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MANAGING INNOVATION IN ORGANISED CLUSTERS
TOWARDS AN UNDERSTANDING OF CLUSTERS AS META-ORGANISATIONS

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Managing Innovation in Organised Clusters: Towards an understanding of clusters as meta-organisations

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UNIVERSITÉ DE NEUCHÂTEL

FACULTÉ DES SCIENCES ÉCONOMIQUES

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Summary

This research develops insight into the functioning of self-aware and organised clusters seeing these as 'context-embedded meta-organisations'. Specifically, it builds a theoretical framework for strategy-making in organised clusters, elaborates on their 'agentic' nature and ability to shape their environments.

Contrary to a more 'traditional', determinist, approach in cluster studies, viewing clusters solely as 'geographic concentrations' of organisations, the perspective adopted in this research conceptualises clusters as 'organisations of organisations'. This suggests a more voluntarist stance where self-aware and organised clusters are perceived as intentional actors within their environments implementing deliberate strategies and pursuing system-level goals.

This perspective is rather novel in cluster studies and opens up interesting research directions. This thesis explores two major implications of the 'meta-organisational' view of clusters: (1) the deliberate nature of collective strategy-making in these and (2) clusters' 'actorhood' and their interactions with their contexts.

First, seeing clusters as 'organisations of organisations', suggests that these can be deliberately managed and calls for the application of management studies to the cluster context. However, to date, most strategy tools and frameworks have been developed with an individual firm in mind. As a consequence, these cannot reflect the complexity of the 'meta-organisational' setting where a number of interests are at play, and strategy-making is a collective exercise. Thus, the 'meta-organisational' perspective on clusters calls for the adaptation of the extant strategy frameworks to account for the specifics of the setting. To answer the need for strategy tools and approaches adapted to the context of clusters seen as meta-organisations, this thesis proposes a novel framework of the 'cluster business model'. This topic is addressed in Article 1 adopting a design science approach to develop a practical tool for strategy- and decision-making in clusters. The article proposes a model describing value creation in the cluster context, develops a method for its application in practice as well as a visual representation of both.

Moreover, as clusters are increasingly seen as drivers of innovations and mechanisms for a transition towards the knowledge economy, this thesis develops a set of interventions for cluster business model design fostering the innovativeness of its members. Article 2 addresses this topic and applies a mixed methodology combining a systematic literature review with a design-oriented synthesis. This allows to uncover the generative mechanisms of cluster innovativeness and formulate a set of interventions aimed at shaping cluster business model elements with a view to fostering its innovativeness.

Second, the meta-organisational perspective on clusters raises important questions about their intentionality and 'actorhood'. Indeed, seeing clusters as 'organisations of organisations' implies that these can deliberately act, just as individual organisations. This view, again, has not yet been explored in the cluster studies, still dominated by the 'traditional', determinist, approach. Recent research in the field of organisation studies suggests that organisations may display different levels of 'organisationality' depending on the extent to which the attributes of formal organisations are present. Applying this knowledge to clusters allows uncovering the yet

unexplored mechanisms of cluster 'actorhood' and its limitations. Article 3 explores this topic and applies a theory-elaborating multiple case study method to gather insight into the clusters' ability to shape their environments mediated by their level of 'organisationality'. The article develops a set of theoretical propositions based on the case studies of two clusters in Australia. It suggests that clusters can deliberately 'construct' themselves both as organisations and social actors. However, their 'organisationality' design choices influence the locus of their actorhood resulting in more or less collaborative approaches to social action.

Finally, and related to the previous point, viewing clusters as intentional actors capable of interaction with their environments, suggests that these can adopt deliberate strategies in response to external pressures. Going further, clusters can be seen as change agents or institutional entrepreneurs in unsupportive institutional settings. Article 4 explores this topic and adopts a theory-elaborating embedded multiple case study method. It studies two clusters in the context of a transition economy (Russia) presenting a range of institutional barriers to innovation. The article uncovers the dual role of clusters as institutional entrepreneurs. It suggests that clusters may both act collectively due to their powerful position grouping a number of players, and, at the same time, these can contribute to creating enabling conditions for the individual acts of institutional entrepreneurship.

While this thesis offers a range of implications for research and practice in the cluster field, its most broad and significant contribution lies in the further development of the novel 'meta-organisational' perspective on self-aware and organised clusters. This research thus contributes to the consolidation of the 'meta-organisational' perspective and coins new language for addressing the topic of 'managed' or 'organised' clusters. This perspective has not yet drawn wide attention in cluster research and practice but can be valuable for empowering clusters and giving them practical tools to exercise their collective power and shape their environments. In a way, this 'meta-organisational' view of clusters might become 'self-fulfilling' by contributing to shaping the perception of clusters as deliberate and organised actors, triggering a reflection of cluster practitioners and providing them with adapted conceptual frameworks and practical tools.

Keywords: cluster, meta-organisation, innovation, business model, design science, actorhood, institutional entrepreneurship, institutional work

Résumé

La présente recherche propose une nouvelle approche du fonctionnement des clusters organisés en les considérant comme des « méta-organisations contextualisées ». Elle établit un cadre théorique pour l'élaboration de stratégies dans les clusters et approfondit les connaissances sur leur capacité d'agir et de façonner leur environnement.

Contrairement à l'approche « traditionnelle » et déterministe qui inspire la plupart des recherches existantes sur les clusters, qui considèrent les clusters uniquement comme des « concentrations géographiques » d'organisations, cette nouvelle perspective conceptualise les clusters comme des « organisations d'organisations ». Il en découle une position volontariste où les clusters organisés sont désormais perçus comme des acteurs intentionnels mettant en œuvre des stratégies délibérées et poursuivant des objectifs communs.

Cette nouvelle perspective sur les clusters ouvre des pistes de recherche intéressantes. Cette thèse explore deux implications majeures de la vision « méta-organisationnelle » des clusters : (1) la nature délibérée de l'élaboration de stratégies collectives au sein des clusters et (2) la capacité des clusters d'agir et d'interagir avec leur environnement.

Premièrement, le fait de considérer les clusters comme des « organisations d'organisations » suggère que ceux-ci peuvent être gérés de manière consciente. Ce constat appelle l'application dans le contexte des clusters des approches développées au sein des sciences de gestion. Toutefois, jusqu'à présent, la plupart des outils stratégiques ont été conçus en tenant compte des besoins des entreprises individuelles et ne reflètent pas la spécificité du cadre « méta-organisationnel ». En effet, la complexité de ce contexte se traduit par la présence d'acteurs multiples avec des intérêts souvent divergents et par la manière collective de l'élaboration de la stratégie et de la prise de décisions au sein des clusters. Ainsi, la perspective « méta-organisationnelle » sur les clusters exige d'adapter les cadres stratégiques existants en tenant compte des spécificités de ce contexte. Pour combler les lacunes en termes d'outils et d'approches stratégiques adaptés au contexte des clusters, cette thèse propose un cadre théorique du « modèle d'affaires des clusters ». Ce sujet est abordé dans l'article 1, qui adopte une approche tirée de la science de la conception. L'article propose un modèle décrivant la création de la valeur dans le contexte des clusters et développe une méthode pour son application dans la pratique ainsi qu'une représentation visuelle de ces derniers.

Par ailleurs, vu que les clusters sont de plus en plus considérés comme des moteurs de l'innovation et de la transition vers l'économie de la connaissance, cette thèse développe un ensemble d'interventions en vue de façonner les modèles d'affaires des clusters pour favoriser l'innovation de ses membres. L'article 2 aborde ce sujet et applique une méthodologie mixte qui consiste à réaliser une revue systématique de la littérature et à en faire une synthèse dans la tradition des sciences de la conception. Cela permet de découvrir les mécanismes générateurs de l'innovation et de proposer une série d'interventions visant à favoriser l'innovation au sein des clusters.

Deuxièmement, la perspective « méta-organisationnelle » sur les clusters soulève d'importantes questions sur leur intentionnalité et leur capacité d'agir. En effet, le fait de considérer les

clusters comme des « organisations d'organisations » implique que celles-ci peuvent agir délibérément, tout comme les organisations individuelles. Ce point de vue n'a pas encore été exploré par la recherche académique dans le domaine des clusters, toujours dominée par l'approche « traditionnelle » et déterministe. Des recherches récentes dans le domaine des théories des organisations suggèrent que les niveaux d'« organisationnalité » peuvent varier en fonction de la mesure dans laquelle les attributs des organisations formelles sont présents. L'application de ces connaissances dans la recherche sur les clusters permet de découvrir les mécanismes encore inexplorés de leur « agentivité ». L'article 3 explore ce sujet et applique la méthode d'étude de cas multiples pour recueillir des informations sur la capacité des clusters à façonner leur environnement en fonction de leur niveau d'« organisationnalité ». L'article développe un ensemble de propositions théoriques basées sur deux études de cas de clusters en Australie. Il suggère que les clusters peuvent délibérément se « construire » à la fois en tant qu'organisations et en tant qu'acteurs sociaux. Cependant, leurs choix conceptuels par rapport à leurs niveaux d'« organisationnalité » les mènent à adopter des approches plus ou moins collaboratives de l'action sociale.

Enfin, et en lien avec le point précédent, le fait de considérer les clusters comme des acteurs capables d'interagir avec leur environnement suggère que ceux-ci peuvent adopter des stratégies délibérées en réponse aux pressions et contraintes extérieures. En outre, les clusters peuvent même être considérés comme des agents de changement ou des entrepreneurs institutionnels dans des contextes peu favorables. L'article 4 explore ce sujet et adopte une méthode d'étude de cas multiples visant à l'élaboration des théories existantes. Il étudie deux clusters dans le contexte d'une économie en transition (Russie) présentant une série d'obstacles institutionnels à l'innovation. L'article met en évidence le double rôle des clusters en tant qu'entrepreneurs institutionnels. Il suggère que les clusters peuvent à la fois agir collectivement grâce à leur puissance qui résulte de la présence d'un nombre important d'acteurs, et, en même temps, stimuler les actes individuels d'entrepreneuriat institutionnel en façonnant des conditions favorables.

Bien que cette thèse offre une série d'implications pour la recherche et la pratique dans le domaine des clusters, sa contribution la plus significative réside dans le développement de la nouvelle perspective « méta-organisationnelle » sur les clusters organisés. Cette recherche contribue donc à la consolidation de cette perspective et développe un nouveau langage pour aborder le sujet des clusters « gérés » ou « organisés ». Cette perspective n'a pas encore été explorée dans la recherche et la pratique, mais elle a un grand potentiel et peut contribuer à renforcer l'autonomie des clusters et leur fournir des outils pratiques pour exercer leur pouvoir collectif et façonner leur environnement. D'une certaine manière, cette vision « méta-organisationnelle » des clusters pourrait devenir « auto-réalisatrice » en contribuant à façonner la perception des clusters en tant qu'acteurs intentionnels et organisés, en déclenchant une réflexion des acteurs au sein des clusters et en leur fournissant des cadres conceptuels et des outils pratiques adaptés à leur environnement.

Mots clés: cluster, méta-organisation, innovation, modèle d'affaires, sciences de la conception, capacité d'action, entrepreneuriat institutionnel, travail institutionnel

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1. Introduction. The changing nature of clustering

Traditionally, cluster studies have been informed by research into the functioning and evolution of spontaneous geographic agglomerations, such as the wine cluster in California or the leather fashion cluster in Italy (e.g. Porter 1998a). However, recently, an important shift in perception of clusters has been taking place: rather than being viewed as spontaneous and self-generative phenomena, these have become considered 'organised' and 'manageable' entities, and manifestations of 'meta-organisations' deliberately pursuing collective goals (Gadille, Tremblay, and Vion 2013; Gimet and Grenier 2018; Fen Chong 2009; Knop 2015; Fosse 2017).

This shift of perspective opens up new avenues for research and poses interesting questions. Specifically, the meta-organisational perspective in cluster studies calls for the application of tools, frameworks and approaches developed by scholars in organisation and management fields. However, these tools, developed with an individual firm in mind, are likely to be less suitable in complex meta-organisational settings. Moreover, seeing clusters as a form of organisation implies that these are not only acted upon by policymakers or shaped by their contexts but can deliberately transform their environments (King, Felin, and Whetten 2010). Thus, more insight is needed into cluster-environment interactions assuming that there is a two-way relationship between clusters and their contexts. Thus, this research aimed at developing the meta-organisational perspective in cluster studies by proposing a strategy framework for managing clusters, as well as by extending the current research in cluster-environment interactions.

The following sub-sections of this introductory chapter will elaborate on the 'meta-organisational perspective' on clusters and its implications. Specifically, the first sub-section will outline in further detail the historical evolution of the cluster concept towards the 'meta-organisational' view. It will provide insight into the contextual changes which led to a new perception of clusters going beyond the traditional 'geographical' view. The second sub-section will then describe two key implications of this perspective for cluster studies. Specifically, it will elaborate on (a) the potential of tools and concepts developed within organisation and management studies for the understanding of 'organised' clusters, and (b) on the 'actorhood' of clusters and their ability to shape their environments. For each of these perspectives, two research questions will be formulated and will guide this doctoral dissertation.

1.1. Tracing the evolution of clusters: from 'geographic agglomerations' to 'meta-organisations'

Researchers in economic geography, industrial economics and regional studies (cf. Lazzeretti, Sedita, and Caloffi 2014; Hervás-Oliver, Gonzalez, and Caja 2014 for comprehensive overviews of these studies) have been interested in the phenomenon of spatial 'clustering' or agglomeration of firms since the publication of 'The Principles of Economics' by Alfred Marshall in 1890. This pioneer of studies in 'geographic agglomerations' of organisations defined the triad of external economies stemming from co-location: labour market pooling, specialised inputs and knowledge spill-overs.

