Cluster facilitation in a cluster life cycle perspective

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ABSTRACT

Clusters influence the way in which firms cooperate, organise, and compete but clusters and their related benefits rarely come spontaneously in a straight line of expansion. It is argued that clusters typically develop in accordance with a life cycle, which includes an evolutionary sequence of steps where actors from the private and public sector are engaged and where one or more cluster facilitators are coordinating and promoting the process. In literature, the role of cluster facilitators has almost exclusively been described as static, leaving a research gap about how this particular role changes during the life cycle of clusters. Inspired from that, this paper contributes to the understanding of the relationship between cluster development and cluster facilitation. It brings forward a framework for describing and discussing the exact changes taking place with the role of cluster facilitators, including the facilitation focus, competencies, and tasks they make use of along the cluster life cycle. This investigation is based on a multiple case study consisting of nine different clusters located in Denmark.

Keywords: Cluster, cluster facilitator, cluster life cycle, case study, Denmark.

INTRODUCTION

Clusters constitute a recognised and scattered concept that influences the way in which firms cooperate, organise, and compete (Krugman, 1991; Porter, 1990, 1998; Sölvell et al., 2003). Clusters are thus stressed as growth promoters as well as facilitators of higher productivity and competiveness for the firms located within clusters compared to those that are not (Baptista and Swann, 1998; Delgado et al., 2010; Porter, 1990). Inspired by these circumstances, the interest regarding clusters has grown considerably among researchers in areas of economics, business studies, regional science, and economic geography, as well as among policy makers who would like to endorse and benefit from the presence of one or more clusters in their administrative domain. But clusters and their related benefits rarely come spontaneously in a straight line of expansion. Clusters do typically develop in accordance with a life cycle where actors from the private and public sector are engaged and where one or more cluster facilitators are coordinating and promoting the process. So far, the role of cluster facilitators has almost exclusively been described as static (see e.g. Coletti, 2010; Gagné et al., 2010; Mesquita, 2007; Perry, 2005), leaving a research gap about how the role of cluster facilitators, including the facilitation focus, competencies, and tasks they make use of change along the stages of the cluster life cycle.

The necessity and importance of understanding the role and key characteristics of cluster facilitators from a cluster life cycle perspective are first and foremost due to the critical role played by these facilitators and their associates in continually improving the potential and competitiveness of clusters throughout their entire life cycle (Aziz and Norhashim, 2008; Ketels, 2003). It is also due to the fact that cluster facilitators have a significant impact on the speed and scope by which clusters develop and, as illustrated in the Global Cluster Initiative Survey (Sölvell et al., 2003), clusters often fail or stagnate in their life cycle when they lack consensus and a vision, which are two tasks characteristically depending on the work and coordination of cluster facilitators. On this basis, it is a surprise to the researchers that there are only very few contributions on the relationship between cluster development and cluster facilitation. Although there is literature on each of the two topics individually, the literature misses out on a framework for describing and discussing the dynamic nature of cluster facilitators, including how the facilitation focus, competencies, and tasks they make use of change during the cluster life cycle. In continuation of this, we ask the following research question: How does the role of cluster facilitators change along the stages of the cluster life cycle?

This paper is organised as follows. Section 2 explains the theoretical concepts framing the analyses and discussions of this paper. This is followed by a literature review in section 3. Section 4 describes the research strategy and the methodological techniques used for the purpose of building a multiple case study. Section 5 introduces the case study, followed by section 6 which presents and discusses the case findings in order to build a framework for describing and discussing the dynamic role of cluster facilitators along the cluster life cycle. Finally, section 7 concludes on this paper and draws research implications.

CLUSTERS, DEVELOPMENT AND FACILITATION

In the following, the theoretical base of this paper is laid out by presenting the theories applied in the analyses and discussions in order to meet the purpose of this paper. Below, theory on clusters, on cluster development, and on cluster facilitation is presented.

Clustering and cluster characteristics

In literature, the concept of clusters and associated concepts like industrial districts, regional innovation systems, new industrial spaces, innovative milieu, learning regions, and local production systems have gained increasing awareness. For the sake of transparency, research on clusters can be divided into the following three groups: (1) industrial clusters based on localisation economies; (2) industrial clusters based on inter-industry relationships found in input-output tables; and then (3) industrial clusters based on a large range of arguments, such as geographic proximity, internal returns to scale, value chain linkages, and technology (Hofe and Chen, 2006). Following this categorisation, the cluster concept is not something new either as a theoretical concept or as a policy concept. It dates back to Marshall (1920) and his research on industrial districts in England in the 1890s. However, modern history of the cluster concept is highly associated with the work of Porter (1990, 1998), which belongs to group three in the framework of Hofe and Chen (2006) and it focuses on the competiveness and productivity of clusters. Porter defines clusters as "... *geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate*" (Porter, 2000, p. 16). This definition and the underlying cluster understanding have roots in Schumpeter's approach to entrepreneurship and innovation (Stoerring, 2007), Dahmén's theory on development blocks, and Burenstam-Linder's focus on local demand conditions (Dietrichson et al., 2009). A synthesis on Porter's cluster thinking is accumulated in his diamond model. The model consists of four sources which influence the competitiveness of clusters: factor conditions, demand conditions, related and supporting industries, and firm strategy and rivalry.

In addition, a number of researchers have added and challenged the cluster understanding of Porter. For example Moulaert and Sekia (2003) point to the weakness that Porter neglects untraded interactions like networking and social interface as success factors for clustering. The importance of this topic of social capital and social infrastructure is also stressed in the research made by Becattini (1990) and Brusco (1986) on industrial districts. The theory on industrial districts stresses that social institutions like trust and loyalty facilitate cooperation between small and medium-sized firms belonging to a particular industry in the same region for the sake of increasing their innovative capacity as well as the competitiveness of the region as a whole. Moreover, the cluster approach by Malmberg and Maskell (2002) adds to the Porterian school of clustering by emphasising the importance of learning and knowledge flows as a localised process in order to develop innovative clusters. Despite these and other stands on clusters, the work of Porter (1990, 1998, 2000) is applied as theoretical base for this paper due to its great influence in academia and among policy makers (Cumbers and MacKinnon, 2004).

