related centres and government sponsored centres correlates positively with industry interaction. This implies that researchers collaborate with industry independently of the organisational framework and act on their own conviction. This is not to say that the organisational framework is unimportant, it might also be a facilitator for collaboration, but this entails certain preconditions such as a more institutionally-adept organisation (Kraatz and Block, 2008).

Regarding organisational structure, Corley et al (2006) studying multidisciplinary research centres, found that centres formed on a bottom-up initiative, consolidating different epistemic norms, develop a flat and horizontal organisation structure. Centres formed on a top-down initiative, on the other hand, develop a more formalised organisational structure. This implies that the organisational initiative have consequences for formation of the organisational structure which in turn, one might expect, must affect the rate of collaboration or at least the organisation of collaboration. Other studies have shown that collaboration between industry and academics is often induced with the end of completing rather than initiating new R&D projects (Cohen et al 2002). Thus, cross-sector collaboration formed without already joint research projects will probably encounter barriers that are of both structural and institutional character. However, a strong institutional collaborative environment, e.g. great organisational isomorphism, can result in less diversity among the types and behaviour of the organisations (Hollingsworth, 2008), and this can challenge the end of excellent and innovative research. Yet, assuming that a collaboration embedding different institutional logics such as the one of academia and industry (Gumpert, 2000) will result in a strong institutional environment is probably too far-fetched.

Establishing a new research organisation (centre), which in addition is multi-organisational in character, can be challenging on several levels: e.g. how to organise collaboration with actors from different sectors and how to comply with the demands of the funding agencies. The centres in our study are units of multiple institutional systems (Kraatz and Block, 2008) since they include different sectors such as industry and academia and are to some extent multidisciplinary. The different institutional systems or logics (Gumpert, 2000) are comprised of institutions that are regulative, normative and cultural-cognitive (Scott, 2008). Together with associated activities and resources, these institutions provide stability and meaning to social life and form an institutional framework that 'define the ends and shape the means by which interests are determined and pursued' (Scott, 1991). Actors representing different sectors are thus embedded in different institutional systems or logics and the institutions might contradict in the collaboration efforts. For instance, the ends of industry and academia are often different. They may operate under different conditions which can pose tensions related to for instance problem choice and time-horizons; changes in market-forces often demand a fast solution compared to changes within science. These different conditions might complicate collaboration efforts. However, institutional pluralism can create both challenges and important opportunities. In the latter case institutionally-adept organisations are often able to simultaneously meet the expectations imposed by various institutional spheres in which they operate (Kraatz and Block, 2008), since they can make use of different identities in different settings. And because tensions are built into a pluralistic organisation, especially the cultural-cognitive dimension

of institutions, this might either create tensions that have positive consequences such as an innovative output or structural tensions which can complicate collaboration and communications between the representatives.

Formal cross-sector collaboration in academia is often initiated due to new policies and financing schemes. The design of the policies and financing schemes can force the organisation, such as the university, to sometimes incorporate new practises and procedures. This can pressure existing institutions which then may come into contradictions (Meyer and Rowan, 1977). If so, organisations can employ different coping strategies in order to avoid the internalisations of the directives. For instance the policies and programmes can function as powerful myths which in turn create an opportunity for the organisation to adopt them ceremonially (ibid.). This implies that the organisation on the surface conveys to the regulative institutions in order to create legitimacy, but in practice they continue as before. Thus Centres that are not institutionally-adept and created for the purpose of meeting the call of the financing schemes may experience both institutional and structural challenges and tensions.

Methodology and context

Studies on university-industry collaboration often focus on the university or the department as the analytical level (Bozeman and Gaughan 2007), disguising the fact that there are differences between the individual researchers peopling the departments and disciplines. For instance, Colyvas (2007) found that researchers within the same department had multiple behaviours and practices with regards to commercialisation of scientific results. Assuming that this also holds for centres even though they are composed of researchers from different departments and are problem-driven rather than discipline driven, we have employed a multiple case study approach and interviewed researchers affiliated with Centres of Excellence and Centres of Excellence and Innovation in Sweden and Norway.

Increased interaction between universities and industry has been on both Norway's and Sweden's research policy agenda for a long time, yet with a significant increase in the number of formal support mechanisms for interaction the last couple of decades. The Centre of Excellence and Innovation scheme was introduced in Sweden in 1995, while Norway emulated this scheme in 2005. The strong applied research institute sector in Norway (e.g. doing contract work for industry) could explain why the need for such linkage mechanisms was stronger in Sweden. The Centres of Excellence scheme was launched in 2002 in Norway and an equivalent in Sweden is the Linneus Grant established in 2005. It should, however, be noted that Sweden has prioritised concentration of resources for at least a couple of decades.