While only a small number of researchers were interested in the phenomenon of geographic co-location of organisations in the several decades following Marshall's work (e.g. Dahmén 1970 who proposed the concept of 'growth poles'), the socio-economic developments in the 1980s-90s triggered a new wave of studies in this tradition. Specifically, two major changes in the social organisation and economic landscapes should be noted: the advent of 'the new competition' (Best 1990), and the advances of information and communication technologies (ICTs) which fostered flexible production arrangements (Nohria and Eccles 1992).

The phenomenon of the 'new competition' (Best 1990) implied a radical shift from the traditional price-based competition to a Schumpeterian '…competition from the new commodity, the new technology, the new source of supply, the new type of organization…' (Schumpeter 1943, 107). To be able to compete in this new paradigm, companies engaged in the process of disintegration and downsizing, i.e. a transition from the organisational model based on a large vertically integrated firm to a network of firms linked laterally and horizontally (Nohria and Eccles 1992; Lorenz 1991; Miles and Snow 1986; Cravens, Piercy, and Shipp 1996; Quinn 1992). This process, later accompanied by the ever-increasing use of ICTs, implied a decentralisation of activities towards subcontracting firms and gave rise to a new form of organisation – a 'network enterprise' or a 'meta-enterprise' (Raymond and Blili 1997). This novel organisational form provided the benefits of both vertically integrated companies and small firms, i.e. economies of scale, as well as flexibility and adaptability (Johnston and Lawrence 1991; Raymond and Blili 1997).

These developments had a reflection in the studies of geographic agglomerations of organisations triggering the revival of the Marshallian tradition. Thus, the ability of these new 'network' forms of organisation to withstand economic shocks and swiftly adapt to changing market conditions was noted by the Italian school of 'new industrial districts' (e.g. Becattini 1987; 1989 among others) and the GREMI school of the 'milieux innovateurs' (Aydalot 1986; Camagni 1995; Castells 1996) in the 1980s – 90s. These schools of thought shed light on several important elements of inter-firm network innovativeness, notably, the combination of competition and co-operation between the actors, their conscious engagement in networking activities, and synergies between them. Further to this 're-discovery' of Marshall's industrial districts and the new understanding of the drivers of their innovativeness, the first organised support initiatives were launched in the 'new industrial districts' in Italy around the 1980s. These initiatives aimed at supporting the development of already existing industrial districts through the provision of collective research and business services to their members (European Innovation Monitoring System (EIMS) 1993; OECD 2011).

This trend towards public and private 'intervention' to support networking and collaboration for innovation received wide public attention with the publication of Michael Porter's seminal work entitled 'The Competitive Advantage of Nations' (1990). In this and subsequent related works, he coined the concept of 'clusters' defining these as 'geographic concentrations of interconnected companies and institutions in a particular field' (Porter 1998a, 78). Despite the criticisms for its 'fuzziness' (Martin and Sunley 2003), the 'cluster' concept has been widely adopted within the policymaking community (Motoyama 2008). Arguably, its 'interpretive flexibility' facilitated its adoption in practice allowing to suit different goals and priorities of

regional development officials (Uyarra 2017; Sugden, Wei, and Wilson 2006). Clustering and cluster policies have thus become common in the developed and, later, in the developing and emerging countries as mechanisms facilitating the regional and national transition towards the knowledge-based economy (Etzkowitz 2012; Rosenfeld 2002; Sölvell, Lindqvist, and Ketels 2003; Lindqvist, Ketels, and Sölvell 2013; Ketels 2013; Ketels, Lindqvist, and Sölvell 2006).

The proliferation of cluster policies, in turn, led to the advent of a new phenomenon of 'cluster initiatives' (Sölvell, Lindqvist, and Ketels 2003) or 'cluster projects' (Fosse 2017) – actions taken by the public or private sector actors aiming at promoting the establishment, development and competitiveness of clusters (Sölvell, Lindqvist, and Ketels 2003; Skokan 2015; Fosse 2017). These initiatives have been gaining popularity across the globe ever since (Sölvell, Lindqvist, and Ketels 2003; Lindqvist, Ketels, and Sölvell 2013).

These developments imply a major shift from viewing clusters as self-generative and spontaneous phenomena to perceiving them as 'organised' and 'manageable' entities (e.g. Andriani 2003; Fen Chong 2009; Knop 2015; Fosse 2017). Recently, a line of studies focusing on such 'organised' clusters has highlighted the potential of the 'meta-organisational' perspective for the understanding of their dynamics and accounting for the specifics of the 'managed' versus 'spontaneous' clusters (Viachka 2013; Gadille, Tremblay, and Vion 2013; Leys and Joffre 2014; Fen Chong 2009; Gimet and Grenier 2018). Meta-organisations are 'organisations of organisations' driven by a common, system-level goal rather than steered by a hierarchical authority (e.g. Ahrne and Brunsson 2008; Gulati, Puranam, and Tushman 2012). This perspective can be revealing when applied to the context of self-aware and organised clusters helping account for the crucial differences between the spontaneous and 'deliberate' clustering. However, to date, it has received only limited scholarly attention.

1.2. Implications of the 'meta-organisational' perspective and research questions

The 'meta-organisational' perspective in cluster studies suggests a shift from a determinist to a voluntarist perspective assuming that a cluster can be seen as a 'coherent organisation' rather than a 'geographic agglomeration' or a 'population' of organisations (cf. Astley and Van de Ven 1983). But what does this mean for theory and practice? Two major implications can be distinguished: (a) the possibility to apply strategic management thinking in clusters and (b) the perception of clusters as deliberate actors within their environments. From these two implications of the 'meta-organisational' perspective in cluster studies, this research has drawn four research questions.

1.2.1. Application of strategic management tools in clusters

The meta-organisational perspective on self-aware and organised clusters opens up the pathway towards the application of organisation and strategy tools and frameworks. Indeed, seeing clusters as organised entities implies that these can be deliberately designed and managed. However, the specifics of the meta- or inter-organisational contexts limit the direct applicability

of approaches developed with an individual firm in mind (Normann and Ramirez 1993; Stabell and Fjeldstad 1998; Gulati, Puranam, and Tushman 2012).

Indeed, the increased role of inter-organisational relations in the process of value creation implies a significant evolution of the role of managers. These latter increasingly face the challenge of managing assets which are not directly owned by their own firms (Iansiti and Levien 2004). To respond to the challenges of this new reality, organisational and strategy scholars have developed a number of approaches emphasising the importance of dynamic value flows between the actors in the process of value creation (Raymond and Blili 1997; Allee 2000; 2002; Lusch, Vargo, and Tanniru 2010; Stabell and Fjeldstad 1998).

Such organisational tools as business models – notably 'open' and 'network-embedded' business models – were proposed to better reflect the firms' value creation mechanisms through their exchanges with external stakeholders and partners (Chesbrough 2007; Zott, Amit, and Massa 2011; Markides 2013; Palo and Tähtinen 2011; Bankvall, Dubois, and Lind 2017). The business model approach has been gaining momentum as a way to understand the existing business logic of an organisation and to improve its business processes (Osterwalder 2004). However, despite this increased interest in the inter-organisational context of value creation, most strategy and organisation research – including in the field of business models – is still predominantly firm-centric (Weiblen, Frankenberger, and Gassmann 2013; Palo and Tähtinen 2011; Kriz et al. 2016).

The application of the business model concept in the meta-organisational settings, such as clusters, can be extremely valuable as a way to uncover the complex processes of inter-organisational value creation (Arend 2013). Moreover, using the approach in a collective strategy-making exercise can help forge a shared understanding and vision among cluster members, which has been shown to contribute to cluster success (Sölvell, Lindqvist, and Ketels 2003; O'Dwyer et al. 2015). Thus, while there may be considerable benefits in applying the business model concept in clusters, to be meaningful and useful it should be adapted to reflect the complex nature of value creation in a meta-organisational setting. This brings forth the following research question:

Q1: *How is it possible to apply the theoretical framework of business modelling to the strategic management of clusters?*

Given the importance attributed to clusters as the drivers of regional and national innovativeness and competitiveness, it is crucial to understand how they contribute to these goals. To date, research has been inconclusive as to the effects of clustering on the individual firm performance (Arıkan and Schilling 2011). Furthermore, the 'managed' clusters have been subject to criticism as to their ability to drive innovation-based economic growth (cf. Hospers, Desrochers, and Sautet 2009). This research suggests that in order to deliver on their promise as the drivers of innovation, clusters should be deliberately designed with a view to foster the innovativeness of their members. As a business model can be designed around certain themes (Zott and Amit 2010; Storbacka et al. 2012) it has the potential to reflect different types of clusters' strategic objectives, including the promotion of innovation and technology (Sölvell, Lindqvist, and

Ketels 2003). Thus, a better understanding of the mechanisms driving cluster innovativeness is needed and the business model approach can provide a valuable theoretical foundation in this respect. The following research question is thus formulated:

Q2: *How can a business model of a cluster be designed to foster the innovativeness of its constituent members? In other words, what actions should be implemented by the cluster architects with respect to the business model elements so that these become conducive to cluster innovativeness?*

1.2.2. Examining clusters' 'actorhood'

Adopting the 'meta-organisational' perspective on clusters implies that these can be perceived as intentional collective actors capable of interacting with their environments and being a source of change within their contexts (Astley and Van de Ven 1983; King, Felin, and Whetten 2010). Indeed, organisation studies have recently highlighted the growing recognition of agency and 'actorhood' attributed to organisations (King, Felin, and Whetten 2010; Meyer 2010; Meyer and Bromley 2013; Bromley and Sharkey 2015; Halgin, Glynn, and Rockwell 2018). However, other research shows that 'actorhood' is not a necessary condition for the existence of an organisation and entities which are not perceived by the public as 'actors' can still have all the attributes of formal organisations (Grothe-Hammer 2018). On the other hand, the phenomenon of 'partial' organisations has been recently proposed to account for the existence of organisations displaying only some elements of formal organisations, i.e. lacking some of the attributes such as membership, hierarchy, rules, monitoring and sanctions (Ahrne and Brunsson 2011). The presence or absence of some of these attributes defines the extent to which the organisations are subject to external pressures and the ways in which they respond to these (Grothe-Hammer 2018; Ahrne and Brunsson 2011). Thus, should clusters be seen as organisations, or meta-organisations, these would be expected to display at least some of the attributes of the formal organisations. Moreover, their interactions with their external environment would depend on how these elements are enacted in the cluster setting.

As discussed, the view of clusters as 'meta-organisations' is still rare and the application of organisational theory to the cluster context has been limited to date. On the other hand, understanding the factors shaping clusters' capability to influence their environments can be of considerable practical importance. Indeed, it could both inform the policymaking and collective cluster management whereby the organisational design could become more deliberate and could better serve the goals of clustering. Thus, to extend the existing cluster and meta-organisational theories, the following research question has been formulated:

Q3: *Can self-aware and organised clusters be perceived as intentional actors capable of interaction with their contexts? How does the level of cluster 'organisationality' mediate its ability to act upon its environment?*

Finally, viewing clusters as deliberate actors capable of shaping their environments suggests that these can potentially defy dominant institutional logics to act as change agents (cf. Crouch, Schröder, and Voelzkow 2009). Such strategic action can be crucial for clusters operating in 'unsupportive' contexts, such as certain developed country regions displaying path

dependencies and lock-ins in undesirable evolutionary trajectories (Trippl and Otto 2009; Tödtling and Trippl 2013; 2005) or developing and emerging countries (Ketels, Lindqvist, and Sölvell 2006; Lehmann and Benner 2015). In such settings, cluster policies have become the 'go-to' approaches for an ever-growing number of policymakers, seeing clustering as a way to reshape the regional development paths (cf. Rosenfeld 2002). Thus, it is crucial to understand what strategies clusters can implement to deal with the systemic barriers to innovation present in their environments. While most research to date has been focusing on the role of cluster facilitators or 'cluster management organisations' (e.g. Ingstrup and Damgaard 2013; Lefebvre 2013; Coletti and Di Maria 2015), seeing clusters as meta-organisations can bring new insight into their ability to act collectively.

Moreover, while adopting the 'meta-organisational' perspective on clusters, this research highlights the importance of the contextual or territorial specifics with which clusters' development paths are inextricably linked. Thus, while the meta-organisational research is a-spatial (cf. Ahrne and Brunsson 2008), clusters are seen here as a distinctive, context-embedded, form of 'meta-organisations'. Thus, it becomes even more important to understand the ways in which cluster-environment interactions occur.

Transition country context can provide an interesting contextual setting for a study of clusters' intentionality and their interactions with their environments. Indeed, cluster policies in such countries have become widespread as a tool to counter 'systemic failures' hampering innovation and knowledge-based development (Ketels, Lindqvist, and Sölvell 2006; Andersson et al. 2004). These systemic failures are due to the inconsistencies present in the institutional environment governing the relationships between different actors of the innovation process. Transition economies, indeed, present a range of institutional inconsistencies or contradictions which are inherent in the process of institutional transition from the planned to a market economy (Li, Peng, and Macaulay 2013; Meyer and Peng 2005). While such contradictions may present barriers to the development of innovation and entrepreneurship, they can also enable the entrepreneurial action aimed at changing the institutions themselves (Battilana, Leca, and Boxenbaum 2009; Seo and Creed 2002).

Thus, if self-aware and organised clusters can be deliberate actors within their environments, it follows that they can intentionally shape the institutional settings to make them more conducive to innovation. This ability may be important in the contexts presenting considerable 'system failures' and may be enabled by the very presence of institutional contradictions, especially visible in the transition economy contexts. To answer the need for a better understanding of the ways in which clusters can shape their environments and re-direct the regional development paths, the following research question has been formulated:

***Q4**: How do clusters engage in institutional entrepreneurship in transition economies to alleviate institutional barriers to innovation?*

The next section will present the research design which was developed to answer these research questions.

