Universities, User-Driven Competence Centres And Intellectual Property

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Introduction

For more than 30 years, a growing body of research has evolved that suggests university-based science has undergone substantial change. For instance, the Triple Helix of university-industry-government relations (Etzkowitz & Leydesdorff, 1998; 2000; Etzkowitz *et al.*, 2000) offers a prominent perspective on these developments. It suggests that tri-lateral networks between actors in science, industry and government are growing, and the boundaries between the three spheres are becoming increasingly blurred. According to Etzkowitz and Leydesdorff (2000: p. 111), the Triple Helix is concerned with "generating a knowledge infrastructure in terms of overlapping institutional spheres, with each taking the role of the other and with hybrid organizations emerging at the interfaces."

While research has dealt with tri-lateral networks, far less work has been concerned with "hybrid organisations" at the touch points (see *e.g.* Howells, 2006). More recently, work has pointed to the rise of user-driven centres of excellence (Meyer *et al.*, 2018). Policy interventions have aimed to produce knowledge that combines both relevance and scientific excellence (Rip, 2004; Hessels & van Lente, 2009). The rise of "centres for excellence and relevance," "collaborative research centres," or "centres of competence" can be taken as indicators for this new landscape and the beginning of institutionalisation, or rather "formalisation," of innovation-directed collaborative research (Rip, 2004; Thune & Gulbrandsen, 2011; Turpin & Fernández-Esquinas, 2011).

In this paper, we explore these new forms of intermediaries that can be considered "Triple Helix born" organisations as they have been specifically created to operate at the intersection of academia, business and government as implied by the Triple Helix construct and we examine what appropriate arrangements of managing IP would look like for them.

Those centres are truly "Triple Helix born;" they bring together academic and business research(ers) in structures co-funded with public money with the explicit mission engage in user driven Triple Helix activities. In this sense, they differ from purely academic settings that engage with industry on specific (bilateral) project bases. So, instead of engaging in traditional knowledge transfer, the centres focus on user-driven co-creation between academia and business in the context of a dedicated structure.

Universities occupy a special place in this context. Academic inquiry is a process that places business schools and universities at the plexus between advancing and sharing business and management theory, learning, teaching and professional practice. As such knowledge creation and/or discovery, or its dissemination and application via the scholarship of application, integration and to and for teaching, are widely recognized as the foundation for economic growth, social development and enabling national competitiveness (*UK White Paper Industrial Strategy 2017*).

Universities, given their historic and present status in societies, are said to be the longest surviving of institutions, after the Roman Catholic Church. While there is continuity from medieval universities, the secular universities of the 17th and 18th centuries, research universities after 1870, and the present mass education universities, it is clear that the history of the university is marked by contextual transformations and this state of flux has at times has questioned and challenged the purpose and value of universities and by extrapolation, what is the core of being a university in this postmodern world—teaching, research, enterprise, *etc.?*

O'Reilly and Tushman (2007) recognise that business schools and practitioners might "forge relations that foster virtuous cycles of knowing and doing" (p. 771). Concerns as to whether organizational and management research is of value and relevance to the business community still remain today (Pfeffer, 1993; 1995; 2007; 2009; Ghoshal, 2005; Spencer, 2001; Hodgkinson, 2001; Hodgkinson *et al*. 2009; Keiser and Leiner, 2009; Markides, 2011) and a growing gap appears to exists between researchers "doing" research for its own sake and researchers doing research to help others to use research to solve current problems and inform solutions for future management problems (Zollo, 2009), such as managing and or capitalising on intellectual property or management education (Pearce and Huang, 2012) or to inform teaching.

As such the role of the university, still remains the same, namely, to:

- Generate knowledge (research)
- Transfer knowledge (education & consulting)
- Disseminate knowledge (publishing)
- Apply knowledge (development & realisation and societal betterment)

Universities therefore are to remain central and critical players in Triple Helix born organisations.

