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Towards a New Conceptualisation of Clusters

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ABSTRACT

Clusters have emerged as an industrial organisational form recognised as having a superior ability than that of single firms operating in isolation to foster national economic development and growth. However, there is little agreement about the way to define industry clusters and a lack of consensus regarding the determinants of cluster formation and operation and, the analysis of clusters. This paper begins by marshalling the different definitional approaches of clusters to produce new thinking about these entities. It examines the definitional concepts together with the identified elements and features of clusters as outlined in the literature to develop an alternative cluster classification and a new framework for analysing clusters. The paper concludes that the notion of a value adding web establishes a new way of conceptualising clusters and suggests that the resource-based view of the firm together with dynamic capabilities view provide a productive means of analysing the competitive advantage of clusters.

Key Words: clusters; competitive advantage; value adding

INTRODUCTION

The term cluster emerged as a widespread and prevalent concept used extensively in discussions about the role of industrial advancement in regional development and globalisation (e.g. OECD 1999, 2001, 2005; European Commission 2002). The interest in clusters is often linked to the many promises connected to the concept including economic and industrial growth, regional development, job creation and greater competitiveness. Encouraging clusters as a response to economic and industrial development seems axiomatic in the 21st century or, as Martin and Sunley (2003: 6) put it: “Clusters, it seems, have become a world-wide fad, a sort of academic and policy fashion item.”

Many contributions in the field of cluster research create implications for policy makers in relation to ways to foster clusters or cluster-development (e.g. Bresnahan, Gambardella & Saxenian 2001, Feldman & Francis 2004, Maskell 2005). However, questions of value creation and the role of single firms as parts of clusters are less central in the literature. Cluster developers and cluster managers are often confronted with the problem that firms frequently do not participate fully in cluster activities for fear that competitors will obtain access to firm-specific information that confers individual competitive advantage. With this tension between individual competitiveness and group synergies, a coordination and motivation problem is present which can influence cluster activities significantly. A major research gap in the area of clusters is the lack of clarity regarding what exactly a cluster is, i.e., there is a lack of a consensus about the accepted elements to be included in a definition of the term ‘cluster’. A second deficiency is that the overall competitiveness of clusters is often analysed while the competitive advantages of the single firm in a cluster is overlooked. One aim of this paper therefore is to develop a useful definition of clusters that incorporates a strategic perspective for individual participants.

Competitive advantages that can be realised by single firms because they are located in a cluster are not only important for the firm itself, but also important for policy makers or economic developers since the willingness of single firms to contribute to the performance of a cluster is central for its development. Following this identification of the research gaps the outlined research tasks are set out. The prevailing definitions of clusters are explored and analysed. The concept of clusters as value adding webs is contended to extend existing knowledge within the field and is explored as the basis for the development of a theoretical framework. This framework is inspired by the resource-based view of the firm (e.g. Peteraf 1993, or Collis & Montgomery 1997).

Defining ‘Clusters’

The term ‘cluster’ is used in a very broad sense in many different contexts and became very popular in recent years. On the one hand clusters are seen as “phenomena” within a globalised world. Porter (e.g. 1998a, 2000) describes this phenomenon as a paradox – why do industries cluster in a certain region when it is possible for them, due to globalisation processes, to organise their activities worldwide? Theoretically, the role of location in competition should decline, but this is not the case. Porter poses this question as the basis for understanding the paradox of cluster development. On the other hand clusters are somehow seen as a catalyst for growth in (economically weaker) regions. When it is possible to attract firms to participate in a cluster and in cluster activities and to establish such a cluster, positive effects spill-over to the whole region in terms of job creation, higher purchasing power and so forth are contended to ensue. This view on clusters is discussed extensively by researchers and it is the one that is attractive to politicians and regional economic developers. However, it can be questioned if it is possible to purposefully establish clusters or whether to be successful, clusters need to develop organically.

When reviewing cluster literature it becomes obvious that the term cluster itself is not clearly defined. Some analyses of clusters do not provide a clear definition for the term cluster (e.g. Audretsch & Feldman 1996, Austrian 2000, Colgan & Baker 2003, Dahl & Pedersen 2003, Tracey & Clark 2003). Many others build on Porter’s cluster concept and the various definitions offered by him (1990, 1998a, 1998b, 2003). Porter concentrates on clusters and (industry-) competitiveness, which is of special interest from a strategic management point of view. The main components used by Porter to describe a cluster in these definitions are: (1) geographic concentration, (2) interconnection of companies and institutions, (3) presence of both competition and cooperation, and (4) specialisation. One critical point, however, is that the boundaries of a cluster are often not considered when defining the term. The expression “geographic scope” as used by Porter is quite broad and can range “... from a region, a state, or even a single city to span nearby or neighbouring countries (e.g., southern Germany and German-speaking Switzerland)” (Porter 2000: 16). Some authors, for example Bresnahan et al. (2001) have therefore dispensed with geography as a necessary element for defining a cluster, while others

(Maskell 2005) have suggested geography merely provides necessary resources and an opportunity to monitor other firms' performance rather than there being any particular competitive advantage to be gained from co-location.