2. Research design

This research aims at developing insight into the functioning of self-aware and organised clusters seen as 'context-embedded meta-organisations'. Specifically, this research pursues two major objectives. First, it aims at developing a theoretical framework for the strategic management of clusters with a view to fostering their collective innovativeness. Second, it aims at extending the existing theory with regards to the 'actorhood' of organised clusters and their ability to interact with and shape their environments to alleviate the barriers to innovation these present.

The research design of this thesis will now be described with respect to these objectives through the prism of three dimensions: (1) the 'archetypical model' of science, (2) the philosophical framework (e.g. ontological and epistemological assumptions), and (3) the methodology.

2.1. 'Archetypical' models of science

Studies in the field of organisation and strategy have followed the premises of four 'archetypical' models of science: natural sciences, humanities, social sciences and sciences of the artificial or design science (Romme 2003; Kagan 2009; Avenier and Gavard-Perret 2012). The formulation of the research questions as presented above meant that a combination of archetypical models of science had to be used for different parts of this research.

The first two research questions (Qs 1,2) suggest an orientation towards the search of a practical solution to a field problem, warranting a design science approach (van Aken and Romme 2009). Indeed, while management and organisational studies have traditionally been modelled after the natural sciences, humanities and social sciences (van Aken and Romme 2009; Kagan 2009), the potential of the 'sciences of the artificial' (Simon 1996) for the development of the management theory has been increasingly recognised due to their ability to produce results relevant to practice (Avenier and Gavard-Perret 2012; van Aken and Romme 2009; Denyer, Tranfield, and van Aken 2008). This perspective is also suitable to this research in that it is well adapted to the study of complex phenomena partially shaped by the human actions, such as organisations, markets and systems (Avenier and Gavard-Perret 2012). Indeed, clusters, being complex phenomena partially designed by human action and closely dependent on their external environments, represent a unit of analysis which fits the design science framework.

The second pair of research questions (Qs 3,4) dealing with the ability of clusters to influence their environments and the strategies these use to do so are more 'traditional' within the field of organisation studies and warrant approaches modelled after the social science tradition. Indeed, in contrast to the design sciences focusing on the creation of new systems and artefacts, social sciences focus on prediction and explanation of the existing organisational phenomena (Kagan 2009; Romme 2003). Thus, as the second pair of research questions aims at understanding clusters' strategic responses to environmental pressures, this research can clearly be inscribed into the social science tradition.

2.2. Philosophical framework

Adhering to a specific 'archetypical' model of science does not automatically imply adopting a specific epistemological framework or using any particular research method (Carlsson 2006; van Aken and Romme 2009). As this research adopts a rather 'non-traditional' approach to studying the phenomenon of clusters, it calls for a discussion of the philosophical groundings of the study justifying the methodological choices. Following Burrell and Morgan (1979), the philosophy of science is seen here as the ontological and epistemological assumptions as well as the assumptions about human nature ultimately influencing the research methods.

Burrell and Morgan (1979) propose that researchers' leaning towards a subjectivist or an objectivist perspective defines their ontological and epistemological assumptions and methodological choices. While in reality a clear-cut distinction between subjectivist and objectivist approaches is hardly possible, or even useful, researchers should still be able to indicate a certain preference towards one or another extremity of the 'subjectivist-objectivist' continuum (Saunders, Lewis, and Thornhill 2012). The stance taken in this research can be best described as 'intermediary' (Holden and Lynch 2004), though still leaning towards a subjectivist point of view.

Ontologically, this research admits that certain general or universal laws and an external reality do exist regardless of the subjective perceptions of the individuals. However, it also suggests that these latter are not only governed by the external, objective laws and realities but can themselves impact them intentionally or unintentionally. Their ability to do so, again, is both shaped by objective contextual factors and the individuals' subjective perceptions of these. Specifically, in the framework of this research, this ontological stance implies that both clusters and individual actors within these are elements of broad environments with which they continuously interact. Although these environments impose certain constraints, both clusters and individuals within them may take deliberate action to transform either their immediate contexts (e.g. the business model of the cluster) or broader environments, i.e. regional and national contexts.

Epistemologically, the research questions formulated in this research and the adopted ontological position require 'wearing two hats': one of a pragmatist and the other of a critical realist. The former 'develops knowledge in the service of action' and focuses 'on changing and/or creating artificial objects rather than [performing] analysis and diagnosis of existing objects' (Romme 2003, 562, 564). The latter 'requires the researcher to identify the contingent causal powers that are operating in the particular situations under research and the ways in which they combine and interact in order to create the particular events observed in the empirical domain' (Easton 1995, 377).

Indeed, the first research question with regard to designing a cluster business model framework (Q1) calls for a design science approach and thus warrants the application of a pragmatist perspective. Indeed, this latter focuses on practical applied research and integrates different perspectives to interpret the data (Saunders, Lewis, and Thornhill 2012).

On the other hand, identifying the drivers of cluster innovativeness (Q2) and the ways clusters interact with and influence their environments (Qs 3,4) can be inscribed within the critical realist perspective. This approach implies that the phenomenon under study exists and develops independently of the researcher's interest in it. On the other hand, it also accepts that reality is socially constructed to a certain extent (cf. Easton 2010). Moreover, this approach takes a particular interest not only in the identification of specific elements and structures of a phenomenon but aims at uncovering the underlying mechanisms or powers which guide the relationships between the elements and lead to specific outcomes of their interactions (e.g. Avenier and Gavard-Perret 2012). The identification of these 'generative mechanisms' is warranted by the three research questions dealing with the drivers of cluster innovativeness, the impact of cluster organisationality on its ability to act and the strategies clusters use to shape their environments (Qs 2-4).

Finally, the assumptions made about the nature of human behaviour in this research lean towards a voluntarist perspective, as mentioned in the previous sections. Clusters are thus seen as deliberate and intentional actors. However, their ability to act is at the same time constrained, oriented, and enabled by the broad contextual conditions.

These assumptions with respect to the ontology, epistemology and the nature of human behaviour guided the selection of the methodological approach for this research.

2.3. Methodology and chapter structure

While the methodologies adopted to answer each of the research questions will be described in detail in the corresponding chapters of this thesis, this section will provide a global overview.

The research in the framework of this doctoral dissertation has been designed around two phases: theory development, and theory elaboration. To identify the specific steps to be taken and methods to be adopted within each of these phases, this research has built upon the methods adopted within the design sciences (Takeda, Veerkamp, and Yoshikawa 1990; March and Smith 1995; Hevner et al. 2004; Peffers et al. 2007; Denyer, Tranfield, and van Aken 2008; Winter 2008; van Aken and Romme 2009; Offermann et al. 2009; Hevner and Chatterjee 2010) and the social sciences (e.g. Easton 1995; 2010; Miller and Tsang 2011; Avenier and Gavard-Perret 2012; Yin 2008; Saunders, Lewis, and Thornhill 2012). This literature was also used to identify the mechanisms ensuring the rigorousness of the study in terms of its validity (internal and external) and reliability (Gibbert, Ruigrok, and Wicki 2008; Yin 2008). An overview of the research design is presented in Figure 1.

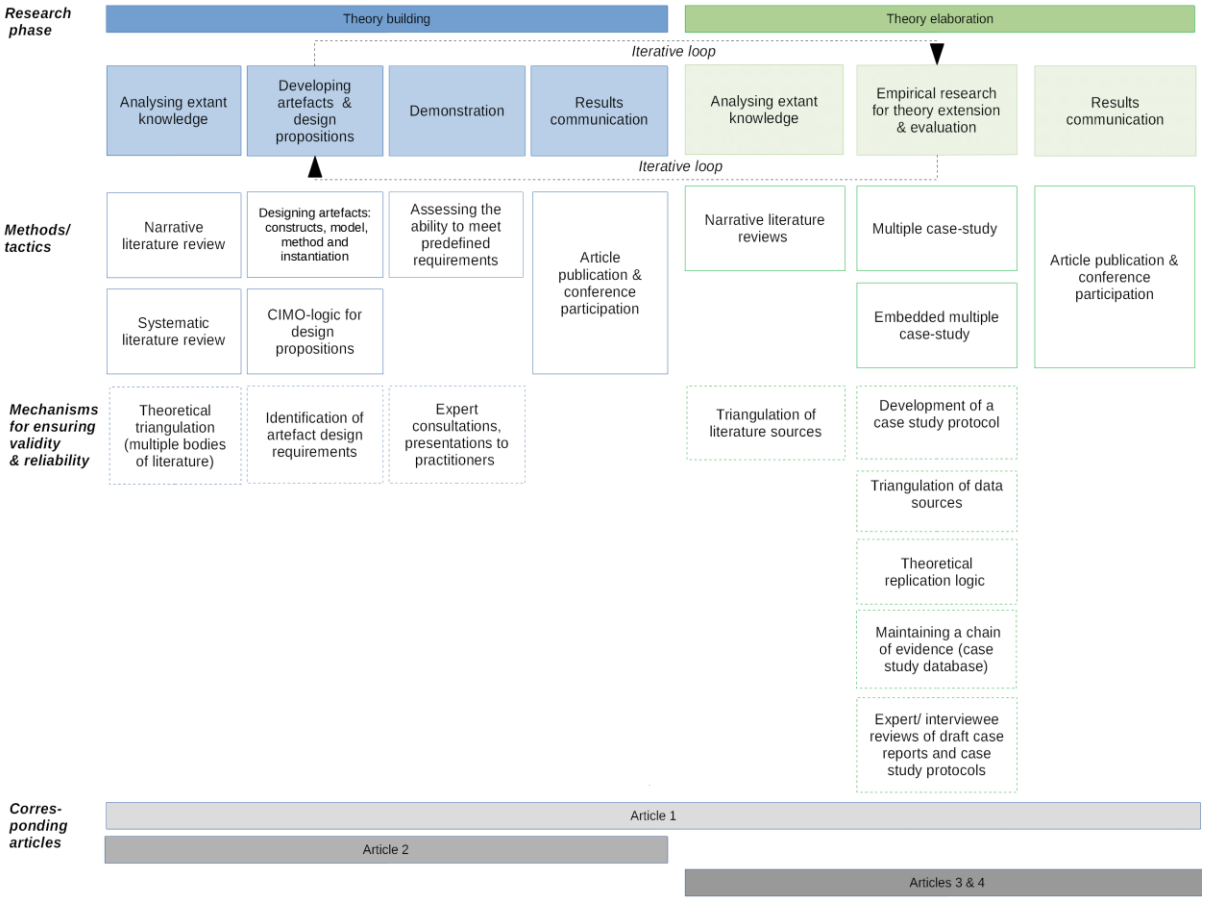

Figure 1: An overview of the research design

Before this section moves on to the discussion of the structure and methods of individual articles, it is important to note one crucial implication of the voluntarist stance taken in this research described in the previous sections.

The 'traditional' cluster studies were modelled after the determinist perspective seeing clusters as 'populations' of organisations. In general, these studies have been using quantitative methods for cluster identification using the analysis of patent data (Alcácer and Zhao 2016), industry concentration (Ellison and Glaeser 1994), or input-output relationships between industries (Feser and Bergman 2000) to measure the relative density of economic activity in a given location which indicated the presence of a cluster.

The voluntarist perspective, on the other hand, suggests that clusters can be seen as a 'coherent organization' displaying corporate unity or internal cohesion (Astley and Van de Ven 1983, 258). Cluster identification then becomes a matter of distinguishing between the 'organised' versus 'non-organised' economic activity and can draw upon Penrose's classical distinction between 'the firm' and 'the market'. Indeed, she suggested that what differentiates the former from the latter is the fact that the economic activity in the firm 'is carried on within an administrative organization' (Penrose 2009, 13). Similarly, assuming an organisational perspective on managed clusters suggests that their boundaries can be drawn following the limits of their administrative organisation. Thus, 'organised' clusters functioning as meta-organisations should display at least some elements of formal organisations such as

membership, hierarchy, rules, sanctions and monitoring (Ahrne and Brunsson 2011). Another organisational element, the collective identity (Dobusch and Schoeneborn 2015; Schoeneborn, Kuhn, and Kärreman 2019), can also be important for the identification of a cluster functioning as a meta-organisation. Indeed, meta-organisations can be based on the adherence of their individual actors to a system-level goal rather than their being bound by formal, contract-based, relations (Gulati, Puranam, and Tushman 2012). Thus, within the meta-organisational perspective, identifying and delimiting clusters implies a qualitative approach, whereby a 'geographic concentration' of companies can be considered an 'organised' cluster if it displays at least some of the five elements of formal organisations. Another possible approach in the absence of formal membership would imply identifying clusters based on their communicative claims (i.e. self-attribution of the 'cluster' identity) and that of their members (self-attribution as 'cluster members'). These considerations constituted the premises for the selection of clusters for case studies. The case study design is covered in more detail in the respective protocol (Annex 5).

The 'research communication' at each phase is covered in the respective academic articles presented in Section 4 of this document. Moreover, the communication of the research findings was ensured through the researcher's participation in three conferences: (1) International Society for Professional Innovation Management (ISPIM) Innovation Summit, Melbourne, Australia on 10-13 December 2017; (2) II International Workshop on Cluster Research on 15-18 May 2019 in Padua, Italy; and (3) TCI (the Competitiveness Institute) Network Global Conference on 8-10 October 2019 in Antwerp, Belgium.