Centres of Excellence and Innovation are ideal representatives of the pluralistic organisation. They incorporate diverse sectors in which representatives are embedded in different institutional work-environments. However, the core of the organisation rests within the academic environment since the universities function as the host of the centres. Thus the centres are legitimated first and foremost in the academic environment. Centres of Excellence represent also to some extent this sort of organisation as the majority incorporates different disciplines (epistemic communities) and have extended collaboration with other sectors. However, they have fewer stakeholders to report to.

A multiple case study approach often means aiming for analytic generalisability through ensuring a certain variation among the cases along important dimensions (Creswell, 2007). In our investigation the country dimension is one example, the type of funding support (excellence/ Excellence and Innovation) another, and all centres represent to some extent different disciplines. A central country dimension is the professors' privilege. Sweden has kept this whilst Norway in 2003 transferred the rights of exploration of research results from the researchers to the universities. Furthermore, a comparison between the funding schemes Centres of Excellence and Centres of Excellence and Innovation allows us to explore the informal/formal dimension.

The Centres of Excellence and Innovation are contractually bound to collaborate with other sectors – firms and/or public agencies, and these collaborators have to provide matching funding in the centres. The composition of the funding schemes in Norway and Sweden differ on the size of the demand of matching fund: Sweden 74 percent, Norway 50 percent. The Centres of Excellence are encouraged to collaborate with other sectors, but not obliged. Thus the formal/informal dimension is one of the main variables. Other selection criteria of centres are; their duration¹ – all have at been operative for at least one year to ensure that they are relatively well organised and that they have had the chance to produce some output or outcomes; size - they are neither the largest or the smallest centres; type of relation with other sectors - long-term or newly established. The comparison between the different centre types further allows us to probe central tensions and barriers immanent in the science policy norms of excellence and innovation.

We have together eight cases whereof four are Centres of Excellence and four Centres of Excellence and Innovation. All centres are located at one university in Sweden and one in Norway and both universities are the largest and among the oldest in each country and they are multidisciplinary. We have interviewed 3-5 researchers at each centre, in total 33 researchers. This includes all centre leaders and other researchers in central or project leadership positions. They are all, except the centre leader which position is normally financed by the scheme, affiliated with the centres and have their formal employment in other departments. We used a semi-structured interview guide and typical questions posed included: How will you characterise your research? Have you patented or established a start-up as a result of your research? In what ways do the different participating organisations (disciplines) collaborate? The interviews lasted from one to one and a half hours. All interview data was recorded and transcribed. The data was coded and a number of dominant themes were identified from the material. Among these are issues such as characteristics of own research, problem choice, ownership and collaboration practices which influences cross-sector collaboration.

Analysis

We will in this section focus on the tensions and challenges in cross-sector collaboration with the end of excellence and innovation. The tension focus illuminates the challenges that the multi-organisational and –institutional centres face. The first tension is evident in the researchers' characterisation of their own research. This serves as an indicator on how a perception of the

¹ They are funded for 8-10 years

academic profession influences the researchers' modes of reflecting upon their own research and role within the centres. We have also identified three other areas where the tensions are at play and these are; problem choice, organisational practices and the handling of IP R-issues.

Tensions between individual researchers' perception and aim of funding mechanism

We asked all informants how they characterize their research, i.e. basic, applied, fundamental or other characteristics and the result reveal that their perception of own research does not depend upon their centre affiliation. The majority of the researchers affiliated with Centres of Excellence emphasized the importance of basic research, given the mandate of the centre. The main message was that research should be free of constraints and exogenous demands and entail high quality. One centre leader's response was illustrative: "We will decide our own agenda and we do not do contract research. I do not find that appealing." A project leader in another centre said, "What we do in the centre should be basic research. We do not take on contracts and especially not confidential ones". Hence, for these researchers excellence is equal to basic research, similar to the findings of Kyvik and Gulbrandsen (2010). Nevertheless, several researchers also underlined that the research should, in the end, "have relevance". Some already had established cross-sector contacts whilst others uttered a positive attitude towards collaboration. The contacts were often individual in character – only in one case were several of the affiliates involved in a collaboration project. For some researchers this collaboration took the character of contract research. These researchers emphasized the feedback value to their own research and their role in participating in knowledge dissemination – experiencing few tensions when combining these different institutional logics. Thus, the strong weight given to basic research in the Centres of Excellence creates legitimacy and an autonomous space for the researchers that engage in cross-sector collaboration – seen as a tension free collaboration, not enforced and based on an argument that it enriches the research.