User-driven Competence Centres and Networks

User-driven competence centres are often located in what analysts characterise as "use-inspired basic research" (see upper right quadrant in Figure 1). They are pre-competitive arrangements but with a view towards potential applications. Etzkowitz's (2008) work allows us to explore the dimensions in which such a hybrid, Triple Helix born, organisation operates. He distinguishes three dimensions, or spaces:

(1) Knowledge spaces, which focus on collaborations of different actors aiming at improving local conditions for innovation by concentrating related R&D activities and other relevant operations;

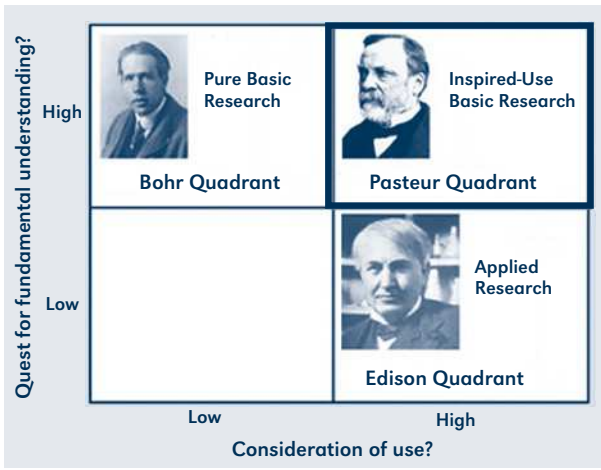
(2) Consensus spaces, that create ideas and strategies in a "triple helix" of multiple reciprocal relationships among institutional sectors (academic, public, private);

(3) Innovation spaces, which realise the goals articulated in the previous phase, establishing and/or attracting venture capital.

Knowledge Spaces: Concentration of R&D Activities and Resources

Knowledge generation spaces, so far often organised as (uni-

Figure 1: Use Inspired Basic Research (Pasteurs' Quadrant)



Source: Adapted from Stokes (1997; p73), graphics in Curry (2015).

versity-based) centres (or units), bring together several research groups around a shared theme for a number of reasons: (i) attracting a greater amount of funding than any single group could, (ii) building or acquiring a new facility/infrastructure, and (iii) undertaking larger-scale and more long-term projects (Etzkowitz & Kemelgor, 1998; Etzkowitz, 2008). Within the Triple Helix context, centres need to be sufficiently broad to generate interest beyond their immediate research agendas and ensure they are socially relevant. Topical breadth and relevance as well as sufficiently sizeable funding bases required to build a variety of activities will therefore be key descriptors for Triple Helix organisations.

Consensus Spaces: Strategic Research Planning and Governance

Consensus space can be considered a neutral ground where actors from different organisational backgrounds and perspectives can come together to "generate and gain acceptability and support for new ideas… consensus spaces transform knowledge spaces from potential to actual sources of economic and social development" (Etzkowitz, 2008: 78). Consensus spaces are the place for strategy review and formulation where actors from different strands of the Triple Helix are brought together with the potential to converge. This consensus space can be associated with a number of intermediary roles and functions, such as foresight/forecasting, environmental scanning, knowledge processing, articulation of user needs and requirements, gatekeeping and brokering, strategy making, etc. (Howells 2006). They address a central concern with research and innovation environments, which is to ensure that activities are user-relevant. "Users" are often equated with "industry," but they may also be the benefactors from what industry does. Arguably, a feature of Triple Helix born organisations could be the strong influence of industry and users on their boards and throughout their governance, defining and setting the research agenda.

Innovation Spaces: Innovation and Intermediation Functions

Innovation spaces are novel organisational mechanisms that are concerned with realising the goals identified in strategies developed in the consensus space (Etzkowitz, 2008). The Triple Helix framework conceptualises innovation as a multi-layered process integrating linear, reverse linear and non-linear processes into a complex adaptive web of relationships and interactions, which is reflected in a broad range of intermediation functions. Table 1 summarises some of these functions based on Howells's (2006) earlier work, such as testing and validation, accreditation, regulation, protecting the results, commercialisation of the outcomes.