Article 1 entitled 'Designing a cluster business model' covered both theory-building and theory-elaborating stages. The article addressed the research question regarding the application of the business model concept in clusters (Q1). To do so, the article aimed at building a strategy tool and used the methods of a narrative literature review combined with the design science approach. The narrative literature review was used to assess the state of knowledge in the field and develop the requirements for the design of a cluster business model. The design science approach was applied to develop the constructs (i.e. the elements describing the value creation in clusters) and the business model, describing the relations between the constructs. Then, the method for cluster business modelling was developed as well as an instantiation, or a visualisation, of the model and the method. To evaluate the developed theory, three approaches were used: literature review, expert evaluations, and case studies. The first evaluation approach was based on the analysis of three streams of literature on clusters, meta-organisations, and network business models. This allowed for the triangulation of the sources and thus ensured construct validity and the reliability of the evaluation stage. The second evaluation approach implied sharing the developed framework with the practitioners in the cluster field and soliciting their feedback. Finally, four case studies were conducted to evaluate the extent to which the developed business model framework is applicable in the context of clusters[1].

[1] For each of the clusters participating in the case studies a business model report was prepared by the researcher. To preserve the privacy of the sensitive data these have only been shared with respective clusters and do not make part of this thesis.

Article 2 entitled ‘Innovation-centric cluster business model: findings from a design-oriented literature review’ focused on developing design propositions to shape the cluster business model elements so that these become more conducive to cluster innovativeness. This article covered the theory-building stage and was based on a mixed-method approach combining the systematic literature review and a design-oriented synthesis following the ‘CIMO-logic’ (Denyer, Tranfield, and van Aken 2008). The latter implies the synthesis of the findings of a literature review following four dimensions: Contexts, Interventions, Mechanisms and Outcomes (CIMO). While the adoption of a systematic literature review approach ensured the transparency of literature selection and thus the reliability of the study, the adoption of the ‘CIMO-logic’ allowed to formulate clear propositions for cluster design, thus ensuring the relevance of the study for cluster practitioners.

Article 3 entitled ‘Do clusters act? Understanding clusters’ ability to change their environments’ took a theory-elaborating stance and focused on extending the current understanding of cluster intentionality and ‘actorhood’. The article thus built upon and extended the organisation studies research, notably the recent developments regarding the attributes and levels of organisationality, ‘cross-pollinating’ it with cluster studies. As the meta-organisational perspective in cluster studies is rather novel, the theory-elaborating approach was deemed most appropriate. The multiple case study methodology was applied, whereby two clusters in Australia were analysed in order to gain insight into the influence of the level of organisationality on the cluster-environment interactions.

Finally, Article 4 entitled ‘Clusters as institutional entrepreneurs: lessons from Russia’, tackles the question of whether self-aware and organised clusters can be considered institutional entrepreneurs and discusses the strategies these adopt to change their environments. In this article, again, the theory-elaborating approach was taken due to the lack of research focusing on strategic interactions between meta-organisations and their environments. The initial understanding of the research field was built based on three streams of research: the neo-institutional theory and meta-organisation studies, again, ‘cross-pollinated’ with the cluster research. For this article, the embedded multiple case study methodology was used which allowed gaining insight into the acts of institutional entrepreneurship both at the cluster level and at the level of sub-groups of cluster actors. The contextual characteristics were an important element of this research and Russia was selected as an example of a transition economy displaying a range of institutional contradictions which may enable, constrain, and orient institutional entrepreneurial activity.

3. Collection of articles

Article 1: Designing a cluster business model[2]

Abstract

In this article, we adopt a meta-organisational perspective on self-aware and organised clusters seeing these as 'organisations of organisations' which can be deliberately designed and managed. However, the meta-organisational context poses a set of unique challenges and requires novel approaches to organisational design and strategizing. While organisation and strategy scholars have devised a wide range of tools and approaches to management in individual companies, the meso-level approaches focusing on the inter-firm settings are still rare. To make a step towards developing a repertoire of strategy tools answering the challenges of managing clusters, we adopt the design science approach to develop a 'cluster business model' and a method for applying it in practice. The developed framework can be used for collaborative strategy-making by the cluster members, helping align the diverging interests of multiple actors. The meta-organisational approach developed in this paper represents a departure from the traditional approaches to cluster analysis and opens up novel avenues for future research.

Keywords

visual strategy tool; strategy as practice; cluster; meta-organisation; business model; innovation

Introduction

Clusters are increasingly perceived as a pathway towards the knowledge economy both in the developed countries and the developing and transition economies (Ketels, Lindqvist, and Sölvell 2006; Etzkowitz 2012). However, high expectations of the policy-makers are not always realised in practice, as many of the 'Silicon Somewheres' of the world have turned out to be largely unsuccessful (Hospers, Desrochers, and Sautet 2009). One of the reasons, we suggest, is the lack of appreciation in current cluster research and practice of the shift from 'spontaneous' towards 'organised' clustering which has been taking place in the past decades. In this paper, we perceive clusters as 'context-embedded meta-organisations' consciously implementing strategies and pursuing collective goals (Gadille, Tremblay, and Vion 2013; Viachka 2013; Leys and Joffre 2014). However, the 'meta-organisational' perspective on clusters requires new analytical and managerial tools, traditional ones being less well suited to the complex inter-organisational forms (Normann and Ramirez 1993; Stabell and Fjeldstad 1998; Gulati, Puranam, and Tushman 2012). To answer this need, we develop a framework for strategizing in the cluster context – a cluster business model – and a method for its application in practice.

Recently, organisational and management scholarship has highlighted the potential of business models and organisational design for a better understanding of meta-organisations – complex,

[2] An abridged version of this article was submitted to the 'Journal of Business Models' on 9 March 2020 as E. Lupova-Henry, S. Blili and C. Dal Zotto. 'Designing a cluster business model'. The article is currently under peer-review.

non-traditional, settings involving non-monetary relationships between the participants (e.g. Arend 2013; Gulati, Puranam, and Tushman 2012; Palo and Tähtinen 2011). Although the calls have been voiced for the business model and organisational design studies to move beyond the single firm level (cf. Fjeldstad and Snow 2018), most current research in this field still predominantly focuses on individual organisations (Weiblen, Frankenberger, and Gassmann 2013; Palo and Tähtinen 2011). The application of the business model concept in clusters can be of considerable practical value as it can allow to better understand the existing business logic of the cluster and to improve its business processes (Osterwalder 2004). It can also help forge a shared understanding and vision among cluster members, which has been shown to contribute to cluster success (Sölvell, Lindqvist, and Ketels 2003; O'Dwyer et al. 2015). However, a direct application of strategy tools and approaches developed with an individual firm in mind will not bring the desired results in a meta-organisational setting (Arend 2013; Gulati, Puranam, and Tushman 2012).

To develop a tool adapted to strategy-making in the cluster context, we adopt a design science approach which has proven relevant for designing practical solutions to real-life problems (Van Aken 2004; Denyer, Tranfield, and van Aken 2008). First, we define the business model elements relevant for clusters and the relations between them – i.e. we construct the cluster business model. We then develop a step-by-step method for its application in practice. And, finally, we develop a visual representation of the cluster business model adapted to the strategy- and decision-making in complex meta-organisational settings. In doing so, we leverage the potential of business models as 'physical tools for thinking' allowing to visualise the clusters' business logic and activities (Arend 2013; Boland and Collopy 2004a).

This article is organised as follows. First, we present our theoretical background and discuss the potential of the meta-organisational perspective and business modelling in the cluster context. Then we move on to describe our research design. We then present our findings: the cluster business model, the method for applying it in practice and the visual representation of both the model and the method. Finally, we discuss the contributions of the article to theory and practice and conclude by proposing avenues for future research.

Theoretical background

Of clusters and meta-organisations

Clusters are most commonly defined as 'geographic concentrations of interconnected companies and institutions in a particular field' (Porter 1998a, 78). This definition is quite broad and has been criticised for its 'lack of clear boundaries' (Martin and Sunley 2003), which meant that the criteria for identifying clusters have proven difficult to pin down (Rosenfeld 1997). This led to a wide variety of geographic agglomerations of companies having been tagged 'clusters', such as the carpet industry in Dalton, Georgia (Rosenfeld 2002), semiconductors and electronics in Silicon Valley (Saxenian 1994), or music and life sciences clusters in Sweden (Laur, Klofsten, and Bienkowska 2012) to name just a few. While some of these clusters are not self-aware and do not pursue a common strategy, others are deliberately managed and enjoy government support in the framework of targeted cluster or innovation policies (Laur, Klofsten,

and Bienkowska 2012; Sölvell, Lindqvist, and Ketels 2003). For the purposes of this paper, we will focus on those entities which do recognise themselves as 'clusters', have a form of management and pursue common goals.

However, how are we to draw a boundary of such clusters be it a geographical or conceptual one? The classical distinction between the firm and the market can be revealing in this respect: the economic activity in the former 'is carried on within an administrative organization' (Penrose 2009, 13). Applying the same reasoning to defining the boundaries of an 'organised' cluster to set it apart from 'the market', we suggest that its boundary can be drawn following the limits of its administrative organisation. Thus, 'organised' clusters display at least some elements of formal organisations as membership, hierarchy, rules, sanctions and monitoring (Ahrne and Brunsson 2011). Such clusters can be considered 'organisations of organisations' or meta-organisations (Ahrne and Brunsson 2008). These can be defined as 'networks of firms or individuals not bound by authority based on employment relationships but characterized by a system-level goal' (Gulati, Puranam, and Tushman 2012, 7). However, while the meta-organisational perspective is a-spatial, clusters are deeply context-embedded phenomena whereby the national, regional and sectoral characteristics along with the cluster evolutionary stage and institutional mode are crucial in understanding their dynamics (Fromhold-Eisebith and Eisebith 2005).

Indeed, clusters are shaped by socio-economic, legal and political landscapes as well as cultural contexts (Castells and Hall 1994; Asheim 1996; Brass et al. 2004; D. A. Wolfe and Gertler 2004). Notably, broad institutional characteristics, such as the rule of law, mechanisms for protection of intellectual property rights, corporate and individual taxation, and competition laws among others have significant influence on the ways entrepreneurial actors engage with each other in the cluster context (R. E. Miller and Côté 1987; Smilor, Gibson, and Kozmetsky 1989; Bröcker, Dohse, and Soltwedel 2003; D. A. Wolfe and Gertler 2004; Mason and Brown 2014; Murray and Budden 2017). Furthermore, sectoral settings and dynamics also define which cluster characteristics would be crucial for its survival. For instance, highly dynamic and volatile environments characterised by constant and unpredictable technological change require highest possible levels of organisational flexibility and adaptability of a cluster, whereas in less dynamic settings this will not be the case (Cravens, Piercy, and Shipp 1996). Moreover, clusters should be understood as dynamic entities, which come into existence over time and pass through different life-cycle or development stages, such as formation, development and maturity (e.g. Leslie and Kargon 1996; Enright 2003; Müller et al. 2012; Carbonara 2004). Depending on the current life-cycle stage and trajectory of evolution, clusters may have different architectures, goals and priorities, and will thus require different approaches to management (cf. Fosse 2017; Ingstrup and Damgaard 2013). Finally, the institutional mode of a cluster – i.e. the level of involvement of public versus private sector actors – is an important factor defining the power distribution in the cluster and the actor roles (cf. Fromhold-Eisebith and Eisebith 2005).

Drawing on the discussion above, we define self-aware and managed clusters as 'context-embedded meta-organisations'. Driven by a system-level goal, individual companies constituting a cluster align their interests and engage in coopetition (Best 1990), the meta-

organisational context providing a boundary and enabling collaboration between unlikely allies (Berkowitz and Dumez 2016).

The meta-organisational view of clusters implies a departure from the more traditional perspective seeing clusters as spontaneous entities (Porter 1998a; Andriani 2003). Specifically, it suggests that clusters, just as individual organisations, can be deliberately designed and managed by a variety of change agents (van Aken and Romme 2009). These, in the cluster context, may involve a broad range of stakeholders both internal and external to it, no single actor being 'in charge' of the cluster (e.g. Berkowitz 2018). Rather, in clusters functioning as meta-organisations, the strategy-making and management are collective tasks involving the whole cluster community (Gulati, Puranam, and Tushman 2012). These specifics of strategizing in clusters call for new tools and approaches adapted to the meta-organisational and multi-actor contexts.

Business modelling in the inter-organisational context

While the concept of business models has been widely adopted in the strategic management research and practice, its value within the single-firm settings has been contested (Casadesus-Masanell and Ricart 2010; Arend 2013). On the other hand, in complex, non-traditional organisations involving non-monetary exchanges – such as meta-organisations – the business model approach can bring significant value allowing to identify, delineate and analyse their structuring and value creation (Arend 2013). In this paper, we see business models as 'simplified and aggregated representation' of the relevant value-creating activities of an organisation (Wirtz et al. 2016, 41). As such, a business model can be seen as a 'recipe' describing how strategic elements of an organisation are arranged and combined making it successful or not (Baden-Fuller and Morgan 2010). Finally, a business model is a reflection of the organisation's strategic choices be these intended or emergent (Casadesus-Masanell and Ricart 2010; Shafer, Smith, and Linder 2005; Wirtz et al. 2016).

In their comprehensive review of the business model literature, Wirtz et al. (2016) identified the most common business model elements: strategy, material and immaterial resources, network (as a part of the focal firm business model), customers, market (competitors, market structure and value offerings), value-creating activities (e.g. value generation, resource acquisition) and the financial elements, such as revenues and costs. These, however, are based on the literature predominantly adopting an intra-firm, perspective. Indeed, although the external relations are increasingly taken into account in the business model literature (cf. Chesbrough and Rosenbloom 2002; Osterwalder 2004; Shafer, Smith, and Linder 2005; Chesbrough 2007; Chesbrough and Schwartz 2007; Chesbrough 2010; Nenonen and Storbacka 2010; Storbacka et al. 2012), only a limited number of studies focuses on the inter-organisational level of analysis. However, there are some notable exceptions which can provide insight into business modelling in the inter-organisational context, see Table 1 for an overview.

