Annex A. Evaluation of cluster organisations in the three case study sectors

The assessment framework

The interviews with stakeholders in the sector strongholds have provided numerous insights into the current approaches and perspectives towards supporting start-ups and scale-ups in the three case study sector strongholds for this report. Meanwhile, the nine international inspiring policy practice case studies have provided points of reference for Denmark. In this section, the template proposed by (Giest, 2021[1])is used to develop a summary of the collaborative and absorptive capacity in the advanced production, energy technology and food and bio resources cluster organisations, thus providing an assessment of their performance on these dimensions.

In Giest's model, collaborative capacity highlights factors such as the purpose of the clusters, the structure of the organisation, the communication strategy and the resources the cluster organisations have at their disposal to fulfil their mission. The absorptive capacity focuses on the intra-cluster and extra-cluster knowledge systems. A well-developed cluster with a competent cluster management organisation can be an important instrument in supporting start-ups and scale-ups, as it contains the key actors and inter-relationships within entrepreneurial ecosystems. According to (Brown and Mason, 2017[2]), these key actors and inter-relationships are:

- Entrepreneurial actors (support and mentoring services, business incubators, and networking and accelerator programmes).
- Entrepreneurial resource providers (financial providers (e.g. venture capital), business angel networks, linkages to large firms, and linkages to universities and R&D centres).
- Entrepreneurial connectors (start-up communities, business enterprise centres, and investor-investee matching services).
- Entrepreneurial orientation (role models, and social status of entrepreneurship).

The two Swedish clusters presented in the advanced production chapter of this report are good examples of such well-developed clusters with the presence of many of these key actors and inter-relationships present.

Summary of cluster organisation assessment

Table A A.1 summarises the assessment of the three national cluster organisations on different dimensions of collaborative and absorptive capacity.

Table A A.1. Collaborative and absorptive capacity of the MADE, Energy Cluster Denmark and Food & Bio Cluster Denmark

Framework	Basic elements	MADE	Energy Cluster Denmark	Food & Bio Cluster Denmark
Collaborative capacity				
Purpose	Leadership	✓	✓	✓
	Shared vision	✓	✓	✓
	Network membership	Partly	✓	✓
Structure	Formal and informal	✓	✓	✓
	Procedures	✓	✓	✓
	Clear roles	✓	✓	✓
Communications	Information links	✓	✓	✓
	Active communications	✓	✓	✓
Resources	Knowledge and skills	✓	✓	✓
	Financing power	Partly	Partly	Partly
Absorptive capacity				
Intra-cluster knowledge system	Knowledge spillovers	Partly	Partly	✓
	Social relations	✓	✓	✓
Extra-cluster knowledge system	Extra cluster knowledge sources	Partly	Partly	Partly
	Interface between the external linkages and the intra-cluster knowledge system	Partly	Partly	✓

Source: (Giest, 2021[1])

Collaborative capacity within clusters

Table A.1 shows that the collaborative capacity of the national clusters in the three sector strongholds is good, with the exception of financing power and to an extent the network membership. Providing better collaboration between stakeholders from the private and public sector, and between industry and Danish Universities was one of the main aims of establishing the national cluster organisations. Based on the interviews undertaken, it seems that the cluster organisations have the leadership required to achieve this aim, and also a shared vision of their mission among their stakeholders. The structure of the cluster organisations as well as the communications internally and externally are also satisfactory. Furthermore, the clusters appear to have the necessary knowledge and skills at their disposal. Therefore, as determined by the majority of the dimensions of this criterion, it can be concluded that the initiative of forming national cluster organisations has been a success.

Network membership

The minor reservation with respect to the network membership concerns the way in which the clusters work with SMEs, start-ups and scale-ups. Generally, the cluster organisations are dominated by the large firms in the sector. This is particularly the case with the cluster organisation for the advanced production sector (MADE). MADE is in the process of changing its membership policy, so that SMEs are also encouraged to become members. The three clusters could, however, have a more explicit strategy of using special measures to support start-ups and scale-ups.

The role of large companies as support for start-ups and scale-ups

Large firms could play a strategically important role in supporting start-ups and scale-ups in the different sectors by being the first customer of products developed by start-ups and scale-ups, by establishing corporate funding agencies (see the case of Novo Nordisk) to provide funding for start-ups and scale-ups, and through corporate spin-offs. For this, they need to be motivated. The general impression from the interviews was that it is an important task to facilitate and improve the collaboration between the large firms and start-ups and scale-ups. Motivation could come from more long-term funding for the clusters to ensure ongoing co-operation in joint projects. Dedicated agencies could also be established, such as the Ignite Sweden programme, to achieve this in the future. Good international examples of how this can be done can be found in the two Swedish clusters, which are covered in the advanced production chapter as learning cases.