The problems of identifying cluster boundaries are compounded by the porous nature of clusters. Clusters are made up of interconnected activities that may not fit within easily discernable sectors. Cluster boundaries are therefore not obvious and different interpretations of such boundaries may exist. Porter states, that a "creative process" (Porter 2000: 17) takes place when cluster boundaries are drawn. Within this context other authors use the spatial dimension for defining the boundaries of a cluster (e.g. the maximum range of 50 miles favoured by May, Mason & Pinch 2001). However, such absolute criteria cannot grasp the many different dimensions of a cluster. Furthermore, such absolute criteria are not as clear as they first appear: a distance of 50 miles may be insignificant in a rural area, but in an urban area the distance may be considered substantial.

It remains vague how geography, industrial specificity and the interconnectedness of firms define cluster boundaries. The definitions, their development over time and the concept for analysing clusters provided by Porter have therefore been criticised by many authors including Martin and Sunley (2003), Desrochers and Sautet (2004), and Cooke (2006). One critical aspect is the geographic flexibility of the definition, or as Cooke describes it "... the cluster definition stretches alarmingly from the local to the national and back again with bewildering facility" (Cooke 2006: 7). Furthermore, the boundaries of a cluster in terms of industrial groupings are not clearly defined (e.g. Martin and Sunley 2003: 10). The imprecise defining of the boundaries of clusters and the openness of the definition has led to widespread and arbitrary use of the term (e.g. Desrochers & Sautet 2004: 236). What these definitions highlight, however, is an under-developed concept in clusters that of the interconnectedness of cluster members and what those connections and relationships may comprise in cluster formation.

Major Areas and Theoretical Foundations of Cluster Research

The numerous definitions and elements identified show how difficult it is to systematise cluster research. According to Maskell and Kebir (2006: 34-37) major research areas associated with cluster analysis are: local spillovers, competitiveness, and the region and its development. Contributions with a focus on *local spillovers* are rooted in Marshall's (1919) contributions on what he terms 'industrial districts'. The focus here is on the district in which a firm acts and on the influences of the market.

The contributions of Michael Porter and scholars following in this field are around *competitiveness*, and more specifically about competitive advantage. In addition, the relationship between cluster and region has been at the forefront of most definitions and investigations of the competitive advantages

attained through clustering. The most popular and often-used tool for analysis is the diamond approach offered by Michael Porter. Porter's concept identifies fundamental forces that underlie the competitive advantage of nations and demonstrates how the concept can then be related and confined to the analysis of the relationship between a particular geographic area and the cluster(s) operating within it (Porter 1990).

Porter (2000) argues that competition within a region is affected by clusters in different ways. First, it increases the productivity of firms or industry. Second, the capacities for innovation and productivity growth of the actors are increased. Third, entrepreneurship is fostered and with that the size of the cluster grows due to new firms. It has been found "many cluster advantages rest on economies or spillovers across firms, industries, and institutions of various sorts" (Porter 2000: 21). These spillovers occur both internally within the cluster and externally to the region in which a cluster operates. The capacity for clusters to impact on the competitive advantage of the districts in which they operate was examined by Porter (2003) when considering the types of industries within certain regions. It was deduced that a large percentage of industries operated solely at a local level. However, Porter (2003) suggested that to maximise benefits in terms of employment and growth a policy focus was needed on expanding "traded industries" within regions – i.e., those industries that trade across regional and even international borders.

In particular, the region and its development have been at the centre of the examination of the "innovative milieu approach", which was mainly developed by a group of French researchers (Groupe de Recherche Européen sur le Milieux Innovateurs (GREMI)). The research focuses on similarities among successful innovative regions and on the causes of different regional capabilities to innovate. Regional networks and socio-cultural factors are analysed. The innovative milieu is defined as "... the set or the complex network of mainly informal relationships on a limited geographical area, often determining a specific external 'image' and a specific internal 'representation' and sense of belonging, which enhance the local innovative capability through synergetic and collective learning processes" (Camagni 1991: 3).