Unit of analysis	Definition	Business model components	Authors
Open business models for innovation networks	'focused on external resources as key contributors to a firm's value creation process where the value for the customer is co-created between actors in a network' (p. 319)	*Customer* (customer needs); *Network Value Creation* (value proposal; core competencies; network activities); *Network Actors* (actors and roles; partner evaluation criteria); *Network Value Exchange* (shared resources/activities; information; technology); *Network Value Capture* (cost; revenues); *Network Governance* (security policies; KPI network performance; benefits sharing).	(Rojas and Azevedo 2014)
Business models for virtual enterprises	'A business model explains how the logic of the organization is, the way it operates, and how it creates value for its stakeholders.' (p.626)	*Customers* (customer needs; value proposition); *Value network* (activities; partner evaluation criteria; actors; roles; competencies); *Value exchange* (shared resources/activities; information; technology); *Value capture* (cost; revenues); *Network governance* (flows of information; security policies; KPI network performance; benefits sharing).	(Rojas et al. 2012)
Networked business models	'describes the way a strategic business net creates value' (p.378)	*Actors* (suppliers, partners, customers, competitors, and other network players) *and their roles* (in terms of network position and value created); *Value exchanges* (flows of money, resources, competencies, and other benefits); *Business logic and strategic choices.*	(Palo and Tähtinen 2011)
Collaborative network business models	'conceptual tools containing a set of objects, concepts and their relationships to express the business logic of a […] collaborative network.'	*Value proposition* (co-created by a network together with its customers); *Infrastructure/technological architecture* (enabling co-creation, marketing, and delivery of the value proposition); *Organisational arrangements* (governance model of cooperation; costs, investments and risks required to generate sustainable revenue streams).	(Romero and Molina 2011)
Business models for value networks	'the system connecting internal and external actors by value flows to create, deliver and capture value' (p.3)	*Value actors* (network nodes); *Value flows* (relationships among actors); *Value network structure* (scale, density, and centrality).	(Wu and Zhang 2009)
Network business model	A business model centred on a network	*Product/service*; *Business actors and their roles* (value-creating activities); *Value-creating exchanges among the actors* (economic and non-economic value created and exchanged - the money flows, product/service flows and information flows)	(Komulainen et al. 2006)

Table 1: Network business models

Comparing the elements of the inter- and intra-organisational business models makes apparent several key differences between these. First, in both research fields, value is the key underlying concept of a business model (e.g Amit and Zott 2001; Osterwalder 2004; Teece 2010; Palo and Tähtinen 2011). However, the firm-centric perspective tends to emphasise the monetary or financial aspects of firm operation: intra-organisational business models basically describe how firms achieve profitability (Wirtz et al. 2016; Keen and Qureshi 2006). On the other hand, the inter-organisational perspectives tend to focus on the value exchanges among the actors and the governance mechanisms ensuring value appropriation (cf. Palo and Tähtinen 2011; Romero and Molina 2011; Komulainen et al. 2006). This reflects the non-monetary orientation of value creation in the meta-organisational settings (Arend 2013). Thus, the financial aspects are not covered in most inter-organisational approaches with the exception of Rojas et al. (2012) and Rojas and Azevedo (2014).

In the inter-organisational context, governance comes to the fore as a mechanism allowing collaboration and value appropriation by individual actors. Whereas in the firm-centric approach the strategic decisions are carried out by individual firms to govern their relations with external network actors (Amit and Zott 2001; Nenonen and Storbacka 2010), within the inter-organisational setting, governance is performed collectively and aims at enabling cooperation, benefit sharing and shaping the business logic of a network as a whole (Rojas et al. 2012; Palo and Tähtinen 2011; Romero and Molina 2011; Rojas and Azevedo 2014).

With respect to resources, the key difference of the network business model is in that it describes the pools of resources and capabilities which are made available by the network actors to each other for collective value creation but do not belong to the network and remain in the ownership of individual actors (cf. Rojas et al. 2012; Rojas and Azevedo 2014; Palo and Tähtinen 2011).

Furthermore, within the inter-organisational perspective, customers and competitors are considered as actors within the network rather than external to it. Indeed, viewing business models from the inter-organisational perspective implies a reversal from considering the network as a part of a business model of an individual firm to viewing individual firms – as well as customers, competitors and other actors – as components of the network's business model. Thus, whereas the firm-centric business models include the value network (or value chain) as one of the components (Nenonen and Storbacka 2010), the inter-organisational perspective refers to such elements as network actors, their roles as well as value flows among them (Rojas and Azevedo 2014; Rojas et al. 2012; Palo and Tähtinen 2011; Wu and Zhang 2009; Komulainen et al. 2006).

Finally, within the inter-organisational perspective, value-creating activities are performed by the collective of actors rather than the focal firm. Again, these are not necessarily focused on monetary value generation but may involve other, non-monetary collective benefits. In a similar vein, in the inter-organisational business models the 'value proposition' is no longer perceived as an output of a single firm but as a collective output of the network of actors (Komulainen et al. 2006; Romero and Molina 2011; Rojas et al. 2012; Rojas and Azevedo 2014).

To summarise, adopting the inter-organisational perspective on business modelling requires a shift of perspective. Indeed, the constituent actors and their roles define what types of resources and capabilities will be available for the inter-organisational value creation. This, in turn, shapes the collective value proposition of the network. Clear governance mechanisms are crucial to ensure that the tangible and intangible resources flow between the actors, enabling these to engage in collective value-creating activities. These specifics of the value creation in the complex meta- and inter-organisational settings call for strategy tools adapted to these contexts.

Research design

In this paper, we adopted the design science research approach (A. R. Hevner et al. 2004; Peffers et al. 2007; Van Aken 2004; 2005). Currently, no commonly accepted methodology exists for conducting design science-based research (cf. Dresch, Lacerda, and Antunes 2015 for an overview of design science research approaches). Thus, we built upon a number of approaches adapting these to the needs of our research but following their major guidelines for ensuring the validity and relevance of our study.

Most design science approaches build upon and expand the two key design activities proposed by March and Smith (1995): building and evaluating. The two activities are iterative: the potential solutions are developed, evaluated, and the results are then fed back into the 'building' stage to re-design the artefacts until they fully meet the design requirements (Nunamaker, Chen, and Purdin 1990; Venable 2006; Peffers et al. 2007; A. R. Hevner et al. 2004).

'Building' activities include theory building, identification of requirements to the solution (artefact) design and solution design per se (Peffers et al. 2007; Venable 2006; Nunamaker, Chen, and Purdin 1990; Van Aken, Berends, and Bij 2012). At this stage, the designers define the artefact's architecture based on its desired functionalities, translate this into a prototype artefact and then create the final artefact once the evaluation has been performed (Nunamaker, Chen, and Purdin 1990; Van Aken, Berends, and Bij 2012; Peffers et al. 2007). The way the artefact will be implemented in practice is also defined at this stage (Peffers et al. 2007; Van Aken, Berends, and Bij 2012).

'Evaluation' activities imply observing and/or measuring how well the developed artefact meets its objective, i.e. to what extent it solves the problem it was designed to solve (Peffers et al. 2007; Van Aken, Berends, and Bij 2012; A. R. Hevner et al. 2004). Evaluation can be artificial (such as simulations and laboratory experiments) or naturalistic, i.e. involving empirical analysis, such as case studies, field studies, field experiments among other methods (Venable, Pries-Heje, and Baskerville 2016).

Methodology

Building stage

The 'building' stage in our case meant designing four types of artefacts – constructs, models, methods and instantiations (March and Smith 1995). First, we defined the constructs, or concepts, which form the vocabulary helping describe the problem within a domain of study (March and Smith 1995). In our case, these referred to the elements through which the process of value creation in a cluster context could be described. Then, we designed the model describing the relationships between constructs (March and Smith 1995). In our case, it meant describing how the identified elements interact and lead to value creation. Then, based on the constructs and the model, we identified the activities which would be involved in a business modelling exercise, i.e. developed a method of business modelling in the cluster context. Finally, we built an instantiation to operationalise our constructs, model and method (March and Smith 1995). In our case, it meant designing a visual representation of the business modelling method and the model itself. Table 2 summarises our approach and specifies the desired properties of each artefact and the key literature sources used for the framework development.

Artefact	Requirements	Key literature sources
Constructs **Model**	Encompassing the full spectrum of attributes and their relationships describing the value creation in the cluster context	Network business models (e.g. Rojas et al. 2012; Romero and Molina 2011; Palo and Tähtinen 2011; Komulainen et al. 2006); Cluster typologies (e.g. Markusen 1996; Iammarino and McCann 2006; Arıkan and Schilling 2011; Paniccia 2006); Meta-organisation studies (Ahrne and Brunsson 2008; 2005; Berkowitz and Dumez 2016; Gulati, Puranam, and Tushman 2012).
Method	Being applicable to different contexts while allowing to account for differences stemming from these	Organisational design (Burton et al. 2008; Burton, Obel, and DeSanctis 2011); Business model design (Zott and Amit 2010; Amit and Zott 2015; Zott and Amit 2007; Nenonen and Storbacka 2010; Storbacka et al. 2012; De Reuver, Bouwman, and Haaker 2013).
Instantiation	Visually demonstrate the relationships between the constructs (i.e. the model) and the relationships between the method and the model. Be suitable for the strategy making in pluralistic organization settings: - Be able to account for the needs and interests of the actors within and outside the formal boundaries of an organisation and	Strategy-as-practice (Jarzabkowski and Fenton 2006; Spee and Jarzabkowski 2009; Denis, Langley, and Rouleau 2007; Jarzabkowski and Wilson 2006); Meta-organisations as pluralistic organisations (e.g. Brès, Raufflet, and Boghossian 2018).

	- Focus both on individual and common value systems - Be transparent and easy to use

Table 2: Artefacts, requirements, and literature sources

Evaluation stage

For the 'evaluation' of our artefact, we followed the approach proposed by Venable, Pries-Heje, and Baskerville (2016) involving four activities: defining the goals of the evaluation, choosing the evaluation strategy(-ies), determining the properties to evaluate, and designing the individual evaluation episode(s).

To determine whether the artefacts fulfil their purpose we designed evaluations for the constructs and the model, the method, and the instantiation. We aimed at evaluating (a) whether the developed constructs and model reflect the full process of value creation in the cluster context, (b) whether the method for business modelling provides sufficient instructions to analyse the existing business model and to develop interventions for its improvement, and (c) whether the instantiation is transparent, allows to account for the involvement of multiple actors with diverging needs and to establish common fundamental values.

We conducted two rounds of evaluations from 2017 to 2019. These comprised three types of evaluations: literature reviews, practitioner evaluations and case studies. The evaluations were conducted in two iterative loops whereby the artefacts were re-built and re-evaluated until the final model was developed which satisfied the desired properties. This approach also supported the case study method whereby a preliminary case study allows to evaluate the methodology and refine it for consecutive case studies (Yin 2008). See Table 3 for a description of the evaluation procedure.

	Key focus/assumptions	**Evaluation process**	**Constructs**	**Model**	**Method**	**Instantiation**
1st round	The business model approach focused on the cluster management organisation and its activities in facilitating cluster networking.	Literature review	X	X		
		Case studies	X	X	X	
		Practitioner evaluation	X	X	X	X
2nd round	The transformation of the approach towards a meta-organisational perspective based on the results of the 1st round of evaluations further confirmed during the 2nd round.	Literature review	X	X		
		Case studies	X	X	X	
		Practitioner evaluation	X	X	X	X

Table 3: Evaluation approach

Though our literature reviews we evaluated whether the constructs and the model allow to fully describe the business logic of a cluster. We did so by comparing the model with extant relevant research to ensure that all the key elements are covered. We analysed three literature fields: the 'traditional' cluster and industrial district studies, the meta-organisational research, and the stream of research on network business models. With respect to the first stream of literature,

we focused on the research developing cluster and industrial district typologies and thus providing insight into the relevant elements characterising these. Through this analysis, we developed the constructs and theorised the relationships between these, i.e. designed the model.

The two rounds of practitioner evaluation allowed to evaluate all four types of artefacts and were conducted by sharing these with cluster practitioners, such as regional development officials, cluster managers and member companies as well as consultants specialised in the cluster field. This was done through personal contact and participation in specialised conferences. In each iteration, the feedback was solicited by the researchers which allowed to re-design the artefacts after the 1st iteration and to validate the final design in the 2nd iteration.

Case studies aimed at evaluating the relevance of the constructs and the model as well as the method's ability to guide the user through the process of business modelling at the same time meeting the specified requirements. To do so, we used interviews, observations, and document analysis. To select the clusters where the case studies would be performed, our key criterion was diversity in terms of contexts which would allow evaluating whether the key requirement to the method is met. Based on our preliminary literature review, we identified several contextual dimensions which influence cluster structure and strategy: cluster's institutional mode (i.e. government versus private sector driven) as well as its national, regional, and sectoral contexts. Thus, when selecting clusters, we ensured that these display variability along these contextual dimensions.

To identify clusters, we followed the meta-organisational perspective, whereby clusters represent an 'organisation of organisations', rather than a 'geographical concentration' of organisations. Thus, to select clusters functioning as meta-organisations, we focused on those which display at least one of the elements specific to formal organisations: hierarchy, membership, rules, sanctions and monitoring (Ahrne and Brunsson 2011). Table 4 provides a description of clusters where our case studies were conducted.