This multiplicity concerning the cluster concept is also empirically rooted as clusters come in many shapes and forms due to their size, type of interaction, level of cooperation, etc., and the differences in each of these characteristics makes it possible to place clusters on a continuum ranging from a group of firms with few interactions to a group of firms with close and high involvement interactions concerning, among other things, information exchange, joint marketing, subcontracting and technological learning, cooperation in product development, and shared educational and training programmes (Barkley and Henry, 1997). These differences in cluster characteristics are important as they influence how value and benefits are created as well as how clusters develop and how this developmental process can be supported and facilitated.

Cluster development

Much research on clusters deals with the topic of cluster development, and several contributors have touched upon that clusters in similarity with industries, technologies, and products have a life cycle consisting of stages such as birth, growth, maturity, and decline or reinvention (Bergman, 2007; Brenner, 2004; Klepper, 2007; Menzel and Fornahl, 2009; Porter, 1998; Sölvell, 2008). The focus on cluster life cycles does not only emphasise the dynamic nature of clusters, it does also stress the path dependency underlying cluster development (Sonderegger and Täube, 2010). Exactly the issue of path dependency is highlighted by Malmberg and Maskell (2002) as they state that clusters are often born through the establishment or location of one or few firms, and they grow through spin-offs and imitations from these initial firms and through attraction of other firms, associated institutions, and venture capital. Later in the process, clusters mature as part of the local milieu characterised by local institutions, supporting infrastructure, and a local culture. But at some point in time, changes in the surroundings of clusters can force them to either close down or to reinvent themselves. To explain the shifts between these developmental stages in the cluster life cycle, Sölvell (2008) points to a number of factors that in each stage are the drivers of change. In the beginning, natural factor advantages and historical accidents typically set off clusters, whereas in the growth stage knowledge infrastructure, networking, social capital, legislation, advantages in demand, and related clusters among other things drive the process. However, in the mature stage, consolidations and a focus on efficiency and economics of scale act as the engine of clusters, and in the decline or reinvention stage, shifts in markets and technology become the engine instead.

In continuation of this understanding of cluster life cycles, a number of researchers have created different versions of this developmental framework in order to fit their individual research purposes. The spectrum of different cluster life cycles is tried summarized in the following. Belussi and Sedita (2009) propose that clusters develop in line with these stages: infancy, growth, maturity, and stagnation/decline or revitalization. In their work on cluster life cycles, they focus on describing the triggering factors that promote the development of clusters from one stage to the next. Related to that, Tichy (1998) has identified the cluster life cycle stages of creation, growth, maturity, and petrification in an attempt to explain the factors leading to successful clusters and clusters in decline, supplemented with a focus on how policy initiatives can support the development of clusters in each of the four life cycle stages. Swann (1998) focuses, through his cluster life cycle, on how the decline of clusters can be turned around to forward new growth within the same clusters, but with a new set of industries, and Menzel and Fornahl (2009) have developed a cluster life cycle which includes the stages of emergence, growth, sustainment, and decline where the fundamental dynamics behind the development process are the transfer and exploitation of knowledge within clusters. Last in this presentation of cluster life cycles and their focuses, Enright (2003) has developed a cluster life cycle where clusters are divided in accordance to their level of activity and self-realisation using the following five stages: wishful thinking clusters, policy driven clusters, potential clusters, latent clusters, and working clusters. In line with the research purpose and the theoretical stand on clusters applied in this paper, the cluster life cycle framework of Enright (2003) and its terminology is chosen as it departures from the Porterian school of clustering and because of its emphasis on activities within clusters which are possible objects for facilitation.

The cluster life cycle of Enright (2003) has, as mentioned, five stages where the three stages of potential clusters, latent clusters, and working clusters are depicted in figure 1 and used

later in this paper for categorisation. A potential cluster has a promising economic potential, but it lacks both a critical mass and key inputs making possible benefits of co-location difficult to achieve. Latent clusters are, on the other hand, characterised by having a critical mass of firms in related industries, but the interaction and information flows between the actors in these clusters miss value in order to grasp the full benefits of co-location and take advantage of the associated opportunities. Finally, a working cluster has a well-developed critical mass of knowledge, resources, activities, and actors laying the ground for complex and high-involvement interactions and synergy effects in order to realise the full potential of clusters and give the participating firms a competitive gain compared to the firms outside clusters. Derived from these descriptions on cluster development, aspects such as facilitation and coordination become vital as to ensure successful clustering and progress along the entire cluster life cycle.

Figure 1: The applied cluster life cycle of Enright
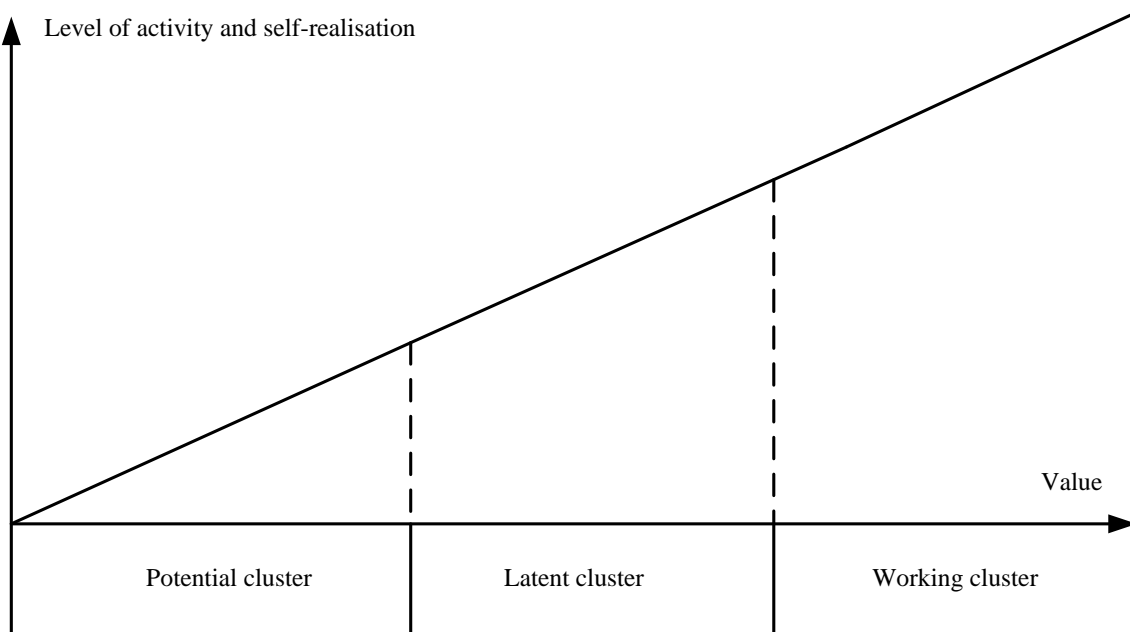
Cluster facilitation