The Centres of Excellence and Innovation are, on the other hand, contractually obliged to collaborate with other sector of which the outcome is expected to be innovative and relevant research. The affiliated informants' responses regarding the characteristics of their research differed first and foremost on the country level. Most of the Norwegian researchers emphasized the basic orientation of their research. One quote by a central researcher in one centre is illustrative: "I have a typical basic researcher's head. (...) My role in the centre is to assure that the academic output holds high quality". Even though he is active in the centre's research he distanced himself from the mandate of the centre sustaining traditional academic values and practices such as basic research and publication in journals. Another researcher which in addition held a position at a research institute noted that: "what gives credibility in academia is "scholarly Excellence and Innovation", at the research institute things are different- we do things that somebody out there is willing to pay for". He indicated that the norms and values within academia create a tension in the perception of what counts in a centre with goals of innovation. However, the centre leaders, whose network had been vital for the establishment of the centres, had a more instrumental perspective on the collaboration. These were typical boundary-spanning actors (Youtie and Shapira, 2008), who juggled the different roles with few problems, having a solid belief in the quality of their own research. Hence, within the same centre, even though the overarching mandate is outspoken, there are pluralistic institutions at

work at the same time represented in the heterogeneous personnel that populate the centres (Kraatz and Block, 2008).

The emphasis on basic research was less evident in Sweden. This might relate to a number of different factors. First, one of the centres represented a relatively new disciplinary field created at the intersection of industry and university. Thus the centre is accustomed to applied work. The other centre of Excellence and Innovation in Sweden is also established within a field that is applied in its research orientation. The two centres in Norway are within established scientific disciplines (mathematics and chemistry) and thus the researchers adhere to an institutional logic emphasising free and basic research. Second, several of the Swedish researchers claimed that the strong applied dimension in the centres was a product of the funding system. One researcher stated; “It is difficult to get money for basic research now. It is easier to obtain funding when industry is involved”. This is also influenced by the fact that the centres in this study have difficulties finding funding opportunities outside of the research council that manage the Centre of Excellence and Innovation scheme. Third, Swedish researchers had greater awareness of the university’s “third mission” and mentioned concepts such as “Triple helix” in the interviews. Cross-sector collaboration is thus apparently more embedded in Swedish researchers’ mindset compared to their Norwegian colleagues – which was actually reflected in nearly all interviews, including those affiliated with Centres of Excellence. Together, these three factors, which are related to the discipline and the overall country specific research system, create different cognitive appraisals of the research.

Challenges in problem choice

Centres of Excellence and Innovation experience tensions with regards to selection of research topics and in developing overarching research questions that can unite stakeholders from academia and industry. Challenges arise expectedly and especially between the demands from the academics and the industry representatives (or other actors) about which research to undertake. One informant emphasised:

One problem in academia is that one is not good in formulating excellent research questions and solve them in a way that functions well in academia and in a applied manner. For industry it is a matter of developing a long-term perspective, if not, the academics can't help them. We will just end up duplicating already existing ideas.

This emphasises the problem of developing and undertaking research that is both excellent and innovative at the same time and not just incremental problem solving. The level of aspiration in the collaboration has to be high and a mutual understanding of the means to reach the centre’s goals must be present. Furthermore, the selection of research questions also depends upon the perception of the character of the research undertaken. There are different degrees of basic and applied research and as one researcher pointed out: ‘If you ask industry my research would be characterised as basic; I think of it as more applied’. These different understandings often create difficulties in reaching an agreement in research projects.