	1st round of evaluations		2nd round of evaluations	
	ALPHA	BETA	GAMMA	DELTA
National context	Australia	Australia	Russia	Russia
Regional context	Natural resource-rich environment, strong mining, agriculture	A tourism-oriented region, variety of resources but a lack of regional specialization	Natural resource-rich region, dominant petroleum industry	Limited natural-resource base, strong science tradition
Sectoral context	Machinery manufacturing, defence	Food processing, sustainability, machinery manufacturing	Oil refinery, petrochemicals, automotive and robotics	Pharmaceuticals and biotechnology
Life-cycle stage	Year founded: 2011 Emerging (starting to form linkages among the key cluster and ecosystem actors, defining the premises of value creation)	Year founded: 1996 Mature (strong linkages, established premises of value creation)	Year founded: 2011 Developing-mature (the collaboration of the existing regional actors started only after the foundation of the cluster)	Year founded: 2011 Developing (some ties have existed for a long time while others are being currently formed, notably with the newly established actors)
Institutional mode (private vs. public sector driven)	A private initiative supported by public funding	Private sector-driven	Mostly driven by the public sector actors (regional authorities, state-controlled companies)	Driven by the public sector actors (regional authorities)
Organisatio-nality	No formal membership, although a hierarchy exists	All elements of formal organisations are present	All elements of formal organisations are present	All elements of formal organisations are present

Table 4: Case studies overview

Formal interviews were conducted with 17 people in total (Clusters Alpha and Beta: 6 people, all involved directly or indirectly with both clusters; Cluster Gamma: 6, Cluster Delta: 5). The interviewees were selected to represent the different communities of cluster actors: firms, cluster management organisations, academia, and government. The goal of the interviews was to 'unpack' the cluster business model following the developed method. The average duration of the interviews was of one hour. Some participants were interviewed more than once. The interviews were conducted based on the interview guide which included topics for discussion,

rather than pre-defined questions, to allow for an in-depth analysis. The interview topics were based on the business model elements: governance, value-creating activities, value propositions, actors and their roles, resources and capabilities and value flows. Several cluster strategy and peer-learning sessions were recorded and subject to analysis along with interview audio[3].

In total, we collected about 26 hours of audio recordings as well as internal documentation and information from the open sources, observations, and notes from informal interviews. This data was then analysed with the use of NVivo software. The first round of case studies allowed to identify some discrepancies in our key assumptions about the clusters and their approach to business modelling, and lead to a redefinition of the business model elements. The second round allowed to validate the designed artefacts. Specifically, the key changes concerned the shift of focus from the 'cluster management organisation' to the cluster as a collective as the focal point of a business modelling exercise. This has led to re-shaping the business model elements whereby a decision was made to not include the financial aspects (costs and revenues) or value capturing mechanisms in the final business model framework. Indeed, analysing the value creation by the whole cluster collective implies that a variety of financial flows may be involved between the cluster actors – or groups of these – and the external stakeholders or partners. Moreover, in some cases costs for some cluster actors may represent revenues for others. Thus, in a cluster business modelling exercise, isolating various financial flows does not allow to accurately represent the realities of cluster functioning. However, such business model elements as 'resources and capabilities' as well as 'value flows' have been introduced to provide a better account of the financial and non-financial relations within a cluster. These will be presented in further detail below.

Findings: Presenting the 'cluster business model' framework

We will now describe our framework with respect to its four constituent design artefacts: the constructs, model, method, and instantiation. We will present the constructs and the model together to ensure the integrity of the argument.

The constructs and the model

In order to identify the constructs, i.e. the elements of a cluster business model, we built upon three streams of research: network business models (Palo and Tähtinen 2011; Wu and Zhang 2009; Rojas and Azevedo 2014; Komulainen et al. 2006; Romero and Molina 2011), cluster and industrial district typologies (Iammarino and McCann 2006; Markusen 1996; Arıkan and Schilling 2011; Gordon and McCann 2000; Paniccia 2006) and meta-organisations (Gulati, Puranam, and Tushman 2012; Ahrne and Brunsson 2005; 2008; Berkowitz 2018; Azzam and Berkowitz 2018; Berkowitz and Bor 2018). The review of these literature streams allowed to identify the key elements commonly used to describe clusters, meta-organisations, and network business models. Figure 1 presents the overlaps and differences between these.

[3] See Annex 5 for a detailed discussion of the case study design. For each of the clusters participating in the case studies a business model report was prepared by the researcher. To preserve the privacy of the sensitive data these have only been shared with respective clusters and do not make part of this thesis.

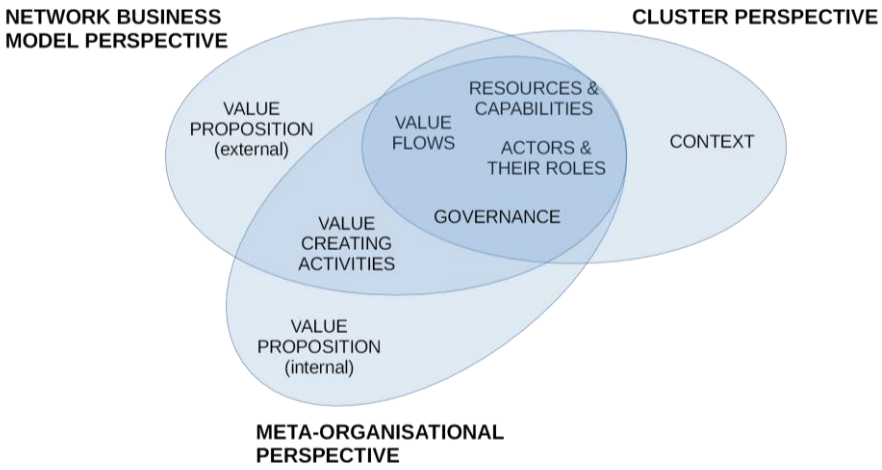

Figure 1: Identifying cluster business model elements

As the figure demonstrates, the three literature streams have some elements in common while others are specific to each of these. We will first focus on those at the intersection of the three fields and then discuss how the other elements – present in only some of the literature fields – may be relevant for the cluster business model design.

Actors and their roles

The three streams of research highlight the importance of understanding the composition of the network or cluster and identify the actors and their roles. Actors are individual organisations which make part of a larger network, meta-organisation, or cluster but at the same time retain their autonomy. Cluster literature highlights the role of the state, academic and research organisations as well as small and large firms in shaping the dynamics of clusters and industrial districts (Markusen 1996; Iammarino and McCann 2006; Paniccia 2006). In the meta-organisational and network business model research, actors can be at the same time the owners, co-producers and end-users of the co-created value (Berkowitz and Bor 2018), they can be simultaneously competing and collaborating, while contributing to the value creation in a different manner depending on the specific roles they play (Palo and Tähtinen 2011). One actor may play more than one role in a network business model (Komulainen et al. 2006).

Meta-organisational actors can be its formal members (Ahrne and Brunsson 2005; 2008) or 'informal' members adhering to a system-level goal but not bound by a membership agreement (Gulati, Puranam, and Tushman 2012). Attracting and retaining the 'right' categories of members is one of the crucial considerations for the survival of a meta-organisation (Berkowitz and Dumez 2016). The ability to do so influences the action potential and status of the meta-organisation (Ahrne and Brunsson 2005; Berkowitz and Dumez 2016).

Within the network business model studies, the actors are seen as assets that can be separated and combined allowing to attain the desired results (Komulainen et al. 2006; Palo and Tähtinen 2011). The meta-organisational perspective sees actors as both assets and constraints, on the

one hand enabling collective action but on the other hand constraining it due to the differences between the individual goals and motivations (Ahrne and Brunsson 2005).

Resources and capabilities

Within the cluster studies, the internal pool of resources plays a crucial role and defines the possibilities for innovation and cluster growth. Such resources as the internal labour market (Markusen 1996) and the innovative capabilities and competencies of cluster actors (Markusen 1996; Paniccia 2006) are key to understanding the clusters' developmental trajectories.

Similarly, in the meta-organisational and network business model studies, the actor composition defines the pool of resources available to its members and, thus, the value which these can create (Gadille, Tremblay, and Vion 2013; Palo and Tähtinen 2011; Ahrne and Brunsson 2005). Meta-organisations themselves do not necessarily own these resources but make them available to other members through the inter-organisational setting (Berkowitz and Bor 2018).

Value flows

Value exchanges in the network business model, meta-organisational and cluster literatures involve the flows of monetary as well as non-monetary resources and competencies allowing to create value (Palo and Tähtinen 2011; Berkowitz 2018; Azzam and Berkowitz 2018; Wu and Zhang 2009; Rojas et al. 2012; Gulati, Puranam, and Tushman 2012; Markusen 1996). These may be performed as discrete transactions or as long-term relationships (Komulainen et al. 2006).

In the meta-organisational setting, the locus of work is displaced to outside the individual firm boundaries where the external actors possessing unique knowledge enable new ways of value creation (Gulati, Puranam, and Tushman 2012). The meta-organisational setting facilitates coopetition, dialogue and information capture, knowledge transfers and collective learning (Berkowitz 2018).

In addition, cluster literature highlights the importance of the links or value flows between the cluster and its external environment (Markusen 1996). These studies also note that the interdependence and linkages among cluster actors depend on the technological complexity and the competencies required to govern the production of specific goods and knowledge (Paniccia 2006; Arıkan and Schilling 2011; Iammarino and McCann 2006).

Governance

The governance structures and modes are also present in the three streams of research and are crucial for understanding the functioning of clusters, meta-organisations and network business models (Markusen 1996; Paniccia 2006; Iammarino and McCann 2006; Gulati, Puranam, and Tushman 2012; Rojas et al. 2012; Rojas and Azevedo 2014).

Membership rules, the openness of access and admission procedures are some of the important mechanisms regulating the relations between the actors both within the meta-organisational (Ahrne and Brunsson 2005; Gulati, Puranam, and Tushman 2012) and cluster approaches (cf. Iammarino and McCann 2006).

In the meta-organisational setting, governance mechanisms do not involve formal authority stemming from an employment contract and giving some actors power over the others (Gulati, Puranam, and Tushman 2012; Ahrne and Brunsson 2005). Indeed, meta-organisations rely on 'soft' law and self-regulation rather than 'hard' laws to enable interaction among the actors (Berkowitz and Bor 2018; Berkowitz and Dumez 2016; Ahrne and Brunsson 2008). Governance is shaped by the members of meta-organisation (Gulati, Puranam, and Tushman 2012; Ahrne and Brunsson 2005) and may involve both formal and informal mechanisms (Brès, Raufflet, and Boghossian 2018; Azzam and Berkowitz 2018; Ahrne and Brunsson 2008).

Finally, the network business model literature highlights the importance of the governance mechanisms allowing profit distribution among the network firms and appropriability of returns (cf. Rojas et al. 2012; Rojas and Azevedo 2014).

Value-creating activities

This element is present both in meta-organisational and network business model research but not in the cluster studies in our selection. This is explained by the fact that clusters in the 'traditional' approaches are seen as 'geographic concentrations' of organisations, each of these pursuing only their own goals – rather than collective or system-level ones – and performing independent activities.

In contrast, the value-creating activities of a meta-organisation define its very existence, they are difficult to change and often result from a fragile compromise (Ahrne and Brunsson 2005; Gadille, Tremblay, and Vion 2013; Gimet and Grenier 2018). Meta-organisations pursue a combination of purposes, such as interaction among members, collective action, creation of collective identity and information production (Berkowitz and Bor 2018). Similarly, value-creating activities are at the core of the business model research and describe the ways actors generate value for their target audiences (e.g. Rojas et al. 2012; Palo and Tähtinen 2011).

While this element is absent from the traditional cluster studies, it can bring insight into the functioning of 'organised' clusters. Indeed, these can engage in different value-creating activities depending on their strategic orientation (Sölvell, Lindqvist, and Ketels 2003) as well as its actor composition and the goals and expectations of the external audiences (Rosenfeld 2002; Müller et al. 2012). Recognising that collective value-creating activities make an integral part of a cluster business model can thus bring insight into the variety of ways in which clusters reach their strategic objectives.

Value propositions

Finally, the concept of value proposition, being one of the critical elements of business model research and the meta-organisational studies, is absent from the cluster studies in our selection. This is, again, the reflection of the dominant 'geographical' approach to clusters whereby these are not seen as 'organised' entities with a common agenda or value proposition. However, some authors recognise the importance of the shared norms and the nature of beliefs of the cluster firms for the cluster evolution (e.g. Gordon and McCann 2000; Markusen 1996).

The conceptualisation of the value proposition within the business model and the meta-organisational perspectives are, however, different. Indeed, the business model research is externally-oriented in that it emphasises the value proposition of the whole network to the external target audiences and stakeholders (cf. Storbacka et al. 2012). Thus, the value in the network settings is shaped both by the customer needs and the internal capabilities and value flows within the network (Palo and Tähtinen 2011; Komulainen et al. 2006; Rojas et al. 2012; Rojas and Azevedo 2014).

On the other hand, in the meta-organisational settings, the value proposition reflects the value that individual members obtain or aspire to do so by participating in the meta-organisation. Each actor, while working towards a common goal is at the same time working towards the satisfaction of their own motivations (Gulati, Puranam, and Tushman 2012). Prospective members compare the value they may gain from participating in the meta-organisation with the contributions they have to make as its members (Ahrne and Brunsson 2005). Some of the key drivers for actors to participate in a meta-organisation is the possibility to achieve external influence and status (Ahrne and Brunsson 2005). The ability of the meta-organisation to deliver on its internally oriented value proposition defines its ability to retain and attract members and thus to exist.