Even though some clusters develop purely organic and laissez-faire through the cluster life cycle, most clusters grow, however, with the support and intervention from cluster facilitators. A cluster facilitator can take the form of individuals, firms and private consultants, public authorities and government agencies, as well as local associations and knowledge institutions (Gagné et al., 2010; Mesquita, 2007). Nevertheless, it is the focus on individuals as cluster facilitators that dominates in literature (see e.g. Coletti, 2010; Perry, 2005; Sölvell et al., 2003; Visser and Atzema, 2008; Zagorsek et al., 2008), followed to a lesser extent by firms and private consultants acting as cluster facilitators (see e.g. Aziz and Norhashim, 2008; Waxell, 2009), as well as public authorities and government agencies (see

e.g. Ingstrup and Damgaard, 2010; Lee and Tee, 2009) and local associations and knowledge institutions (see e.g. Lucas et al., 2009; Molina-Morales, 2005). Despite these four types of actors as cluster facilitators, they all aim at developing clusters through the deployment of several facilitator roles. In continuation of this, Ingstrup (2010) states that cluster facilitators can play three generic roles: (1) the framework-setting facilitator that focuses on the environment of clusters and has an indirect approach to facilitating actors, resources, and activities in clusters through framework improving initiatives, (2) the project facilitator who emphasises and engages in individual projects where a direct and interfering approach to facilitating actors, activities, and resources of clusters is prevailing, and then finally (3) the all-round facilitator which is the sum of the two previous roles.

Looking closer at the concept of cluster facilitation, Mesquita (2007) stresses that the main goal of cluster facilitators, or trust facilitators in his words, is to build trust and a platform for cooperation that can respond to the distrust and competition flourishing in all types of relationships, including in clusters. This focus on trust and cooperation is repeated in most of the identified contributions on cluster facilitation, and Gagné et al. (2010) do further highlight that the goal of cluster facilitators should also be to establish a flow of information, ideas, and resources within clusters, and Molina-Morales (2005) mentions that cluster facilitators should aim at facilitating knowledge and innovation between firms. In this list of goals for cluster facilitators to aim, the focus is generally on improving the conditions for cooperation. It is nevertheless central to underline that it is not the task of cluster facilitators to totally eliminate competition on the expense of promoting cooperation in clusters, as competition acts as a vital driver for developments and continuous improvements in clusters, as explained by Mesquita (2007).

In continuation of this, researchers point to a number of attributes which cluster facilitators would benefit from in order to achieve these mentioned goals for the purpose of developing clusters along their life cycle. Zagorsek et al. (2008) have identified eleven attributes which, according to their studies, lead towards effective cluster facilitation or cluster leadership as they call it. Cluster facilitators should be forward looking, have business understanding, have well-developed managerial skills, be credible, be a communicator, be an integrator, be result-oriented, be neutral, be entrepreneurial, be an external spanner, and finally cluster facilitators should be innovative. Mesquita (2007) supplements these eleven attributes by presenting two sets of abilities important for cluster facilitators, respectively: entrepreneurship/leadership aimed at locating and evaluating opportunities as well as setting goals and visions, and then a set of abilities focused on mediation/arbitration where the focal point is on intervention in order to create mutual understanding and find common ground to build on. At present, the salient point in relation to Zagorsek et al. (2008) is the possibility for cluster facilitators to stay neutral when intervening in the interactions within clusters as proposed by Mesquita (2007). In addition, Aziz and Norhashim (2008) mention that effective cluster facilitation does also depend on the ability of cluster facilitators to build a broad network of contacts and be able to act as a network broker.

The above listed cluster facilitator attributes and abilities come into play through a range of activities. Molina-Morales (2005) outlines five groups of activities for cluster facilitators to be in charge of: organising training activities, undertaking projects, providing support services, building relationships between internal and external actors of clusters, and promotion and branding of clusters and their actors and output. Coletti (2010) continues the list to also comprise activities such as identifying and attracting core people to clusters and distributing knowledge related to markets and technologies of clusters, and Zagorsek et al.

(2008) mention promotion of the overall idea of clustering inside and outside clusters as an important activity with the intention of creating awareness and commitment to the vision and strategy of clusters. However, cluster facilitators can be restricted in performing these activities as their power is limited. Adopted from Zagorsek et al. (2008), two general power bases exist: the personal power base including referent power and expert power, where power stems from personal characteristics, attributes, and abilities, and then there is the positional power base with legitimate power, reward power, coercive power, and ecological power that departures from formal authority linked to the hierarchical position held by a person. Nonetheless, the situation is that cluster facilitators lack access to positional power as they do not have formal authority over the activities, resources, and actors within clusters, and their interaction and decision-making are therefore limited to the mandate given to them from the actors in clusters who own the production factors (Zagorsek et al., 2008). That means that cluster facilitators depend on their personal power base to facilitate clusters and their development, and it poses several challenges, e.g. how cluster facilitators create credibility and effectiveness, but it does also highlight the importance of adjusting goals, attributes, and abilities of cluster facilitators in accordance to the power wasted in them.