A user-driven, Triple Helix focused competence centre should arguably be able to facilitate and open up a broad range of these functions to its members or partners, whether this occurs in-house or through networks.[1] All in all, one can summarise that an effective user-driven innovation environment would broadly encompass the following characteristics and features (Grant *et al*., 2014; Meyer *et al*., 2018):

- Being set up as a legal and independent entity,
- Integrating a large, possibly cluster-level or technology-focused network,
- Consensus building by defining a research and innovation agenda for its area,
- Driving change and collaboration by defining and implementing large-scale research programmes,
- Acting as a hub for intermediary and innovation activities, covering most if not all of them.

What do These Organisations Look Like in Practice?

We carried out a survey of user-driven competence centres across a range of countries to explore how centres operate in practice (Meyer *et al*., 2018). More specifically, we looked at centres in four countries as empirical cases for this specific study (comparable initiatives can now be found in other countries as well):[2]

1. The *Swedish VINN Excellence Centres:* they comprise a group of 20 multi-disciplinary collaborative research centres, typically involving 5-10 members that are located within an active research environment, normally a university, and led by an academic with a mission to deliver research that will yield

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1. Certain universities have put frameworks in place that address these issues as part of larger networks and systems of collaboration (see Debackere, 2000; Martinelli et al., 2008; Mathieu et al., 2008; van Looy et al., 2003).

Table 1. Innovation Spaces - Innovation Functions

Type	Function
Testing and Validation	(a) Testing, diagnostics, analysis and inspection (b) Prototyping and pilot facilities (c) Scale-up including manufacturing modeling to overcome bottlenecks (d) Validation, *e.g.* of analytic methods (e) Training, joint training in use of new technologies
Accreditation	(a) Specification setter or providing standards advice (b) Formal standards setting and verification (c) Voluntary and *de facto* standards setter
Validation and Regulation	(a) Regulation (b) Self-regulation (c) Informal regulation and arbitration (for example, between consumers and producers)
Protecting the Results	(a) Intellectual property (IP) rights advice (b) IP management for clients
Commercialisation	(a) Market research and business planning (b) Sales network and selling (c) Finding potential capital funding and organising funding or offerings/early stage capital (d) Venture capital (e) Initial Public Offering
Evaluation of Outcomes	(a) Technology assessment (b) Technology evaluation

new knowledge and technology in the form of products, processes and services. The centres are financed by VINNOVA, the country's innovation agency, and are industry co-funded. The annual support available for all centres is EUR 20 million.

2. The *Norwegian Centres for Research-based Innovation (CRI)*: they comprise 14 centres. Collectively they receive EUR 17.5 million of public funding annually. These CRIs focus on facilitating active alliances, developing industrially-oriented research groups, and encouraging enterprises to innovate by placing stronger emphasis on long-term research. They also incorporate a training and technology transfer function. The CRI centres seek to strike a balance between industry and academic interests.
3. The *Canadian Business-led Networks of Centres of Excellence (BL-NCE)*: they comprise four large-scale, collaborative networks, led by private sector consortia, with a mission to generate new technologies and products that produce knowledge economy jobs. BL-NCEs have a broad outlook, with a comparatively large funding base at EUR 1.7–2.5 million per Centre per year. The Canadian BL-NCE concept represents a further, downstream development of the generally successful, more research oriented and academic led Networks of Centres of Excellence (NCE) programme.
4. The *Finnish Strategic Centres for Science, Technology and Innovation (SHOK)*: they comprise six very large centres, organised as non-profit, limited liability companies, with often more than 30 shareholders and 100 programme and project associated partners. The SHOKs cover entire clusters and industrial sectors. Launched in 2009-10, with a mission to enable industrial renewal and generate breakthrough innovations, SHOKs are a collaborative venture between the Ministry of Employment and Economy (MEE), the Finnish Funding Agency for Technology and Innovation (Tekes), the Academy of Finland, and the Confederation of Finnish Industries (EK). Further, key players are industry representatives who take the lead in defining the strategic research agenda for each SHOK. The Centres receive a total of EUR 50 million funding per year and can develop and run cluster- and industry-level research, development and innovation programmes.

Table 2 presents a summary of how the centres relate to the key dimensions of intermediary activity and engagement.