Both the external and internal value propositions may be relevant for 'organised' clusters. Indeed, when clusters function as meta-organisations they may find themselves competing for members with other industry bodies as joining a cluster becomes a strategic decision for firms and just one of possible associational strategies they may pursue (Viachka 2013). Thus, being able to shape and deliver on an internal value proposition may be crucial for clusters in order to attract and retain members. On the other hand, clusters are seen as important policy instruments allowing to reshape regional economic development paths (cf. Rosenfeld 2002). Thus, clusters may be expected to deliver on the expectations of a broad range of government and societal stakeholders. In other words, clusters may need to prove their value and relevance to important external stakeholders whose support is crucial for their survival. Thus, both the internal and external value propositions can be relevant for understanding the processes of value creation in the context of 'organised' clusters.

Contexts

Cluster research is highly context-embedded and highlights the importance of the national, regional and industrial characteristics influencing clusters (cf. Markusen 1996; Paniccia 2006). In the reviewed cluster studies, the contextual characteristics pertain to the size of industry, its specialisation or diversification, the degree of decomposability and the nature of technology, knowledge conditions (e.g. knowledge base), spatial scale, range of horizontally and vertically related industries and the long-term developmental trajectories of the major industries cluster operate within (Paniccia 2006; Iammarino and McCann 2006; Markusen 1996). The characteristics along these dimensions may influence how geographically proximate firms engage in innovation, what types of resources these may access and whether there is a demand for clustered firms' products and services (Paniccia 2006).

On the other hand, both the network business model and meta-organisational research are a-spatial. Indeed, although one of the network business model studies emphasised the importance of the environment and its dynamics in the business modelling (Palo and Tähtinen 2011), the majority of papers did not take it into account. The same can be said about the meta-organisational research, some papers specifically noting that geographical co-location is not necessary for a meta-organisation and may even represent a disadvantage (Gulati, Puranam, and Tushman 2012). Although this view is supported by most meta-organisational studies, an important feature in these is the attribution of 'actorhood' to meta-organisations, whereby these are seen as actors deliberately shaping their environments (Azzam and Berkowitz 2018; Ahrne and Brunsson 2005). This point of view contrasts with the traditional 'geographical' approach in cluster studies but reflects the implicit assumptions of policymakers using the cluster approach as a way to re-shape regional development trajectories. We thus suggest that a two-way relationship exists between the organised clusters and their environments: while contextual characteristics do condition cluster developmental trajectories, these can also be shaped by clusters acting as agents of change.

Thus, we identify six cluster business model elements – actors and their roles, resources and capabilities, value flows, governance, value propositions and value-creating activities. These are subject to both strategic choices of the cluster and the external pressures. The configuration of these elements defines the nature of the cluster and its ability to create value. Working together, the key actors distribute roles according to the power relations in the cluster, they make available to each other a pool of resources and capabilities making the cluster a unique system which is larger than the sum of its parts. By exchanging value – both tangible and intangible – they create and shape the unique external and internal value propositions targeted, respectively, at external stakeholders – such as national and regional governments – and the internal ones, i.e. the cluster members.

The method

We view cluster business models as reflections of clusters' intended or realised strategies (Casadesus-Masanell and Ricart 2010). We thus suggest that cluster business modelling exercise can be both used for apriori strategy planning and for 'unpacking' the realised strategy and re-shaping it if necessary and appropriate. Through a review of the two streams of literature on organisational design (e.g. Boland and Collopy 2004a; Gulati, Puranam, and Tushman 2012; Burton et al. 2008; Burton, Obel, and DeSanctis 2011) and business model design (e.g. Zott and Amit 2007; 2010; Amit and Zott 2015; Storbacka et al. 2012), we identified five activities which may be involved in a cluster business modelling exercise: (1) ensuring collaboration; (2) goal-setting; (3) context analysis; (4) business model 'unpacking' and (5) business model design/re-design.

Ensuring collaboration

A collaborative approach can be one of the crucial elements in the business design process (Amit and Zott 2015; Boland and Collopy 2004b). Indeed, it can help bring together unique expertise and talents ensuring more opportunities for the invention of new solutions (Boland

and Collopy 2004b). Clearly identifying and engaging the key stakeholders can also be crucial in the cluster context. Indeed, as mentioned previously, in the meta-organisational context no single actor has the authority to design strategy and make decisions, and none has the full knowledge necessary for strategy development (Gulati, Puranam, and Tushman 2012). Ensuring that business modelling is a collaborative exercise can help engage and empower cluster actors, as well as drive their cohesion around a system-level goal, ultimately leading to cluster success (cf. O'Dwyer et al. 2015; Matinheikki et al. 2017).

Goal setting

The organisational design and business model design studies suggest that a design exercise should start by setting appropriate strategic goals and KPIs (cf. Burton et al. 2008; Burton, Obel, and DeSanctis 2011; Amit and Zott 2015; Storbacka et al. 2012; Jelinek, Romme, and Boland 2008). Business models may be centred around a certain 'theme' reflecting the organisation's strategic orientation (Zott and Amit 2010). Within the cluster context, these latter may range from lobbying, to education, to innovation (Sölvell, Lindqvist, and Ketels 2003), thus, their strategies and business models will vary accordingly.

Context analysis

The organisational and business model design research highlights the importance of contextual elements and environmental constraints in the design exercise and builds upon the institutional, configurational and contingency schools of thought (cf. Zott and Amit 2007; Amit and Zott 2015; Burton et al. 2008; Storbacka et al. 2012; Burton, Obel, and DeSanctis 2011). These suggest that best performance is achieved when there is an alignment or 'fit' between the strategy, organisational, and environmental variables (e.g. Donaldson 2001; Ginsberg and Venkatraman 1985; Meyer, Tsui, and Hinings 1993; Mintzberg, Ahlstrand, and Lampel 2005). Environmental constraints can also be seen as enablers if these are leveraged to create new business models and reshape the institutional environment (cf. Amit and Zott 2015). Thus, a thorough analysis of the environment can be a crucial element in the business model design exercise.

As discussed in the previous sections, a realistic cluster business model cannot be developed if a cluster is viewed as an isolated and static entity. Indeed, clusters are operating within larger networks or ecosystems and are shaped by socio-economic, legal and political landscapes as well as cultural contexts and sectoral dynamics (Castells and Hall 1994; Asheim 1996; Brass et al. 2004; D. A. Wolfe and Gertler 2004; Cravens, Piercy, and Shipp 1996; Cooke 2003). Moreover, clusters' life-cycle stages and institutional modes define the types of actors involved as well as interactions between these (e.g. Leslie and Kargon 1996; Enright 2003; Carbonara 2004; Müller et al. 2012; Fromhold-Eisebith and Eisebith 2005).

Thus, we suggest that cluster business model design should build upon the analysis of the external – national, regional, and sectoral – specifics and internal characteristics of a cluster, such as its life-cycle stage and institutional mode.

Current cluster business model analysis or 'unpacking'

Organisation and business model design literature suggests that these steps should be followed by a design of the organisation structure, governance and processes (Burton, Obel, and DeSanctis 2011). If the exercise is that of re-design rather than new business model creation, the existing business model should be first 'unpacked' by mapping and analysing its elements, interrelationships and underlying processes (Teece 2010).

We suggest that the 'unpacking' exercise should follow the cluster business model logic by proceeding from the framework elements to the core elements. Specifically, analysing the existing governance mechanisms, value propositions and value-creating activities, cluster architects can understand to what extent the current business model allows to reach cluster goals. By turning to actors, resources, and capabilities, as well as value flows, cluster architects can analyse whether the framework business model elements ensure the smooth operation of the core elements. For instance, such an analysis can make apparent whether the governance mechanisms allow actors to engage in cooperative activities and jointly create value, or to what extent the internal and external value propositions ensure the desirable actor composition of the cluster and provide grounds for collaboration.

Cluster business model (re-)design

Once the desired and the current state of the business model have been analysed, the differences between these should be analysed and the necessary changes to business model elements should be identified (De Reuver, Bouwman, and Haaker 2013). The impact of the changes on all business model elements should also be analysed at this stage and a set of specific activities or interventions should be then designed (De Reuver, Bouwman, and Haaker 2013).

Business model design and re-design can draw inspiration from borrowing 'templates' (Amit and Zott 2015) from other clusters but this needs to be done consciously and the appropriateness of borrowing has to be considered with respect to clusters' goals and contexts.

Finally, the design exercise should be an iterative one in order for the organisations to adapt to the dynamic environments they operate in (Burton, Obel, and DeSanctis 2011). The business model research also suggests that the designed business model should not be viewed as a detailed plan of action, but rather as a 'proto-strategy' which should be constantly adapted to the new developments in the environment (Chesbrough and Rosenbloom 2002).

The instantiation

Finally, based on the discussion above, we develop a visualisation of the methodology of business modelling in clusters (Figure 2).

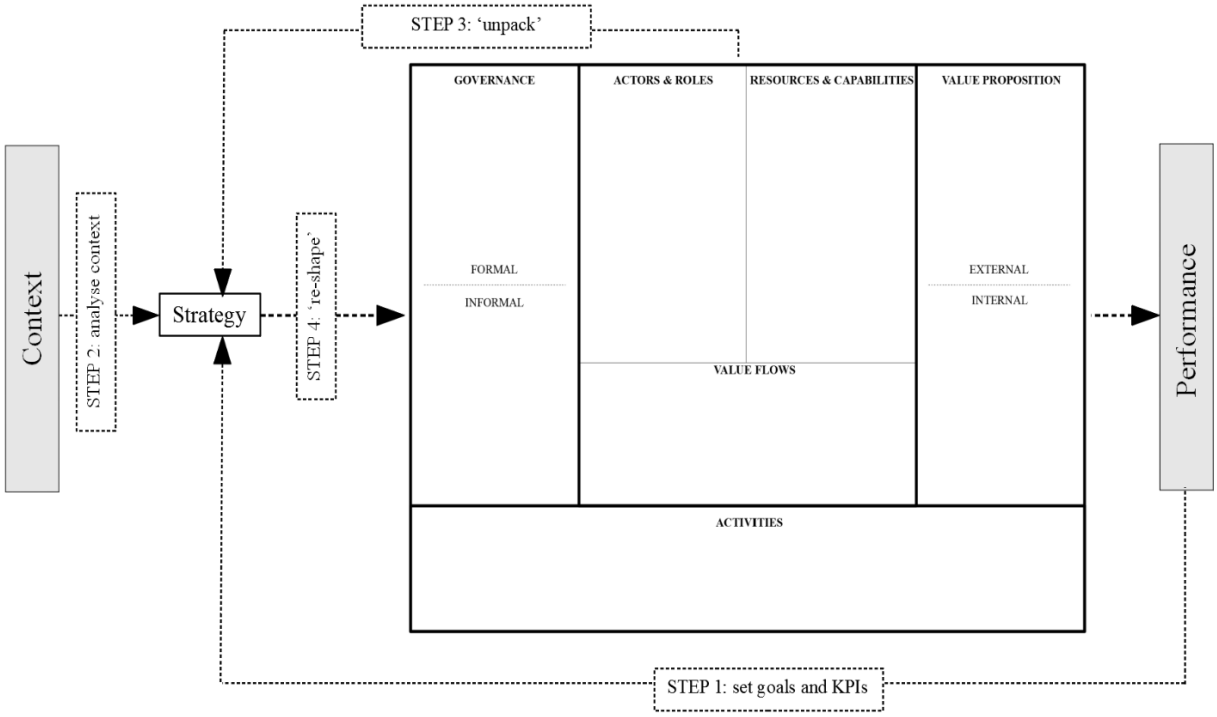

Figure 2: Visualising the cluster business model and the method for its development

To visualise the cluster business model, we drew inspiration from Osterwalder and Pigneur's 'business model canvas' (Osterwalder and Pigneur 2010) which has shown its usefulness both in board rooms and classrooms. In doing so, we employed one of the design principles of borrowing recognising that 'the slate is never blank at the beginning of a project, and all ideas or design elements are ultimately related to others.' (Boland and Collopy 2004b, 268).

While borrowing the format of the business model canvas, we, however, reflected on its appropriateness and adapted it to the goals of our research. The format answered our needs for a transparent and easy-to-use tool allowing to represent and explain complex processes in a clear way by following the principle of 'modularity' of design artefacts, whereby the elements are represented as independent but closely interconnected (Baldwin and Clark 2000). However, the content of the 'business model canvas', or its 'building blocks' as developed by Osterwalder and Pigneur (2010) cannot be meaningfully applied to the cluster context. Indeed, their model focuses on the single firm rather than an inter-organisational setting displaying unique challenges and specifics as described in the previous sections. Thus, we adapted the 'building blocks' to reflect the cluster business model elements and their relationships. By placing value propositions, value co-creating activities and governance elements on the outside edge, we demonstrated that these business model elements 'set the tone' or the framework conditions of the whole value creation process. The other three elements – actors and their roles, resources and capabilities, and value flows – are placed at the centre as they represent the 'core' of the clusters' value creation.

This instantiation also allows to reflect the interests of the actors within and outside the formal boundaries of the meta-organisation and to focus on both individual and fundamental, or system-level, values (Denis, Langley, and Rouleau 2007; Jarzabkowski and Wilson 2006; Spee and Jarzabkowski 2009). Thus, the proposed artefact focuses on the roles rather than the types of actors. This reflects the fact that cluster actors can play multiple roles (Berkowitz and Bor 2018) and allows to integrate actors outside the formal organisational boundaries into the business modelling exercise. The framework thus helps better identify and assign actors' roles as well as to become aware of the power distribution in the cluster. Moreover, by focusing on internal and external value propositions, we account both for individual goals of the actors as well as for system-level goals bringing the actors together.

Finally, our instantiation goes further than simply visualising the cluster business model elements. Indeed, it also describes the business modelling method by demonstrating the relationships between the context, strategy, business model and the cluster performance outcomes.

To demonstrate the potential of the cluster business modelling method and its instantiation developed in this article, we will apply it to describe the business model of one of the clusters studied in the framework of our artefact evaluation procedure.