Concluding on these investigations, cluster facilitators are in this paper defined as individuals or a team of individuals who are seated in a formal cluster secretariat within a cluster, facilitating and coordinating cluster development through trust building in order to promote cooperation and sharing of activities and resources among the participating actors of the cluster. These cluster facilitators execute primarily their work through the use of personal power as to motivate the actors participating in the cluster, potential actors, and cluster stakeholders to acknowledge and follow the strategy and vision of the cluster. Lastly, it is however essential to stress, as done by Perry (2007), that the success of cluster facilitators are directly associated with the outset of the cluster from the beginning of its life cycle.

LITERATURE REVIEW

To expand on the theoretical base of this paper, a literature review is completed regarding the role of cluster facilitators along the cluster life cycle. The literature review is carried out by using six search terms in database searches: cluster/network facilitator, cluster/network broker, cluster/network promoter, cluster/network manager, cluster/network leader, and clusterpreneur combined with these four concepts: cluster life cycle, cluster evolution, cluster development, and cluster building. The search terms have been selected because of their appearance and use in both academic and policy communities of clustering. The first step in the review process was to locate relevant papers by using the above mentioned search terms and concepts in full text database searches at EBSCO (Business Source Complete and Academic Search Premier) and Science Direct. In the second step, the snowball method by Miles and Huberman (1994) was applied to spot other essential references, using the reference list of the papers identified in step one. The review process ended with an identification of 27 papers.

However, only the three papers from Aziz and Norhashim (2008), Lucas et al. (2009), and Zagorsek et al. (2008), out of the in total 27 identified papers, referred to the relationship between cluster facilitation and cluster life cycles. The reminders focused on the two topics separately, highlighting their individual importance and relevance. The three papers in focus deal briefly and in subordinate clauses with the issue of cluster facilitation during the life cycle of clusters with statements like "*The leadership role remains important throughout the*

cluster evolutionary process, however the focus and the nature of the leadership process may change during the cluster's life-cycle" (Zagorsek et al., 2008, p. 100) and "*The understanding of the cluster lifecycle will then enable the cluster managers and governments to develop policies and programs that will help toward ensuring the sustainability and growth of the cluster*" (Aziz and Norhashim, 2008, p. 369). Such statements do not provide much information to build on, as they only emphasize the importance of a situational fit between the cluster facilitator and the life cycle stage of the cluster that is being facilitated. Moreover, they do not describe or discuss how this fit is achieved based on how the role of cluster facilitators changes or should change along the cluster life cycle. What could be learned from the literature review is that cluster facilitation is still a new and emerging field of research, and so far the contributions are very limited and those which exist have mainly a static view on the role of cluster facilitators. Nonetheless, it must be recognised that the literature review carried out is not without limitations. Firstly, other search terms and concepts than the applied might have revealed other relevant papers fitting the overall purpose of this paper. Secondly, only peer reviewed academic journals are included in the review leaving out books, reports, conference proceedings, and PhD theses.

The literature review shows a gap in describing and discussing how the role of cluster facilitators, including the facilitation focus, competencies, and tasks they make use of change along the cluster life cycle. Due to the importance of this topic, as mentioned earlier in the introduction, a multiple case study has been made in order to help closing this research gap. In the following, the research method behind the case study is explained, followed by the case presentation in section 5.

RESEARCH METHOD

The research purpose and the research question presented in this paper ask for a qualitative and explorative research set-up in order to broaden the theories on cluster facilitation with the aim of understanding the way in which the role of cluster facilitators changes during the life cycle of clusters (Eisenhardt, 1989; Yin, 1994). Following this purpose, the research strategy chosen is a multiple case study (Yin, 1994), and it is planned and executed according to Robson (2002). The case study includes nine clusters at different stages of the cluster life cycle, starting with clusters at the early establishment stage and ending with clusters at the mature stage. The suitability and relevance of a multiple case study is first and foremost due to the advantages of the case study method in describing complex and dynamic concepts such as clusters and cluster facilitators in a life cycle perspective, and because the case study method is encouraging altering between empirical investigation and theory in generating new insights into the topic of focus (Yin, 1994). The specific selection of the nine cases of clusters has, beside the idea of them being true and fair representatives for clusters at different stages of the cluster life cycle, also been selected in accordance with the criteria of information richness and accessibility stressed by Neergaard (2007).

Flanking the multiple case study, two data collection techniques have been applied for gathering data: semi-structured interviews and document and literature studies. The semi-structured interviews can be characterised as in-depth personal interviews (Malhotra and Birks, 2006), and they have worked as the primary source of data for the case study. In total, nine interviews were made, one interview with one cluster facilitator from each of the nine clusters. The purpose of the interviews was to gain insight into how each cluster facilitator plans and executes his or her facilitation including which activities, resources, and actors that

are involved. The interviews followed a semi-structured interview guide, which evolved along the process of making the interviews, and it gave the flexibility of focusing on the uniqueness of each cluster facilitator and his or her facilitation. In general, the interview guide was constructed around these headings; type of cluster, development stage of cluster, facilitator role, and facilitator characteristics, all of which have roots in the theoretical base of this paper. The interviews lasted between 70 and 90 minutes and they were generally made on site, although a few were made over the telephone. In addition, the interviews were recorded and notes were taken for later use in the research process. Table 1 provides a list with the names of the nine cluster facilitators that have been interviewed, including the name of the cluster that they each represent.

Table 1: List of interviewed cluster facilitators and their clusters

Name of cluster	Name of cluster facilitator
Agro Food Park	Søren Madsen
Agro Valley Denmark	Pia Bro Christensen
Copenhagen Cleantech Cluster	Maria Valentin Palgaard
Designers' Cooperation	Jens Bøgetoft Christensen
ICT North Denmark	Lars Horsholt Jensen
Lean Energy Cluster	Hans Pedersen
Medicon Valley	Torsten Jepsen
The Stainless Steel Cluster	Jon Kold
Øresund IT	Philip Stankovski

The second data collection technique applied is document and literature studies covering secondary data like press material, consultant reports and analyses, newspaper articles, and web pages from or about the clusters. These types of material were gathered with the intention of constructing a platform of knowledge before the interviews.