Unlike Centres of Excellence and Innovation, Centres of Excellence are not bound by a contractual agreement to work out joint research questions with representatives from other sectors and thus they can interact on their own terms and conditions. One centre leader underlined this: 'We discuss research questions with industry and if they and we find something common and interesting we kill two birds with one stone'. One of the Centres of Excellence represented in this case study came to life due to a joint project between the university and a company and one of its core research questions was spurred through this collaboration. The centre has long and well-established contacts with large firms. There is however no formal agreement at the centre level and the contacts are at the individual level or project based. Thus some Centres of Excellence combine the quest for excellence with innovation, but this is solely based on the individual researchers' initiative and aspiration. Accordingly, it is more demanding to run a Centre of Excellence and Innovation than one with the aim of 'excellence' only since it is in its mandate to achieve both excellence and innovation. One Centre of Excellence and Innovation leader elaborated, 'This is a Centre of Excellence with an innovation aspect. It is expected to deliver high quality scientific research and at the same time include the innovation component. This is extremely challenging'. Finding research questions which unite two different institutional logics: interesting and fundamental enough for the university researchers and practical enough in the foreseeable future for the firms, is demanding in a Centre of Excellence and Innovation. Some researchers have even resigned from these centres due to the lack of success in this, articulating that a membership in such a centre is unattractive. Such reluctance is not found in the Centres of Excellence which often are perceived as the 'A-team' in the research system. These attitudes emphasise the challenges the structure of the funding mechanisms creates. Thus considering the informal/formal dimension of collaboration, we find that cross-sector collaboration is well established in both centre schemes (Boardman, 2009), but take on different character and dynamics depending on the level of organisation e.g. individual/project-based or centre.

Furthermore, other factors like whether the relation is new or old and whether the collaborating partner performs own R&D appears to be important variables for the collaboration. Old relations are obviously easier to manage since the collaboration is already established. Some centres have collaborating partners that lack in-house R&D and have difficulties to create an understanding for the necessity of a long-term perspective on the research, i.e. eight to ten years - the life span of the centres, when the need of these firms are often immediate solutions to their current problems. One might then wonder why such partners are involved at all. The answer lies in the design of the funding mechanism and the function of the field itself. For instance the Swedish Centre of Excellence and Innovation scheme has high demands to matching funds from external partners; 74 percent, and accordingly the centres need to have, depending on the character of the field, many different partners. One had 21 partners, and according to the centre leader this led to coordinating challenges. It was difficult to get them all involved in the research in the centre. Ideally he would have preferred five large firms keeping close contact with all.

The demand for matching funds in Norway is 50 percent. However, this does not necessarily entail that the involved partners are few, for instance one of the Norwegian centres had 12 different partners. This centre also experienced tensions related to developing fundamental research questions and to secure that the projects were science oriented and not only a supplier of research-based knowledge to the collaborating partners. The leader claimed: 'This is a completely new way of doing the discipline', underlining that they needed some time 'to adjust'. Hence, for these

researchers empirical testing of their own methods is relatively new and rather innovative in itself. As such they had created their own definition of innovation – which among others shows the ambiguity of the concept (Star and Giesemer, 1989). However, tensions regarding lack of involvement from the partners could be a question of maturing – the collaboration climate and the interaction between the researchers and the firms are improving – and it takes time to reach an open and sharing environment.

Collaboration and commercialisation practises

In order to achieve an enhanced focus on innovation, the centres depend upon the firms' involvement in the projects. But to involve the different partners and obtain genuine interest in the research can be rather challenging. The centres are researcher driven which implies that the centre leader and the majority of the project leaders come from academia and not from industry. In most of the centres industry has more or less the role of a contractor and a recipient of research: 'It is usually the firms that get ideas from the researcher instead of the opposite', one centre leader said. Thus the firms have an inactive and unarticulated role in developing and shaping the research, unless the researchers directly study the collaborating firms' IPR. This perception was further reinforced by the fact that most of the interaction between industry and the academics was in the form of workshops or seminars where the researchers communicate their ideas and results to the audience, i.e. traditional academic communication and dissemination patterns. As such academic practises steer the interaction between the different stakeholders in the centres. The very format of the research funding seems to contribute to making the interaction converge on fairly traditional academic norms and practises.

Another side of the coin was the innovative activities that took place in the firms were not connected to the respective academic research environment. One researcher claimed that:

The odd part is that the centre has an innovation price which it hands out to the company members, but to my knowledge the centre has not been actively involved in the innovation. They are preoccupied with publishing.

The quote illustrates that this centre has created an innovation price which is purely ceremonial in character, decoupled from the researchers' practices (Meyer and Rowan, 1977). Through the price the Centre signals the value of innovation, legitimating its position as a Centre of Excellence and Innovation, without taking part in the activity itself.