Funding

According to a majority of the interviewees, the lack of long-term funding inhibits the financing power of the cluster organisations. At present, the clusters receive four-year funding from the public sector to run the ordinary activities of the clusters, while other forms of activities (such as research and development and programmes for start-ups and scale-ups) must be based on project funding. This normally runs for a period of up to three years. This lack of long-term funding, for example over a period of ten years as is the case with Norway and Sweden, to promote a strong cluster and cluster organisation, can limit the development of the innovation capacity of the cluster, especially with respect to supporting start-ups and scale-ups. Longer-term funding, over which the cluster organisations have more discretionary control, would provide the financing power necessary to introduce cluster internal initiatives to support innovative start-ups and scape-ups. This could come through the establishment of programmes for promoting start-ups and scale-ups, inviting new start-ups to enter the cluster, and facilitating closer co-operation with universities, larger firms in the cluster and between SMEs. The latter initiative could also result in university spin-offs arising from the cluster's co-operation with knowledge institutions (Asheim and Moodysson, 2017[3]) (Njøs and Jakobsen, 2016[4]).

International evaluations of cluster programmes show that firms in clusters increase their collaboration and innovation activity considerably (Samfunnsøkonomisk analyse AS, 2017[5]). In addition to co-operation with universities, searching on behalf of cluster member firms (especially SMEs and start-ups and scale-ups) for extra-cluster (international) knowledge sources is important in increasing the innovative capacity of clusters. Another benefit of long-term cluster funding is that it can help to underpin the international branding of the cluster and the organisations within it, which will particularly help SMEs, start-ups and scale-ups in accessing international markets and collaboration partners, and identifying international funding sources.

Absorptive capacity

Intra-cluster knowledge system

Food & Bio Cluster Denmark is, at least in part, a positive exception with respect to the functioning of the intra-cluster knowledge system, as there seems to be a well-developed system of co-operation and knowledge spillovers between the members of the cluster, which involves some large firms, many SMEs and also a significant numbers of start-ups. This appears to be due to the regional pattern of ecosystems in this sector, co-located with universities and research institutions (e.g. Aarhus University and Foulum Research Station). This is specifically the case for the agricultural part of the food and bio resources sector, where Arla Foods is a dominant player. By contrast, the experimental, new food element of the sector

struggles more, as the main focus of Arla Foods and the large meat companies is not on alternative materials for food production.

In Energy Cluster Denmark and MADE, the domination of large companies and the relative lack of focus on SMEs, start-ups and scale-ups results in sub-optimal knowledge spillovers between different categories of firm. In the energy technology and advanced production sectors, start-ups and scale-ups enter the industries through the value chain, where the cluster organisations as such are not involved, since they do not work systematically on establishing links between large companies and start-ups and scale-ups. In the absence of this activity becoming a responsibility for the cluster organisation, other, financially-driven mechanisms would need to be found for knowledge spillover promotion.

Extra-cluster knowledge system

The evaluation of the extra-cluster knowledge system is carried out along two dimensions: extra-cluster knowledge sources and the interface between the external linkages and the intra-cluster knowledge system. There are two important issues that need to be considered when evaluating the efficiency of the extra-cluster knowledge systems:

1. The collaboration with universities and research institutes concerning extra-cluster knowledge sources.
2. The collaboration between regional science parks, incubators and accelerators, and the national clusters concerning the interface between the external linkages and the intra-cluster knowledge system.

Collaboration with universities and research institutes

In general, all three clusters have a close relationship and good collaboration with the Danish universities, which have scientific and research strengths in different areas. Thus, the three clusters work more with some universities than with others, depending on their areas of strength. The typical hardware or deep tech sectors of energy technology and advanced production typically have closer collaboration with the technical universities, such as the Technical University of Denmark (DTU) and Aalborg University, as well as the University of Southern Denmark in the area of robotics, specifically with relation to the Odense robotic cluster. Meanwhile, Food & Bio Cluster Denmark has the closest collaboration with Aarhus University and the University of Copenhagen.

While the food and bio resources sector has a close co-operation with knowledge-providing institutions that specialise in research relevant to the sector, MADE does not see the same value in research co-operation with universities. This is partly due to the very specialised knowledge coming out of university research. This problem partially stems from the publication pressures faced by researchers, which forces them to focus on new contributions to the scientific literature, rather than on areas that might be more useful or relevant to start-ups and scale-ups in the sector. Another factor inhibiting co-operation between MADE and universities is the IPR laws and regulations in Denmark, which were identified by stakeholders as being a barrier to the smooth diffusion of knowledge from university to industry, especially for start-ups and scale-ups. Partly, the significant diffusion problems from research to start-ups and scale-ups are due to universities wanting to make money from patents and licences, resulting in them becoming too expensive for start-ups and scale-ups to exploit. There is a further problem in that university collaborations can quickly become bureaucratic and difficult, leading to start-ups and scale-ups (and others) walking away from such collaborations.