For analysis and discussion of the data collected for the multiple case study, the cross case procedure by Miles and Huberman (1994) was followed. Firstly, the data from the nine interviews with relevance to the research purpose and research question was located.

Secondly, the data was categorised using a grid analysis in order to compare and explore similarities and differences across the nine clusters and to find explanation patterns that illustrate diverse roles of cluster facilitators at different stages of the cluster life cycle. The categorisation of data in the grid analysis happened in line with the predetermined headings from the semi-structured interview guide as well as by the use of new themes found during the process of sorting and analysing the data. This data reduction process has, beside the focus on displaying different roles and views on cluster facilitators, also been made with the aim of ensuring validity of the conclusions drawn from the data. The validity has been ensured by following the four qualitative validity criteria by Hirschman (1986): credibility, transferability, dependability, and confirmability. These criteria have been met by presenting the interpretations of the interviews and the final case study to the nine interviewed cluster facilitators. Moreover, before publication this paper has been presented to other researchers at conferences and it has gone through a blind review process.

CASE PRESENTATION

The literature review discovered a gap in understanding how the role of cluster facilitators, including the facilitation focus, competencies, and tasks they make use of change along the cluster life cycle. To address that situation, we will create a framework by drawing on the multiple case study with nine clusters as described above. In order to begin this process, the nine clusters are presented in table 2, which offers basic information on each cluster with a specification of their stage of development in accordance with the cluster life cycle terminology of Enright (2003). It is however important to mention, in line with Menzel and Fornahl (2009), that it is difficult to assign a cluster to a specific stage of development because clusters do not always develop evenly as a whole and not necessarily in the same speed, meaning that some parts of a cluster can be ahead of the rest. For the benefit of clearness, the stage of development individually assigned to the clusters below is based on a general assessment by the authors.

Table 2: Basic information on the nine clusters

Name of cluster	Industry	Level of development
Agro Food Park	Food	Potential
Agro Valley Denmark	Agriculture	Latent
Copenhagen Cleantech Cluster	Cleantech	Latent
Designers' Cooperation	Design	Potential
ICT North Denmark	ICT	Working

Lean Energy Cluster	Cleantech	Potential
Medicon Valley	Life science	Working
The Stainless Steel Cluster	Processing equipment	Latent
Øresund IT	ICT	Working

Next, the nine clusters are described in more detail with a focus on displaying their separate level of activity and self-realisation by presenting the actors, activities, and resources in each cluster as well as the function and the role of the respective cluster facilitators who are seated in formal cluster secretariats.

Potential clusters

Agro Food Park is a cluster with 18 actors linked to the East Jutland Food Cluster and it is focusing on agriculture and innovation of food concepts and products. The cluster was formed in 2009 and it consists of firms, knowledge institutions, and public authorities with relation to or interest in the food industry, and it is especially small and medium-sized firms that dominate the cluster and its activities. So far the activities performed are basic and on an early stage and they include for example social events, networking events, lobbying, searching for funding, identifying new actors to join the cluster, and branding and raising awareness of the cluster. These and other activities within the cluster are facilitated by a cluster secretariat with 3 cluster facilitators who are mainly being financed by private funds.

Designers' Cooperation is located in the Region of Southern Denmark and it was established in 2009 with the aim of promoting design firms and creating a sound platform for cooperation between design firms as well as with other industries and sectors. The cluster is an initiative launched with the support of regional authorities, municipalities, and knowledge institutions and it is part of a large regional focus on design and design-driven growth. Designers' Cooperation includes about 70 actors where almost 65 of them are small and medium-sized firms. Behind the cluster, a cluster secretariat with 3 cluster facilitators run the activities in the cluster which to this point have been limited to networking events, seminars, matching of expectations, searching for funding, and branding of the cluster to attract more actors to join. The cluster secretariat is financed solely by public funds.

Lean Energy Cluster was founded in 2009 and the aim of the cluster is to create intelligent energy solutions to secure more efficient use of energy at both firms and private households. The cluster was started by actors representing triple helix but particularly public authorities have promoted the development process until now. To support the daily activities in Lean Energy Cluster, a cluster secretariat with 5 cluster facilitators financed by a public grant of € 6,700,000 over 3 years are set to coordinate several activities like seminars, networking events, matching of expectations, lobbying as well as branding the cluster for relevant firms and political stakeholders. Later on, it is the ambition that the cluster secretariat should be able to facilitate innovation projects regarding intelligent control of cooling and freezing in

supermarkets, new air conditioning systems, and electrically powered heavy duty vehicles. Up to now, the cluster has 30 actors with a majority of small and medium-sized firms, but also a few large firms are participating.

Latent clusters

Agro Valley Denmark is located on the islands of Lolland and Falster. It is an agricultural cluster centered around seed and plant production and it was started in 2008 with the aim of promoting cooperation in the agricultural industry and related industries. The cluster is built on a network of 40 actors where most of them are small and medium-sized firms added with few active knowledge institutions and public authorities taking the role of knowledge providers and funds providers, respectively. The business promoting unit Green Center acts as the cluster secretariat behind Agro Valley Denmark and it facilitates activities within the cluster, for example: seminars, business idea workshops, small-scale cooperation projects, searching for funding, and networking events. The cluster secretariat is financed by public funds.

Copenhagen Cleantech Cluster was established in 2010 after the UN Climate Summit in Copenhagen and it organises actors in the area of cleantech and aims to be a one-stop-shop for Danish cleantech activities. The cluster consists of 195 actors, mainly small and medium-sized firms, but also knowledge institutions and public authorities are active participants. The cluster secretariat that coordinates the cluster and its development arranges activities such as networking events, seminars, business idea workshops, small-scale cooperation projects, branding, and knowledge sharing, in order to lay the ground for increased benefits for the actors in the Copenhagen Cleantech Cluster. The cluster secretariat has 5 cluster facilitators and it is financed mostly by a public grant of € 19,172,500 over 5 years. In that period, the two main goals are to attract at least 25 new cleantech firms to the Copenhagen capital region as well as 1,000 new jobs.