Incorporating innovation as an academic activity is thus challenging. According to some of the informants academic practices can also be a barrier to develop new research: 'How can we move the research frontier? In academia we are occupied by publishing in journals, participating on conferences and to develop theories', as well as the activities undertaken by the academic organisation: 'In the last evaluation of the university it was a focus on publication and international collaboration, but not on innovation...'. The practices of the university thus signal that innovation is a subordinate goal.

Furthermore, the regulative institutions such as the removal of the professors' privilege function in some centres constitute a barrier to cross-sector collaboration (see also Mowery and Sampat, 2005).

A Norwegian Centre of Excellence and Innovation circumvented the legislation which states that the university owns the research results. They did this because they carried out research on the firms' core business areas protected by their IPR. The academic representatives were satisfied with this arrangement as illustrated by one researcher: 'We do research on the firms' IPR and core business. It is clear that some of this will not be published, however most of what we do gets published and we acquire new knowledge which we use in other research –so no problem!' Yet, there were challenges related to secrecy within the different projects and results that are not included in the IPR agreement. This caused some extra rounds of negotiations.

In the Swedish case IPR had through the funding agency been transferred to the university, i.e. the Norwegian model rather than the Swedish one. This turned out to be problematic for the researchers at the centre. They were set up with intermediary support actors which according to them lacked the commercialising competence and the resources to go through with a patent application. The result was that the contract with the funding agency was renegotiated, the researchers came to own the IPR themselves and their industry partners had the first right of refusal. Accordingly, the IPR that belongs to the university creates tension not only between the partners but also between the university researchers and the university and this may result in special arrangements that bypass national regulations.

Moreover, commercialisation practises in the centres were highly individual –even in Centres of Excellence and Innovation where this is one of the outspoken goals of the funding mechanism. Two of the centre leaders (one Norwegian, one Swedish) declared that patenting was not interesting and that these types of activities were not emphasised in the centre. 'Our solutions are more incremental and it is the firms that commercialise them. As a leader I have not weighted patenting as important. The processes are so long and the projects are short'. However, other members of the same centres were actively involved in patenting processes or had established their own firm. Thus the centres contain a dissonance between the different members and this creates a tension with regards to how the centre is managed and which types of activities that are emphasised. Furthermore, leaders of Centres of Excellence in both countries also held a similar attitude. They were indifferent towards IPR matters whereas other members were engaged in commercialisation projects and tempted by the idea of patenting. But, as they emphasised –patenting is really resource demanding both in terms of time and money. Others recognised the commercial potential of their own research but were more reluctant. One Swedish researcher claimed that: '...industry is very much into that but in my view it is very much a loss of freedom; freedom of questions so to speak'. Together this shows that the centres do not operate as one unit and the centre manager's perception is not necessarily decisive for activities related to commercialisation of research. Not surprisingly, the individual researchers are rather autonomous in their behaviour.

Discussion and conclusion

The results presented above reveal that there are several challenges related to new multi-organisational and –institutional research units with ambiguous objectives such as innovation and excellence. In this paper we are primarily occupied by the tensions the very notion of ‘excellence’ and ‘innovation’ cause for the individual researchers and the organisational unit, and the challenges organisations that operate in pluralistic institutional environments face.

The organisations’ overall objective, e.g. excellence or a combination of excellence and innovation is one tension filled dimension. This is evident in the researchers’ perception of their own research and role in the centres. We found that researchers in boundary spanning roles (Youtie and Shapira, 2008) and academics sustaining the traditional narrative of an academic (Atkinson-Grosjean, 2006) were present in both centre forms. Adhering to the role of a ‘traditional academic’, embracing the established academic norms and practices, is a relative tension free position in both centre forms. However, taking on the identity of a boundary spanner has two different outcomes depending on affiliation with a Centre of Excellence and Innovation or Centre of Excellence. A boundary spanner in a Centre of Excellence enjoys the brand of being an ‘excellent’ researcher. Accordingly, he/she can pursue whatever opportunities he/she finds interesting under the excellence alibi, and thus these researchers experienced few tensions in their quest for commercialising scientific findings and in pursuing cross-sector collaboration. Conversely, a boundary spanner in a Centre of Excellence and Innovation operates under different conditions in which the programme dictates to some extent the means and ends of the collaboration. Thus, even though the researchers’ perform the same activities and practices, the overarching organisational form and end impose tensions. Judging from the academics’ perception then, innovation and excellence are non conflicting ends in centres working within a purely academic organisational framework, while it is more tension filled in units specifically designed for the purpose of combing these two ends.