In terms of knowledge spaces, the focus of the centres varies from setting the research agenda for an entire cluster or industry to performing rather specific research activities. In one instance (the Finnish SHOKs), the centres have received delegated responsibility to develop and administer innovation programmes. In terms of consensus spaces, the centres differ considerably in their organisational set-up (from university-hosted to being incorporated as a limited liability company), the role and involvement of industry users as well as the extent to which they cover intermediary functions. Functions with respect to innovation spaces are also addressed to varying extent.

The *Swedish VINN Excellence Centres* have proven to be successful academic-led research environments achieving a high degree of industry impact (see the recent evaluation by Reeve *et al*, 2009). Even though relatively small in size, they have reached critical mass in specific, well-defined areas. Many of them could build on the solid university-industry networks of competence centres that were established in the 1990s (Arnold *et al*., 2004; Knee & Meyer, 2007). An interim evaluation of the VINN Excellence Centres (Reeve *et al*, 2009) highlights their successes in "creating effective partnerships between universities and industry" (Reeve *et al*, p. 10). While these centres have been particularly successful in involving large corporations as partners, stakeholders have felt that some centres could extend their reach to a larger number and range of interests from companies, including smaller companies (ibid.). With respect to innovation spaces, the evaluators highlighted the need for policy stakeholders to "provide significant input to the process of resolving centre IPR [Intellectual Property Rights] issues." Even though pre-competitive in nature, IPR issues were seen as a major challenge for a range of the involved partners in the centres.

The larger *Norwegian CRIs* have a remit that focuses explicit-

2. The selected countries feature 'centres by design' as well as more organically developing centres. In some instances, policy stakeholders referred to notions developed in the science and technology policy literature (incl. 'Triple Helix', 'Pasteur's Quadrant', or 'Innovation System') when positioning the centres (see also Meyer et al., 2018).

Table 2. CRCs And Their Research Governance And Intermediary Innovation Functions

Centre:	VINN Excellence Centres	CRI Centres for Research-based Innovation	BL-NCE Business-led Networks of Centers of Excellence	SHOK Strategic Centres for Science Technology and Innovation
Country:	Sweden	Norway	Canada	Finland
Knowledge generation space'				
1. Research agenda for sector or cluster				✔
2. Delegated authority to allocate substantial amounts of research funding				✔
3. Annual budget scale	+	++	++	+++
4. Scope of topics	Thematic	Thematic	Cluster	Cluster
Consensus of spaces				
1. Organisational form	Hosted	Hosted	Independent	Independent
2. Industry role	+	++	+++	+++
3. Foresight and diagnostics			✔	✔
4. Scanning and information processing			✔	✔
5. Knowledge processing and combination/ recombination	✔	✔	✔	✔
6. Gatekeeping and brokering			✔	✔
Innovation spaces				
1. Testing and validation	✔	✔		
2. Accreditation				
3. Validation and regulation			✔	✔
4. Protecting the results	**	✔	✔	✔
5. Commercialisation	**	✔*	✔*	✔*
6. Evaluation of outcomes	✔	✔	✔	✔

Code Chart: ✔(indicates existence of feature), + (indicates relative strength of feature, from + 'existing' to +++ 'very strong/ high'); indications here not meant to reflect an assessment of quality or performance but to convey how strongly observations relate to model of Triple Helix organisations.

Notes: * By participating companies as governed by the centre/network agreement.
** Encouraged by funding organisation.

ly on industrial users. Evaluations (*e.g.*, RCN, 2010) emphasised the overall success of the centres and confirmed their industry impact, which has led to the extension of funding for all centres. While positive, the report also outlined areas for improvement. One key area was the latent tension between some host institutions and the centre as a unit. The hosts are still keen to embrace the centre as their own activity rather than viewing it as the "consensus space." The evaluators also recommended the need to establish clearly defined procedures and management groups to ensure the participation of both scientists and user partners in monitoring and planning projects and project portfolios. This may point to the constant challenge of harmonising the interests and needs of user-driven basic research and those of mainstream higher education research activities. One of the report's six recommendations highlighted the need for the centres to adopt a differing governance system, which would enable centres to select their Board chairperson from amongst the user partners (RCN, 2010).