Local spillovers, competitiveness as well as the region and its development are thus major fields of research regarding clusters. Many contributions deal with one or more of these topics. Quantitative studies are used to analyse clusters, e.g. with regard to behavioural aspects such as local tastes and attitudes and their influence on cluster development (Cortright 2002), with regard to input-output linkages (Feser & Bergman 2000), or with the aim to identify "the drivers of an industrial cluster" (Hill & Brennan 2000). Furthermore, there are contributions in the field of cluster research which concentrate on one specific aspect, such as communication flows in a cluster (e.g. Dalum, Pedersen & Villumsen 2002), or on the interaction between clusters, entrepreneurship and spin-offs (e.g.

Bresnahan et al. 2001, Feldman & Francis 2004). An often used tool for the graphic presentation of a cluster is the cluster map. In such maps a cluster is presented systematically and the relationships between the cluster actors are outlined (see Austrian 2000 for an overview).

Cluster research has been extensive and has generally sought to identify the nature of the economic relationship between a cluster and its geographic location, the necessary elements that constitute a cluster; the means to measure the inputs and outputs of clusters and how to define the boundaries of clusters. Additionally, the connectedness in relation to the internal machinations of clusters and the external relationships of clusters with their environment has been analysed in terms of (1) firm to firm relationships within a cluster (internal), (2) cluster to industry relationships (external), as well as (3) cluster to location relationships (external). There are also relationships that would generally be argued to fall outside the confines of a cluster and have therefore not been considered as the relationship of firms with other firms outside the cluster. Investigation of these types of relationships is linked to the research that identifies a need to more closely define cluster boundaries. The focus has also been predominantly on economic factors, that is, how clusters with their array of internal and external relationships impact on local economies.

The focus on the economic advantages of clusters means that much cluster research has sought to measure various aspects of clusters including the strength of internal and external cluster relationships (Feser and Bergman 2000); cluster impact on regional development (Porter 2003) and the impact of geographical characteristics on cluster success (Hill & Brennan 2000, Porter 2000). Due to the economic focus of cluster research it can also be concluded that most cluster research seeks to locate implications for public policy. It seems that policy makers are the main target group instead of the single firms in a cluster. This focus is evident in the policy recommendations of Feser and Bergman (2000) and Porter (2003) who propose micro-economic policy frameworks at the regional level to complement macro-economic policies at both the national/industry and international levels. Likewise, Feldman and Francis (2004) propose policy implications for clusters; however their recommendations are aimed at the individual firm level. In the following section resulting research gaps are further specified and addressed.

Towards a New Conceptualisation of Clusters

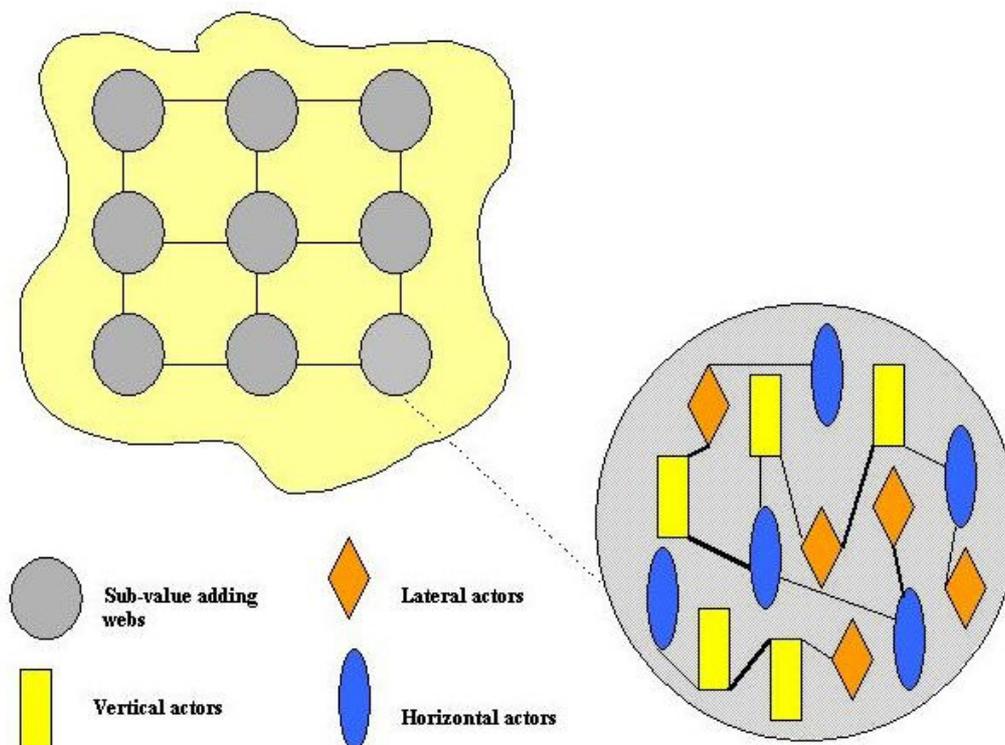
We argue that a cluster should be viewed as a “*value adding web*” which can be understood as a series of linkages between single firms and institutions in a defined interactive space. All actors influence each other and have influence on value creation within the value adding web. The firms and institutions in a cluster can be categorised into horizontal, vertical and lateral actors. Building on these assumptions a cluster is defined as follows:

A cluster is a connection of horizontal, vertical and lateral value adding activities contributed by different actors in proximity to one another which all act in relation to a specific industry. Together the actors are building a value adding web which defines the boundaries of the cluster. Direct and indirect interactions take place between these actors which may be reflected in strong, medium or weak links.

It is contended that it is possible to divide the kind of interaction among the actors in a cluster into external and internal interactions, as well as into direct and indirect interactions. External interactions take place when an actor of the value adding web interacts with actors who are not located in the cluster. Internal interactions describe links between actors who are located in the value adding web. These internal links can be direct or indirect (i.e. be coordinated via a third party) and can be divided into strong, medium, or weak links.

In the case of *direct links*, two firms within the value adding web act directly with each other. In the case of *indirect links* a third party functions as a connector between firms within the cluster. An example of this aspect is when a supplier delivers parts to a buyer that is the supplier of a third firm in the cluster. The third party can also be a University that has joint projects with more than one other cluster actor. Figure 1 shows our perception of a cluster as a value adding web that can be segmented into sub cluster value-adding webs.

Figure 1: The cluster as value adding web



According to this above definition the identification not only of the horizontal and vertical actors but also of lateral actor groups is one of the main tasks when processes of value creation in clusters are analysed. *Lateral actors* are institutions like universities or economic development agencies that facilitate the firms in a cluster to perform better. *Horizontal actors* are the firms which produce the main products of the central cluster industry. They may have a different focus, but a common background such as one firm building containerships and another building yachts. At this point of the analysis it is possible to divide the whole cluster into smaller groups, which becomes helpful in the analysis of the generated rents. This contributes to the fact that a big and well known identified cluster often consists of many smaller clusters (e.g. Silicon Valley). Therefore, a value adding web consists of many smaller sub-value adding webs, which are connected to each other in the context of the overall cluster. Finally, *vertical actors* are firms which contribute to the production process of the horizontal actors. Vertical actors are suppliers as well as buyers of the products delivered by horizontal actors.

When a cluster is seen as a value adding web it becomes obvious that the single firms do not only produce their own value, but that they also add value to the whole cluster. Because every firm is influencing value creation and the overall competitiveness of the cluster it becomes obvious why it is important to think about the single firm when talking about clusters. Competitive advantage does not only result from firm specific competencies, but also from the ability to organise the whole value creation process within the cluster.

When reviewing cluster literature from a strategic management viewpoint there is generally a lack of regard to understanding the role of competitive advantage in the realisation of single firms in clusters (starting points can be found in Maskell 2005 & Folta, Cooper & Baik 2006). Maskell (2005: 415) who explain this gap in the literature as follows:

But what then are the advantages of N co-localized firms of size S undertaking related activities that are not transferable to a single firm of size S x N doing the same? This is arguably the single most important question for understanding the existence of the cluster, yet largely ignored in the conversation on the subject.

The resource based view (RBV) of firms provides an insight into the value adding ability of clusters. Different kinds of rents can be realised by a firm because of the types of resources it possesses. The first underlying assumption of the RBV is the *heterogeneity of resources* between single firms. Only because of this heterogeneity is it possible to realise long-term competitive advantages and financial returns. From possessing superior resources a firm can earn *Ricardian rents* (Peteraf 1993: 180). A second assumption of the RBV is that knowledge is unequally distributed (*imperfect knowledge*) which influences the realisation of competitive advantage. Peteraf differentiates between ex post and ex ante limits to competition to set barriers. Ex post limits to competition are set by resources which are inimitable and hard to copy. They are necessary to sustain the resulting rents. Ex ante limits to

competition are described by the uncertainty for a firm when entering a new market or when a new product is brought to market. A market cost advantage can be realised by being the first firm in a market, i.e. a 'first mover advantage' (Lieberman and Montgomery 1988). *Immobility of resources* or *imperfect mobility of resources* characterises the third assumption. Immobile resources cannot be traded on the marketplace. Imperfect mobile resources are clearly less valuable in a second best application than in their first best application.