Conversely, the individual researchers’ perception of their own research and role in the organisation can pose challenges in making the centres institutionally adept. We saw that researchers embraced the identity and role of the traditional academic in both centre forms, distancing themselves from activities such as commercialisation of science. Moreover, some also kept the collaborating partners on arms length arguing for their own scientific role in the centre. Remembering that researchers’ choice to affiliate with a centre is a value-laden one (Boardman and Bozeman, 2007) and that they engage in cross-sector collaboration if it complements their research (Perkmann et al 2011), these researchers’ choice to affiliate with centres which are explicitly designed to enhance cross-sector collaboration is to some extent an antagonism. Their attitudes may create dissonance and tensions in the efforts of creating a collaborative work environment aspiring for innovative outputs, thus complicating the institutionalisation process.

Centres established on existing partnerships between industry and university are more institutionally adept organisations (Thune and Gulbrandsen, 2011). This is especially evident in issues related to problem choice. Tensions in problem choice were particularly pronounced in centres where the partners were loosely coupled with the academic group. In these centres the cross-sector collaboration was established on the background of the funding scheme, thus the relations are relative unripe at least in terms of developing common research projects with means and ends. A bottom-up process characterises the more successful collaborations, with long-term relations and common R&D projects and interests, and the partners had in-house R&D. In these centres innovation was an obtainable goal and the challenge was to develop projects that inspire the academics in the

centre. Furthermore the firms had assets which were imperative for the scientific work. This was also the case for the Centres of Excellence that had relations with industry. Thus the character of the partnership with the other sector and a common understanding for the importance of the scientific content are important variables in developing a well functioning collaboration. Yet, even unripe collaborations might be ripe after some years, but then time is spent on developing a collaborative work environment instead of producing excellent and innovative research, which might be rather unproductive given the limited lifespan of the centres.

One important finding in this study is that the financing mechanisms themselves constitute a barrier to achieve a well operating centre. The design of the funding scheme and the demand for external matching fund forces some centres established in fields where firms have little in-house R&D to involve as many partners as possible. Obviously this results in collaboration challenges that are both of a practical and institutional character. It is not feasible to involve all partners at all times and thus some are only partners in the name and not in practice.

Another factor that functions as a barrier to institutionalise collaboration is the communication pattern in the centre. The centres that had difficulties involving their partners employed communication channels based on traditional academic practices such as workshops and seminars where the researchers communicate or 'lecture' the findings, ideas etc. Thus it could be that it is the firms that first and foremost are experiencing the tensions between excellence and innovation since they get pulled into these new funding mechanisms with weakly pronounced interest and few actual opportunities for influencing the research agenda. Further research is needed on this subject.

Moreover, whereas research on collaborating firms' IPR seems to be fertile for institutionalising cross-sector collaboration, regulative institutions, such as national IP legislation, appear to have the opposite effect on the centres and their affiliates. National IP legislation that grants the university the right to explore the results was omitted in centres where this was a source of tension – this happened in both countries. The individual researchers were also indifferent towards the legislation. Nevertheless, a well-developed IP-agreement between the parties is important for the collaboration, but it is the interference of the university as an owner of the results which is perceived as negative. This supports other studies of the effects of the Bayh-Dole Act (see for instance Mowery and Sampat, 2005).

Taken together we find that there are synergies between excellence and innovation, independently of centre form, in centres where cross-sector collaboration was established in front of the centre formation. In centres where collaboration has turned out to be challenging, the explanations are both organisational and institutional. Organisational challenges are first and foremost related to that firms in certain sectors are too small, leading to several collaboration partners that are difficult to coordinate and engage in collaborative research. The design of the funding schemes seems to be one of the main reasons for these difficulties. Adhering to the institutional challenges, several of the firms have low in house R&D activities thus lacking an understanding for the need of scientific research questions with a long-term perspective. Furthermore, the centres are run by academics - resulting in traditional academic work practises where the academics are in the front seat and the firms in the rear. And the old academic institutional logic of basic and free research is still vibrant and poses challenges for cross-sector collaboration.

Our findings have implications for policymakers and the design of programmes aiming at enhanced collaboration between university and industry or public agencies. Opting for a high share of matching funds can result in structural and institutional challenges if the partners are not already engaged in R&D projects conflating with the centres intensions and ends. The university is probably not the right partner for firms with low R&D capacity. To be continued....

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