The Stainless Steel Cluster is specialised in manufacturing of steel processing equipments for the food and pharmaceutical industry and it is located in the Triangle region of Denmark. The cluster organises just about 200 actors which for the most part are small and medium-sized firms, but also knowledge institutions and public authorities are taking active part in the cluster and its activities. The Stainless Steel Cluster has a shifting history, but in 2005, by an initiative from people representing the local business service centre, the University of Southern Denmark, and the Danish Technology Institute, a formal cluster secretariat named Steel Centrum was established. Steel Centrum is based on project funding and on an annual membership fee beginning at € 270, in order to finance and run activities such as small-scale cooperation projects, seminars, networking events, searching for funding, knowledge sharing, and the like in the cluster. To facilitate these activities, the cluster secretariat has 1 full-time cluster facilitator.

Working clusters

ICT North Denmark is a cluster located in the North Denmark Region and it is rooted in the local telecommunication and navy communication industry. The cluster organises roughly 260 actors, mainly small and medium-sized firms, but beside the firms Aalborg University

takes an important and dominating role in developing and challenging the innovative milieu of the cluster. In order to support that and to facilitate the cluster in general, a cluster secretariat named Brains Business was launched by several public authorities and Aalborg University back in 2007, and it is being financed by an annual membership fee starting at € 67 for a one-man business and supplemented with public project funds. The cluster secretariat has 5 cluster facilitators and they run activities like innovation and business projects, seminars, project portfolio management, branding, cross-cluster cooperation, knowledge sharing, and networking events for the benefit of the cluster.

Medicon Valley is a life science cluster with a focus on biotechnology, medtech, and pharmacy and it is located in the Øresund region. The cluster counts more than 600 actors and the dominating ones are large and market-leading firms as well as knowledge institutions like the University of Copenhagen and Lund University which play an important role in particular initiating new R&D projects. The cluster is facilitated by the cluster secretariat named Medicon Valley Alliance that was established in 1997 in a joint cooperation between Danish and Swedish public authorities and knowledge institutions, and today it is financed through annual membership fees starting at € 740 and project funding. The purpose of the cluster secretariat and its 12 cluster facilitators is essentially to create growth among all triple helix actors in the cluster through coordinating activities as innovation and business projects, an ambassador program, knowledge sharing, networking events, seminars, and searching for funding.

Øresund IT is an ICT cluster centered around the universities and the ICT industry in the Øresund region. About 130 actors make up the cluster which is organised according to the triple helix idea with representation from knowledge institutions, public authorities, and firms. Especially small and medium-sized firms are highly represented and active participants. Øresund IT is facilitated by a cluster secretariat with 9 cluster facilitators that was formed back in 1999 to promote the cluster and its actors by e.g. running innovation and business projects, conducting market analyses, arranging networking events, searching for funding, and coordinating cross-cluster cooperation. The cluster secretariat was initially financed by Danish and Swedish universities and EU grants, but today it is driven by an annual membership fee beginning at € 805 as well as by project- and university funding.
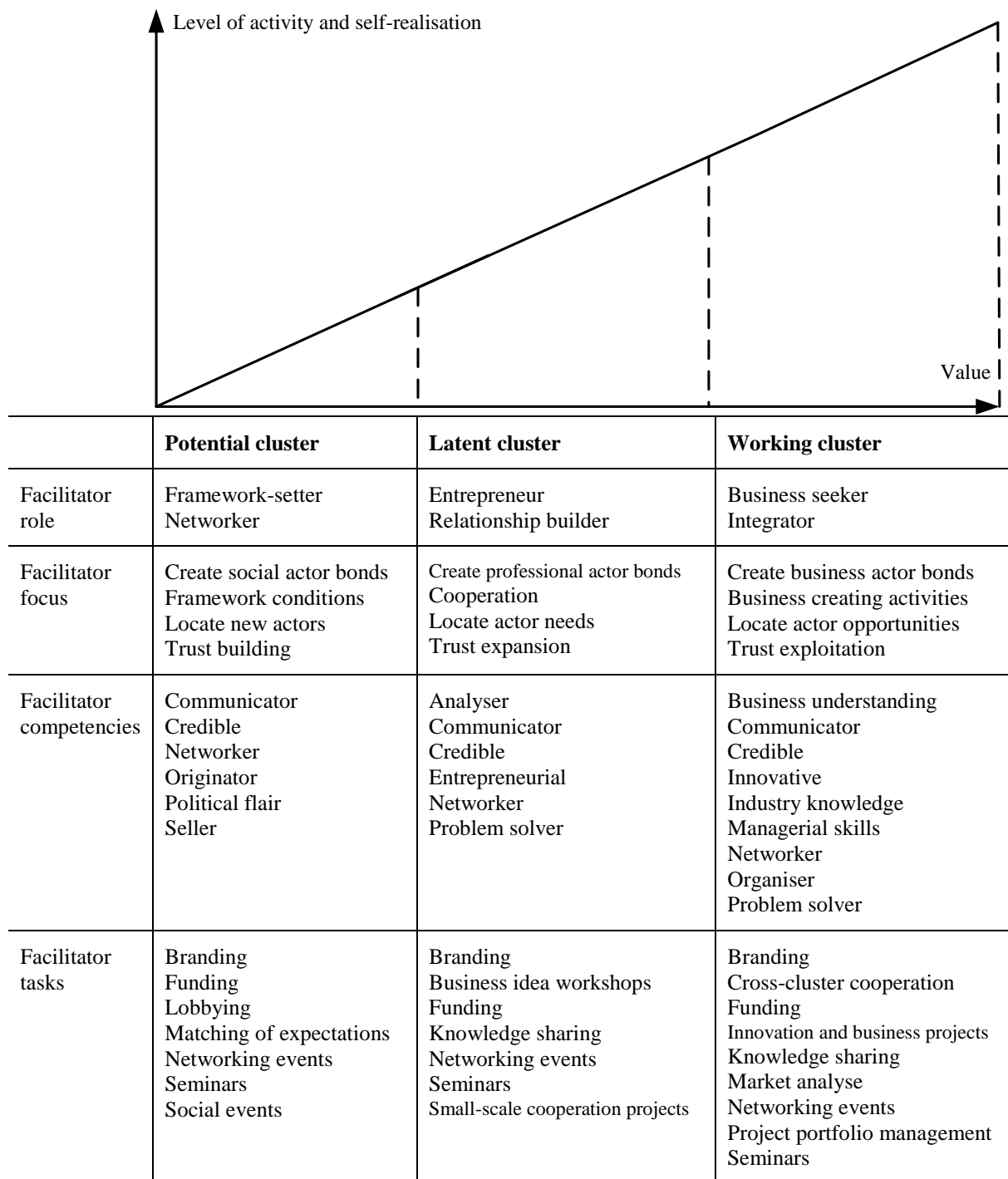