Arguably, the Canadian *Business-Led NCEs* were designed to have even more user/industry involvement than the Norwegian CRIs. Similar to the Swedish centres, the BL-NCEs have built upon and extended a successful programme of collaborative research centres, namely the Networks of Centres of Excellence (NCE) programme launched in 1989, involving some 1,800 organisations brought together in 24 centres (Knee & Meyer, 2007). This organisational form has addressed various stages of the innovation life cycle, most recently commercialisation of activities and accommodating the National level policy requirements to engage in and with SMEs concerning knowledge transfer and innovation activities (Government of Canada, 2009; 2011). BL-NCEs are defined as not-for-profit consortia representing the private sector, with a director as network leader and connector rather than a university professor or clinician as a principal investigator. The research agenda is solely private sector-driven and strongly orientated rather than "university strategically determined" (Zulkifli, 2009). This is reinforced by the private sector participants committing to cover at least 50 percent of the direct research and 25 percent of the administrative costs incurred. An interesting distinction of the BL-NCEs from the initial NCE-programme (and most of the other initiatives discussed in this paper) is that that their funding is not renewable. The latest evaluation of BL-NCE (Performance Management Network, 2012) has found the programme is showing early success pointing to "project portfolios that address the needs of network members" (p.v), characterising them as efficiently managed (p. vi). It is also reported that the networks exceed their matching funds requirement and that a substantial number of highly qualified personnel have participated in the networks' training programmes. The intellectual property arrangements are seen to "facilitate the development of multi-sector and multidisciplinary R&D teams or projects" (ibid.). The need to establish "a better linkage between the network and program level outcomes," which would facilitate the delivery of cluster level impacts, has further been highlighted.

The *Finnish SHOK* centres come the closest to an ideal type'organisation discussed earlier (Grant *et al*., 2014; Meyer at el., 2018). SHOKs were launched in 2009, later than the other Northern European centres. Their conceptualisation was influenced by discussions regarding the Joint Technology Initiatives that were planned under the EU FP7 programme. As stated by the interviewees, SHOKs can be viewed as a new type of public-private partnerships actively involved in research and its use. Unlike the other centres we surveyed, they are organisations in their own right, alongside universities, industry and government. Their size and strong funding base reflect their remit of industrial renewal at cluster level. This includes the allocation of substantial amounts of programme rather than project funding. To illustrate, a single SHOK has launched six programmes that amount to EUR 185 million over a five-year period (Kuusisto & Meyer, 2010). The scale of the centres requires more elaborate governance and management structures than in most of the other centres. Apart from formal reporting requirements, the SHOKs have set up a complex governance structure including a board of directors, a company steering group, an R&D council, as well as strategic steering groups to develop and agree on a strategic research agenda. In one of the centres, around 100 individuals were involved in the initial planning of the strategic research agenda that the shareholders representing the industry cluster needed to agree on with the participating academics. The status of the SHOK centres as limited liability companies has some clear benefits and limitations. While the governance, responsibilities and principles are set out unambiguously, contractual issues have reportedly emerged further downstream. Again, intellectual property rights seem to have become an issue. IPR is one area that has plagued the incorporation and start-up phase of the centres (see also Gustafsson & Järvenpää, 2018).

In the following section we take a closer look at the specific challenges that have been experienced.

Centres and Their IP Challenges

SHOKs

We have argued that the SHOKs are probably the organisations that come closest to a fully developed user driven competence centre or innovation environment. From that perspective, it would seem reasonable to use them as a case study to explore the IP challenges in greater detail. A number of evaluations and reports highlighted the new centres' functioning (*e.g.* Annala and Ylä-Jääski 2011; Lähteenmäki-Smith *et al*. 2013). Manninen (2013) has examined SHOK evaluations from an IPR perspective. One of her findings is that some SHOKs struggled to exploit research results commercially to a sufficient degree, and in this context unresolved IPR issues have been highlighted as well. While the review teams found the IPR rules that were developed to be clear, they also noted that there is still a perception of ambiguity. This in turn resulted in varying attitudes towards commercialisation of the results generated in the SHOKs. While some SHOKs clearly state that commercialisation is not the most important goal, others listed commercialisation as one of their key performance indicators.