Research has shown a decreasing tendency for collaboration between industry and university in the biotech sector after the new IPR law – modelled after the 1980 American Bayh-Dole Act – was introduced in Denmark in 2000 (Valentin and Jensen, 2007[6]). One interviewed stakeholder indicated that something could be learned from Sweden, which still operates with professor's privilege, whereby the professor

(inventor) owns the research results and inventions rather than the university. The interviewee also noted that a committee is currently looking into the question of reforming the IPR law in Denmark. In Sweden professor's privilege results in more professors starting their own companies, which is a useful source of start-ups and scale-ups. It also leads to a smoother collaboration between university professors and industry (Wigren-Kristoferson, Gabrielsson and Kitagawa, 2011[7]). In 2004, Sweden was on course to introducing a similar IPR law to that currently found in Denmark, but halted this partly due to the research results from Denmark referenced above. In fact, when co-operation with Danish universities decreased after the introduction of the IPR law in 2000, collaboration with Swedish Universities, especially Lund University, increased. IPR practices also vary between Danish Universities. The practice adopted by a university is also dependent on the background of the persons running the corresponding technology transfer office. If they have a background in business, the co-operation is more pragmatic than if the technology transfer office (TTO) is run by people with a background in law.

Several interviewees commented that there is a tendency for funding to be too heavily focused on R&D, without enough emphasis on innovation i.e. bringing an invention to the market. In hardware and deep tech, engineering and manufacturing are part of the innovation process. This impacts the funding needed for start-ups in the hardware and deep tech sectors, as the commercialisation process is much longer and more costly. This means that start-ups need significantly larger amounts of patient capital for them to be successful than is the case for, as an example, software start-ups. Finance needs to match lead times.

Interface between the external linkages and the intra-cluster knowledge system: Collaboration between regional science parks and incubators and the national clusters

A final question of interest is what has gone missing by establishing the national cluster organisations. Several interviews emphasised that spatial proximity between stakeholders is especially important to support the development of start-ups and scale-ups, as entrepreneurship is a localised phenomenon (Brown and Mason, 2017[2]). This spatial proximity is found at the regional level but is lost at the national level. An often-mentioned example of a successful regional cluster is Odense Robotics, where a close spatial, organisational, and social proximity between industry, university, municipalities, entrepreneurs and investors helped to turn Denmark into one of the major producers of robotics globally. This does not mean that the national cluster organisations should be abolished. Rather, there should be a drive towards forming systematic channels for co-operation between the national clusters and regional clusters and entrepreneurial ecosystems in order to promote innovation, start-ups and scale-ups.

There is a considerable number of regional ecosystems in Denmark, especially in connection with universities, which usually have incubators, accelerators and science parks related to their respective research strongholds. These regional ecosystems should be able to benefit from a closer, more systematic and long-term collaboration with the national cluster organisations as part of sectoral innovation systems including national and regional levels, in order to maximise the synergy effects of the total ecosystem for start-ups and scale-ups in Denmark.

References

Asheim, B. and J. Moodysson (2017), "Innovation policy for economic resilience: The case of Sweden", *Lund University*. [3]

Brown, R. and C. Mason (2017), "Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems", *Small Business Economics*, Vol. 49/1, https://doi.org/10.1007/s11187-017-9865-7. [2]

Giest, S. (2021), *The capacity to innovate: Cluster policy and management in the biotechnology sector*. [1]

Njøs, R. and S. Jakobsen (2016), "Cluster policy and regional development: Scale, scope and renewal", *Regional Studies, Regional Science*, Vol. 3/1, https://doi.org/10.1080/21681376.2015.1138094. [4]

Samfunnsøkonomisk analyse AS (2017), *Evaluation of Norwegian Innovation Clusters*. [5]

Valentin, F. and R. Jensen (2007), "Effects on academia-industry collaboration of extending university property rights", *Journal of Technology Transfer*, Vol. 32/3, https://doi.org/10.1007/s10961-006-9015-x. [6]

Wigren-Kristoferson, C., J. Gabrielsson and F. Kitagawa (2011), "Mind the gap and bridge the gap: Research excellence and diffusion of academic knowledge in Sweden", *Science and Public Policy*, Vol. 38/6, https://doi.org/10.3152/030234211X12960315267859. [7]