Cross case summary

Derived from the case presentation above, the three potential clusters can generally be described as loosely linked groupings with a relative small number of actors with few interactions between them, and with a majority of small and medium-sized firms. Furthermore, public authorities are important drivers in these clusters as they provide most of the funding for them to develop, but beside that they are rather passive and the same goes for knowledge institutions. The emphasis is primarily on framework conditions as well as building trust, a critical mass, and social actor bonds through activities like networking events, searching for funding, branding, seminars, social events, and matching of expectations facilitated by the cluster secretariats and their cluster facilitators. Alternatively, the latent clusters are emerging and in the process of improving their critical mass, interactions, and cooperation as well as identifying and developing their business potential in order to grow further. These efforts are supported by the activities run by the respective cluster secretariats such as seminars, networking events, small-scale cooperation projects, business idea workshops, and knowledge sharing. The latent clusters exist predominantly of

small and medium-sized firms, but also knowledge institutions and public authorities are participating, and they are more integrated compared to the situation in the potential clusters. Finally, the working clusters constitute three well-developed clusters with structures in place in order to lay the ground for obtaining cluster benefits by e.g. seeking business opportunities and exploiting the trust and actors bonds previously created at the earlier cluster life cycle stages. These clusters are dominated by firms, but what brings them together individually is a full integration of triple helix which makes up a strong and valuable critical mass and resource base surrounded by activities like innovation and business projects, searching for funding, knowledge sharing, cross-cluster cooperation, and networking events all of which are coordinated by the separate cluster secretariats and their cluster facilitators. Concluding on the multiple case study, these three types of clusters relate respectively to the lower end, the centre, and the higher end of the earlier presented continuum from Barkley and Henry (1997). That highlights a progression between the life cycle stage of clusters and the magnitude and complexity of the activities, resources, and actors relevant for facilitation in clusters.

DISCUSSION

The case presentation and the cross case summary highlight similarities and differences in the resource, actor, and activity set-up between potential, latent, and working clusters, and they do thereby stress the contextual changes that cluster facilitators have to cope with when facilitating clusters during their life cycle. Building on these case study findings and the identified research gap in the literature regarding a lack of focus on the dynamic role of cluster facilitators, we propose a framework, presented in figure 2, for exactly describing and discussing how the role of cluster facilitators, including the facilitation focus, competencies, and tasks they make use of change along the life cycle of clusters. The framework is rooted in the theoretical base of this paper and it is structured around these four headings: facilitator role, facilitator focus, facilitator competencies, and facilitator tasks, and in continuation, the data in the framework stems from the data reduction process based on the conducted interviews as explained in the research method section. For an appropriate interpretation of the framework, it is however important to mention that the facilitator characteristics listed in each of the cluster life cycle stages are not an exhaustive list of the characteristics describing the cluster facilitator in potential, latent, and working clusters. It is merely an illustration of the most frequent and archetype characteristics dominating cluster facilitators in the different cluster life cycle stages. In addition, some characteristics are overlapping several stages indicating that previous characteristics are still important for cluster facilitators in future life cycle stages, although they might not have the same contents.

Figure 2: Cluster life cycle framework for cluster facilitators

Level of activity and self-realisation

Value

	Potential cluster	Latent cluster	Working cluster
Facilitator role	Framework-setter Networker	Entrepreneur Relationship builder	Business seeker Integrator
Facilitator focus	Create social actor bonds Framework conditions Locate new actors Trust building	Create professional actor bonds Cooperation Locate actor needs Trust expansion	Create business actor bonds Business creating activities Locate actor opportunities Trust exploitation
Facilitator competencies	Communicator Credible Networker Originator Political flair Seller	Analyser Communicator Credible Entrepreneurial Networker Problem solver	Business understanding Communicator Credible Innovative Industry knowledge Managerial skills Networker Organiser Problem solver
Facilitator tasks	Branding Funding Lobbying Matching of expectations Networking events Seminars Social events	Branding Business idea workshops Funding Knowledge sharing Networking events Seminars Small-scale cooperation projects	Branding Cross-cluster cooperation Funding Innovation and business projects Knowledge sharing Market analyse Networking events Project portfolio management Seminars

To explain and elaborate on the framework in figure 2, cluster facilitators in potential clusters can be described as framework-setters and networkers who are focusing on establishing a platform for these clusters by centering their attention on building and improving framework conditions, trust building, locating new actors to join the cluster, and creating social actor bonds. In accordance with these focus areas, the cluster facilitators aim at producing a critical mass and cohesion within the potential clusters which will encourage cooperation when these clusters develop further as well as making it more attractive to join these clusters. The most dominating tasks executed by cluster facilitators in potential clusters in order to meet these aims and to operationalise the facilitator focus areas are: branding, arranging social and

networking events and seminars, matching of expectations, lobbying at public and private stakeholders, and searching for funding. For these tasks to be accomplished, the cluster facilitators draw among others on the following competences: be credible, be a communicator, be a seller, be a networker, be a originator, and have political flair with the intend of networking in a trustworthy manner and sell the idea of clustering to potential new actors and to the society in general.