In summary, the RBV contributes to the explanation of competitive advantage realization for the firm. From this perspective resource heterogeneity leads to rent creation for single firms, ex ante limits to competition prevent costs from offsetting the rents, ex post limits to competition are necessary to sustain the resulting rents, and imperfect mobility ensures that the created rents stay in the firm and are appropriated by it.

To complement the RBV the Dynamic Capabilities View (DCV) is taken into consideration. The DCV can be seen as an extension of the RBV (Amit & Zott 2001: 49; Collis 1994: 143). While the RBV is concerned with value appropriation and sustainability of competitive advantage (e.g. Barney 1991), the dynamic capabilities view (e.g. Teece, Pisano & Shuen 1997) explores ways by which valuable resources are built and acquired over time. Schumpeterian or entrepreneurial rents are at the centre of attention that can be achieved by risk-taking and entrepreneurial insights in an uncertain or complex environment. These rents are however self-destructive because of knowledge diffusion. The focal concern of the DCV is asset accumulation, replicability and inimitability (Teece et al. 1997: 527). A dynamic view is taken by acknowledging that firms continuously have to build, adapt and reconfigure internal as well as external competencies.

A competitive advantage emerges when the possession of a valuable resource makes it possible for the firm to conduct their business activity better or cheaper than competitors (Collis & Montgomery 1995: 120). The most important requirement which makes a resource valuable and suitable as a basis of long-term competitive advantages is that of imitation. The more difficult a resource is to copy, the more valuable it is over time. Four resource characteristics make copying a resource more difficult (Collis & Montgomery 1995: 121-122): physical uniqueness, path dependency, causal ambiguity, and economic deterrence. In general, a superior firm's competitiveness is rooted in the development of a bundle of resources, which is distinct to its competitors and which is implemented in a well-conceived strategy (Collis & Montgomery 1995: 120).

The existence of clusters is somewhat of a paradox. In a globalised world the importance of location should diminish (this paradox is mentioned e.g. in Porter 2000). Fast travel allows speedy re-location, production processes can be coordinated via long distances with the help of information and

communication technology, communication can take place in multiple and remote locations at any time and labour and capital are highly mobile. From an economic viewpoint firms can locate anywhere to realise competitive advantage. However, firms often remain in a certain region.

We see this feature of being near to each other as being reliant on a resource of a certain location and we call this resource *regionalness*. This term functions as an umbrella for resources which characterise the location of the cluster such as the type of area (urban or rural) and natural resources availability such as minerals, climate and local physical characteristics. We identify “regional-specific resources” with the help of Dunning’s lists of locational factors. Therefore we take the location sub-paradigm from Dunning’s eclectic paradigm and transfer it from the field of foreign direct investment to regional locational factors in clusters. The eclectic paradigm by John Dunning can be regarded as the dominating static approach explaining international business activities within the last few decades. Dunning identifies ownership advantages, location advantages and internalisation advantages (OLI advantages) as relevant factors regarding the international business activities of firms (Dunning 2000: 163-164). We focus on the second sub-paradigm, the (L) location advantages that deal with the attractiveness of a foreign market. We take the suggested location advantages as a pattern for analysing the regional resources of clusters.

A second resource category of major importance is that of *cluster-specific resources* that include an existent cluster-management or the financial backup of cluster activities (such as financing by public actors). *Firm-specific resources* are our third category of relevant resources. From this category we build on the literature of the RBV of the firm. Here resources like the image of the firm, skilled employees, patents, etc. are included. Different firms located within a value adding web should be examined, i.e. firms of different size and age should be identified beforehand e.g. with a questionnaire. To get insight into the resources and their characteristics, interviews could be used as an analytical tool.

CONCLUSION

The outlined framework analyses a cluster on three different levels - on the level of the region, on the level of the cluster and on the level of the individual firm. It is argued that analysis on these different levels ensure that it is possible to capture a cluster in all its dimensions. In a cluster the realisation of competitive advantage of single firms cannot be analysed independently from the overall value adding web therefore firm-specific, cluster-specific as well as regional resources have to be identified and evaluated. This paper has sketched a framework of clusters as *value adding webs* constituted by connections of vertical, horizontal and lateral actors. There remain questions regarding how to make the framework

operational however, this paper has suggested ways the framework can be used to map an outline for understanding and evaluating clusters, and for informing public policy on cluster development and sustainability. The future research agenda is to operationalise this framework.

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