The SHOKs were developed at a time when the open and user innovation agenda concept was becoming increasingly influential. SHOKs were tasked to adhere to the principles of Open Innovation. As they mainly relied on public funding (60 percent came from government agencies and 40 percent from companies), their activity had to follow guidelines of transparency and the results were meant to be freely available. Participants in SHOK programmes would have parallel access to the results and IPRs generated in the course of their programmes. The principle is that whenever the results had been achieved jointly, then the results also belonged to all involved in the joint effort.

Where possible, the results needed to be made public as soon as possible after the end of the research program. All participants were expected to publish the results of their engagement. This applied to research organisations, which must publish all results, as well as to the participating companies, which were obliged to only publish the name of the research programme, the amount of public funding, and an overview of the research results. This publication could be delayed to ensure IPR to be secured.

As evaluators and observers (*e.g.* Manninen, 2013) pointed out, provisions existed for IPR to be shared and transferred. While research organisations owned the results of their work and could provide and transfer access to the results to other organisations for research purposes, the ownership of the commercially relevant foreground and background results was not affected. Owners could protect the results and could transfer the ownership rights, as they deemed appropriate. According to the funder's terms, a market price had to be defined for IPR transfers. This turned out to be problematic, as there were few price-setting markets.

One of the challenges highlighted in the various evaluations and also by Manninen (2013) was the way in which the SHOKs encompassed various different types of research. As outlined earlier, the most sensible domain for user-driven competence

centres and innovation environments would be *Pasteur's quadrant*—the area of (pre-competitive) use-inspired basic research rather than pure or, especially, applied and at times commercial research (*Edison's quadrant*). As a consequence, one could suggest the IPR challenges also resulted from the broad portfolio of SHOKs. A portfolio of programmes and projects cutting across these quadrants may create tension between participating businesses when it leads to commercial exploitation.

This was reflected in problems coordinating the simultaneous pursuit of short-term objectives and scientific pioneering research. The results of the research are only reflected in the company's operations with delays of years, and it is therefore difficult to justify the future benefits to the management of the companies. According to the review team, the high profile of IPR problems is likely to be a sign of transition to more short-term research.

The evaluation team judges too narrow a view that the IPR would be considered the only value added by the companies to the SHOK programs. Everyone may not have realized that the results achieved by other SHOK programs would be shared. Openness can lead to opportunistic behaviour as some only want to be involved in the networks brought by the co-operation, but are not ready to invest their own efforts.

Manninen (2013) suggests that good IPR practices ought to be identified and shared more. She refers to one of the SHOK centres (TIVIT) was acknowledged but not seen as problematic. One solution in this specific context was to create a holding company or foundation for managing the IPR portfolio and selling licenses, with the income to be shared through dividends or re-invested in further research.

BL-NCEs

Evaluation reports (*e.g.*, Government of Canada 2011) of Business Led Networks of Centres of Excellence (BL-NCE) program suggest the network has had an impact in enhancing research, development and innovation in the four funded networks. The business-led model has stimulated the development of industry-university research partnerships in 89 projects, involving 378 researchers. This includes the development of partnerships between industry sectors, also those that have no history of strong collaboration. In terms of IP arrangements, the evaluation did acknowledge some difficulties and delays to agree to the network agreements and to address IP issues. Some of the research projects, the report suggests, "did not quite get off the ground as smoothly as envisaged" (Government of Canada, 2011).

Having said this, another observation was that with significant up-front investment in time and effort, network management and partners managed to develop IP agreements that enabled the cross-sector, multidisciplinary R&D collaboration effectively. Suitable IP arrangements and non-disclosure agreements were seen as one of the major mechanisms for mobilising research results in addition to networking and refereed publications. Given the scope of the network stretching different sectors and industries the detailed arrangements varied accordingly.

Conclusions

This paper explored a range of initiatives aimed at translating research into applications. We reviewed a range of user driven competence centres to develop a better understanding of the challenges they are facing in terms of developing innovations and mobilising their research results.