Cluster facilitators in latent clusters have a diverse approach to facilitation compared to their counterparts in potential clusters as they in contrast focus on initiating cooperation, trust expansion, locating the needs of actors in clusters, and creating professional actor bonds all with the aim of improving interaction and the critical mass within the clusters. This shift in facilitation is among other things visualised as the focus on trust goes from trust building to trust expansion, and regarding actor bonds the focus goes from social bonds to professional bonds. In line with this, the role of cluster facilitators changes from a networker and a framework-setter in potential clusters to an entrepreneur and a relationship builder in latent clusters, and this transformation is too reflected in the set of tasks performed by cluster facilitators. In latent clusters the focus is on: branding, searching for funding, arranging business idea workshops, seminars, and networking events, coordinating knowledge sharing activities, and initiating small-scale cooperation projects. Owing to these changes, the cluster facilitators should be an analyser, be a problem solver, be a networker, be entrepreneurial, be credible, and be a communicator.

Finally, cluster facilitators in working clusters take on the role of an integrator and a business seeker who focus on facilitating business creating activities as well as trust exploitation, locating opportunities for the actors within clusters, and creating business actor bonds. This indicates a new and significant shift in the tasks performed and the competencies applied by cluster facilitators compared to the earlier cluster life cycle stages. In order to manage this shift and to develop the critical mass of knowledge, resources, activities, and actors as to achieve synergy effects and to realise the full potential of working clusters, the following cluster facilitator competencies are underlined as especially important: have a business understanding, be a networker, be a communicator, have managerial skills, be credible, be a organiser, be a problem solver, have industry knowledge, and be innovative, as well as these cluster facilitator tasks: coordinating innovation and business projects, project portfolio management, searching for funding, arranging networking events and seminars, coordinating and executing cross-cluster cooperation, making market analyses, organizing knowledge sharing activities, and branding.

These descriptions of cluster facilitators in potential, latent, and working clusters stress both the dynamic nature of clusters and cluster facilitators and they emphasise that cluster facilitators in their work fulfil certain roles, apply diverse focuses, are in position of several competencies, and are able to perform various tasks which all target specific life cycle stages of clusters. Cluster facilitators in potential clusters aim at establishing a platform for these clusters to stand in terms of building cohesion and improving framework conditions, followed by a focus in latent clusters on initiating cooperative activities as to foster interaction and improve the critical mass, and finally cluster facilitators in working clusters try to benefit from the previous life cycle stages in order to facilitate business creating activities and enlarge the sphere of the clusters. In other words, the role of cluster facilitators moves from a focus on establishing clusters, to making clusters grow through facilitating cooperation within clusters, to a focus on business and cooperation among clusters. In continuation of these transformations in the role of cluster facilitators, including the

facilitation focus, competencies, and tasks they make use, our framework challenges the static view on cluster facilitators presented in the majority of research on this topic, compare with the prior literature review. That means researchers such as Mesquita (2007) presenting two sets of abilities important for cluster facilitators, and Molina-Morales (2005) with five groups of activities for cluster facilitators to be in charge of, provide an imperfect and limited picture of the role of cluster facilitators as they miss out on specifying what their respective abilities and activities target along the life cycle of clusters. This is however relevant for securing an optimal fit between the work done by cluster facilitators and the life cycle stage of the cluster being facilitated. Finally, it is important to highlight that our framework does not question the relevance of the cluster facilitator characteristics presented by Mesquita (2007) and Molina-Morales (2005) among others, but it questions when these characteristics are important to make use of for cluster facilitators during the life cycle of clusters.

CONCLUSION

This paper has explored how the role of cluster facilitators, including the facilitation focus, competencies, and tasks they make use of change during the stages of the cluster life cycle. So far, only few researchers have touched upon this dynamic role of cluster facilitators and for investigating it further, this paper has been built on a theoretical and empirical base. First, a presentation of the concepts of clusters, cluster development, and cluster facilitation make up the theoretical base. According to Hofe and Chen (2006), clusters can take different forms, yet this paper departures from the Porterian school of clustering, and in accordance with this stand the cluster life cycle framework and terminology by Enright (2003) has been chosen with the stages of potential clusters, latent clusters, and working clusters. Furthermore, cluster facilitators are in this paper defined as individuals or a team of individuals who are seated in a formal cluster secretariat within a cluster, facilitating and coordinating cluster development through trust building in order to promote cooperation and sharing of activities and resources among the participating actors of the cluster. Other than this theoretical base, the empirical base is made up by a multiple case study with nine clusters from Denmark at different stages of the cluster life cycle, starting with clusters at the early establishment stage and ending with clusters at the mature stage.

As an outcome of this research set-up we have developed a framework that forms the base for describing and discussing how the role of cluster facilitators change during the stages of the cluster life cycle. The framework is built around four headings; facilitator role, facilitator focus, facilitator competencies, and facilitator tasks, which help visualising the dynamic change taking place with cluster facilitators from the first cluster life cycle stage and onwards. Cluster facilitators in potential clusters try to establish a platform for these clusters to stand in terms of building cohesion and improving framework conditions. In latent clusters, the focus is on initiating cooperative activities as to foster interaction and improve the critical mass, and finally cluster facilitators in working clusters try to facilitate business creating activities and enlarge the sphere of these clusters. Overall, this paper challenges the static view on cluster facilitators and presents instead a dynamic view, which highlights the importance of having a fit between the work done by cluster facilitators and the life cycle stage of the cluster being facilitated. Nevertheless, further research is needed as to test and expand on the presented framework through more case studies as well as to investigate if the type of cluster or the way in which a cluster has been initiated originally influences the role of cluster facilitators. It can also be beneficial to look into how cluster facilitators can initiate cooperative activities to foster interaction and actual business creating activities. Following

this, special attention could then, from a relationship and network perspective, be paid to the interdependencies, actor bonds, activity links, and resource ties influencing these actions.

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