We can draw three lessons from our review of the cases:

- The focus of such centres in terms of their proximity or distance to basic research and its application context is critical to whether suitable network and IP arrangements can be identified. Collaborations seem to be most successful where stakeholders can combine expertise in use-driven but still pre-competitive areas of common interest.
- Upfront investment of time and management effort in agreeing on suitable IP arrangements does pay off. Addressing issues at the beginning, thereby understanding the various stakeholders' positions and requirements, is important.
- Solutions will need to be specific to the technology, sectors and disciplines involved to facilitate a meaningful engagement of the partners. ■

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Appendix. Overview of User Driven Competence Centres			
Country	**Initiative**	**Funding/Duration**	**Brief description / 'Official mission'**
Sweden	VINN Excellence Centres	• EUR 20m p.a. for entire programme • total funding of EUR 650m over up to 10 years, incl. EUR 300m investment from industry and others • maximum amount of funding per project: EUR800k, a third of which to be financed by partners, typically 5-10 members per consortium. • 20 centres supported by VINNOVA and 4 by other funding agencies, • First centres launched in 2006, to run 5-10 years.	• Objectives: to create new internationally competitive concentrations of highly qualified experts with the task of conducting research that is problem-oriented and multi-disciplinary and generating knowledge and technology that will lead to new products, processes and services. • A VINN Excellence Centre seen as a strong research environment positioned in strong innovative surroundings, typically academic led with industry involvement. • Participants: universities, companies, public actors, research institutes, and other research-performing organisations. • Activities covered with this programme: basic research, applied research. • Ideas outside the core actions of the participating actors can also be utilised and further developed, e.g. by the set-up and development of new high-tech and research-based companies.
Norway	CRI – Centres for Research based Innovation	• EUR 17.5m p.a. in public funding; total investment over entire 8 year period: Euro 300m. • maximum amount of funding per project: 50%, at least 25% of the funding is to come from the business partners • Programme duration: October 2006 - December 2014, subject to a successful mid-term evaluation after 3.5 years	• Objectives: (1) encourage enterprises to innovate by placing stronger emphasis on long-term research; (2) facilitate active alliances between innovative enterprises and prominent research groups; (3) promote the development of industrially-oriented research groups that are on the cutting edge of international research and are part of strong international networks; (4) stimulate researcher training in fields of importance to the business community, and the transfer of research-based knowledge and technology; • Activities: basic research, applied research, training and technology transfer
Canada	Business-led Networks of Centres of Excellence Program (BL-NCE)	• 4 BL-NCE centres set up (compared to 39 Networks of Centres of Excellence) • Funding: around EUR 35million; EUR 6.8–9.8 million per centre for 2009-13 (EUR 1.7–2.5 million per year) • Centre duration: 4 year, funding not renewable	• Objective: BL-NCEs will foster a competitive and dynamic business environment to encourage S&T investments and create an 'Entrepreneurial Advantage': "The private sector will identify and lead new research networks that address their priorities under the Networks of Centres of Excellence Program." • Goals: (1) fund large-scale collaborative networks to perform research and commercialization; (2) enhance private sector innovation; (3) deliver economic, health, social and environmental benefits.
Finland	SHOK – Strategic Centres	• Programme level funding: EUR 300m p.a., • EUR 40-60 million annually are invested in research, within each centre • 40% of research to be co-funded by industry • 6 new public-private partnerships set up as non-profit limited company will be responsible for the centre's operations	• Objectives: industrial renewal and radical breakthrough innovations • SHOKs seen as a permanent co-operation and interaction forum: Centres develop and apply new methods for cooperation, co-creation and interaction • The centre will consist of the coordinating function jointly owned by the parties, and a virtual research organisation. Shareholders prepare a strategic research agenda for the centre. Large research programmes created for achieving world class expertise, which is also open to parties that are not shareholders • Activities: basic research, applied research, training and technology transfer
Source: Kavlie (2010), Kavlie et al. (2010), Kuusisto & Meyer (2011), Lundberg (2010), Tekes (2011), Zulkifli (2009), Government of Canada (2009, 2011), European Commission (2006)			