Business modelling in cluster 'Beta': a simplified case study

Cluster 'Beta' is the oldest and the most mature cluster in our selection and displays a high level of 'organisationality', i.e. conformity with the characteristics of formal organisations (Ahrne and Brunsson 2011; Lupova-Henry, Blili, and Dal Zotto 2019b). We follow the four-step business modelling methodology to 'unpack' its business model and provide suggestions for re-shaping it.

Goals

Further to a regional economic downturn triggered by a crisis in the mining industry, the cluster has been working towards improving its innovation capabilities, diversification of its activities and internationalisation to reduce the regional path dependency.

Context

The cluster is located in a region with a wide variety of natural resources and characterised by strong place-embeddedness of local actors. Although this has been one of the strengths of the cluster over the years and allowed some of the businesses to survive economic downturns due to the support of the peers, it also had its downsides. The 'thickness' of social capital in the region and the cluster led to a lock-in situation: the network became a closed 'old boys club' with limited access of new members. As the crisis in the coal mining industry hit about a decade ago, the cluster did not have enough capabilities and lacked external outlook to see it coming in time to take countermeasures. Many cluster companies went out of business, others struggled to keep afloat. This has led the cluster to the realisation that the strategic re-orientation of cluster actors was necessary. However, due to the limited innovation capabilities of many regional actors, as well as the systemic challenges characteristic of the Australian context – e.g. the lack

of venture capital, geographical isolation and the lack of academia-industry collaboration (cf. AMGC 2018; World Economic Forum 2017; Innovation and Science Australia 2016; Australian Government 2016) – the transition towards a more diversified and knowledge-oriented activities has not been easy to achieve.

Business model 'unpacking'

Cluster governance relies on both formal and informal mechanisms: while the Charter and the Board of Directors ensure the formal framework, the dense connections in the cluster work as an informal mechanism deterring opportunistic and otherwise unwanted behaviour. The composition of the Board is crucial: when selecting the members of the Board, the cluster follows some of its key values of openness and inclusiveness, it also uses the Board as a 'competence pool' allowing to tap into varied knowledge and expertise.

Cluster value propositions also play a role in forming the actor composition and governance structure. Indeed, positioning itself as open and transparent, the cluster welcomes new members and new expertise to break out of the 'lock-in' situation it found itself in. For instance, allowing women on the cluster Board of directors led to the discontent of some members who left the cluster which ultimately allowed to change the 'old boys club' mentality. Thus, the internal, system-level values and goals of the cluster have been shaped to attract the 'right' categories of members. On the other hand, the cluster struggles to define its external value proposition due to the difficulty in measuring its impact on regional growth which limits its ability to attract government funds. Being a bottom-up, i.e. privately driven entity, the cluster does not have any formal obligations to measure its performance and to report to external stakeholders.

Value-creating activities in the cluster focused on 'bringing the regional companies to the next level' and helping these achieve better performance and thus drive the regional growth. Some of the key activities undertaken by the cluster in this respect were to lead the companies to a realisation that they can apply their capabilities in other fields than mining, thus breaking their path-dependence. Obtaining government funding for cluster internationalisation has been another key activity and allowed cluster actors to create contacts abroad. Some of the actors have been successful in attracting venture capital from the U.S.A. to compensate for the lack of funding in Australia. The brand-building activities in the cluster have also been crucial and allowed to establish its reputation with the key government stakeholders.

Cluster actor composition has been changing reflecting the changing values and goals of the cluster. The cluster has deliberately reduced the number of members, going after their 'quality' rather than quantity. This allowed to strategically shape the pool of resources and capabilities available to cluster members. One of the challenges of the cluster companies is the lack of talent and skilled human resources in the region which may limit the possibilities of the fast-growing, 'gazelle', companies. Recognising this, the cluster focuses on 'steady-growth' companies which are more locally embedded. The cluster has developed several training programmes to ensure the steady supply of skilled employees and building their managerial and leadership capabilities. One of the challenges faced by the cluster is the lack of engagement of education and research institutions, which is a systemic issue for Australia. Indeed, these do not provide the cluster with a 'window' to global and local technical and business knowledge or act as a

source of firm formation. Also, there is significant variability in the cluster members' innovation capabilities, however, there has been a lack of targeted approach to developing these based on the individual needs of the actors. Finally, the lack of private venture capital, another systemic challenge in Australia, has been a limitation for some of the more innovative cluster firms in developing their projects.

To ensure the inflow of new knowledge and strengthen its diversification effort, the cluster launched an internationalisation programme and organised a number of trade missions for its members. This allowed establishing new contacts and 'global pipelines' through which external knowledge flows into the system. While a number of activities and event is organised for cluster members to facilitate knowledge exchange and collaboration, there have been no assessments of the number and worth of collaborations among the actors. This makes the communication of the cluster value externally and internally difficult. Moreover, there is a lack of structured programmes allowing to transfer academic knowledge, again due to the lack of academic-industry collaboration. Finally, there is limited facilitation of talent flows, i.e. placement of University graduates or attracting other external specialists; circulation of talent inside the cluster is not actively promoted.

Business model re-shaping

To counter the challenges identified in the process of business model 'unpacking', three strategic directions for action have been proposed: building innovation capability; facilitation of open innovation and attracting capital. Specific actions include establishing a capability database allowing to match the needs of members with available resources (e.g. mentors), systematically assessing the capabilities of existing and new members and grouping these according to their level to then provide targeted support. To facilitate open innovation, a virtual platform has been proposed allowing external and internal actors to post projects and collaborate. Such a platform could also be used to track the number and worth of collaborations. This may help demonstrate the value proposition of the cluster to public bodies thus allowing to attract capital. Finally, building a network of private investors nationally and internationally can help facilitate the process of spin-out and spin-off creation and further drive regional economic growth.

Discussion and conclusions

In this paper, we adopted a meta-organisational perspective on clusters seeing these as 'organisations of organisations' (Lupova-Henry, Blili, and Dal Zotto 2019c; Ahrne and Brunsson 2005). We suggested that the lack of appreciation in the cluster research and practice of the unique challenges which 'managed' clusters face can be one of the reasons explaining their sub-optimal performance. Indeed, the challenges faced by meta-organisations significantly differ from those of individual organisations (Gulati, Puranam, and Tushman 2012). Thus, they require strategy and management tools adapted to the complex meta-organisational settings. In this paper, we take a step towards developing a repertoire of strategic tools adapted to such settings and develop a framework for business modelling in the cluster context.

The contributions of the paper to both strategy and practice can be seen along three dimensions. First, we further develop the 'meta-organisational' view of clusters. This perspective has started to attract researchers' attention as a way to better understand and explain the dynamics of the 'managed' clusters (cf. Viachka 2013; Gadille, Tremblay, and Vion 2013; Lupova-Henry, Blili, and Dal Zotto 2019b). Although the latter have been in existence for several decades now, so far, the shift of perspective from 'spontaneous' to 'organised' clustering has not been fully recognised in research and practice. One of the key implications of the 'meta-organisational' approach to clusters is that it provides the 'vocabulary' and the conceptual foundations for thinking about 'managed' clusters as organisations which can be deliberately designed and can interact with their environments. By providing a new language for referring to, thinking about and researching 'managed' clusters we can thus affect the way these are seen by external audiences and the way they perceive themselves (Ferraro, Pfeffer, and Sutton 2005). Furthermore, this opens up avenues for future research into the strategies clusters can use to shape their environments. While some advances have been made in this respect by adopting the institutional theory to analyse cluster contexts (cf. Lupova-Henry, Blili, and Dal Zotto 2019a), future studies could explore the potential of the contingency and the configurational schools of thought to identify cluster configurations allowing to achieve best performance in specific contexts (cf. Meyer, Tsui, and Hinings 1993; Donaldson 2001).

Second, and related to the previous point, our research takes a different perspective on cluster management than studies focusing on the role of the 'cluster management organisation' or 'cluster facilitators' (e.g. Coletti and Di Maria 2015; Ingstrup and Damgaard 2013; Lefebvre 2013). We suggest that in 'organised' clusters the role of the cluster community is crucial for its strategy-making. The cluster business modelling method thus requires collaboration as a first step. In adopting the perspective proposed in this paper, the cluster community can become the designers of the cluster's future, seeing the 'defects' in its functioning and devising explicit remedial efforts (Starbuck and Nystrom 1981). Through the use of this tool in a collective business modelling exercise, the process of strategizing itself can become a means to agree on a system-level goal, drive actors' engagement, cohesion and trust, ultimately improving cluster innovativeness (Matinheikki et al. 2017; Ystrom and Aspenberg 2017b). This perspective opens up new possibilities for research into cluster business model design. As suggested by Zott and Amit (2010), business models can be designed around certain 'themes'. These, however, are likely to be different depending on the strategic directions of the cluster, which range from lobbying to education and training, to innovation and technology to name just a few (Sölvell, Lindqvist, and Ketels 2003). Thus, an interesting and worthwhile pursuit would be to conduct comparative cluster studies identifying different configurations or designs of business models corresponding to different strategic directions.

Our study is not without its limitations. As the literature on both inter-organisational business models and meta-organisations is still in its infancy, only a limited number of papers was available for our literature review and theoretical evaluation of the developed cluster business model. While we complemented this evaluation with case studies and sought practitioner feed-back, future studies could test, expand, and evaluate the model further by applying it in different types of inter-organisational settings and on larger samples.

Article 2: Innovation-centric cluster business model: findings from a design-oriented literature review[4]

Abstract

How should a cluster be designed to foster the innovativeness of its members? In this article, we view self-aware and organised clusters as 'context-embedded meta-organisations' which can deliberately shape their internal structures through design-based interventions. To uncover the elements of the cluster structures and formulate interventions for their innovation-centric design, we adopt a mixed methodology combining a systematic literature review and design-oriented synthesis approaches. We distinguish between six cluster business model elements: actors and their roles, resources and capabilities, value flows, governance, value propositions and value-creating activities. To gain insight into the properties of these elements conducive to cluster innovativeness, we review literature at the intersection of cluster, meta-organisation, business model and innovation studies. Our study allows to consolidate the extant research into 'organised' clustering and the drivers of the cluster actors' innovativeness. It also helps identify several important unanswered questions in the literature and to suggest potentially fruitful directions for further work.

Keywords

Cluster; innovation; business model; meta-organisation; systematic literature review; design science

Introduction

'Managed' clusters have become one of the major policy tools in both developed and developing countries in their quest for innovation and knowledge-based regional economic development (Ketels, Lindqvist, and Sölvell 2006; Lindqvist, Ketels, and Sölvell 2013; Sölvell, Lindqvist, and Ketels 2003). However, while hopes are high for the potential of such clusters, research has been inconclusive as to whether they can live up to their promise (Castells and Hall 1994; Hospers, Desrochers, and Sautet 2009). We suggest that this is partly due to the lack of appreciation of the differences between the 'organic' or 'spontaneous' and 'managed' clustering.

Continuing a recent line of studies (Gadille, Tremblay, and Vion 2013; Gimet and Grenier 2018; Leys and Joffre 2014; Viachka 2013), in this paper, we adopt a meta-organisational perspective on self-aware and organised clusters. We view these as 'organisations of organisations' whereby their constituents retain their autonomy and are not bound by formal authority but are driven by a system-level goal (Ahrne and Brunsson 2008; Berkowitz and Dumez 2016; Gulati, Puranam, and Tushman 2012). This point of view highlights the role of collective value creation and suggests that no single 'architect' – such as a cluster management organisation – can be in

[4] This article was submitted to the 'Triple Helix' journal on 13 March 2020 as E. Lupova-Henry, S. Blili and C. dal Zotto. 'Innovation-centric cluster business model: findings from a design-oriented literature review'. The article is currently under the second round of peer-review.

charge of the steering in a meta-organisational setting (Gulati, Puranam, and Tushman 2012). Furthermore, the 'meta-organisational' view calls for the application of the frameworks developed in the fields of organisation and management studies, such as business models (Arend 2013), which can provide insight into collective value creation in clusters.

The aim of this research is twofold. First, we aim to take stock of the extant research into the drivers of collective innovativeness in clusters functioning as 'meta-organisations'. To do so, we adopt the perspective of organisation studies and strategic management scholarship. Specifically, we leverage the potential of the 'business model' concept for the understanding of value creation in complex, 'non-traditional', organisational settings (Arend 2013). Recognising that clusters may be driven by different logics which shape their strategic choices (cf. Sölvell, Lindqvist, and Ketels 2003), we focus on innovation-centric clusters, i.e. those which prioritise innovation as one of their key strategic directions. We thus seek to understand how the elements of the cluster business model should be designed to foster the innovativeness of its members.

The second goal of this paper is to enable evidence-based management (cf. Rousseau 2012) in clusters. To do so, we combine the systematic literature review with the design-oriented synthesis approach (Tranfield, Denyer, and Smart 2003; Denyer, Tranfield, and van Aken 2008; Briner and Denyer 2012) drawing upon the literature at the intersection of meta-organisation, cluster, innovation and business model studies. This allows distilling the findings of the literature review in the form of actionable propositions for the innovation-centric cluster business model design. Specifically, we follow the 'CIMO-logic' proposed by Denyer et al. (2008) which includes four elements: Context, Interventions, Generative Mechanisms and Outcomes. We apply the framework throughout this study to formulate the research question, to analyse and synthesise the literature and then to present our findings. We thus address the following research question:

- How should the cluster business model be designed so as to trigger the generative mechanisms fostering cluster innovativeness in specific contexts?

In this research, we focused on six elements shaping the value creation in clusters: actors and their roles, resources and capabilities, value flows, governance, value propositions and value-creating activities. By analysing their relationship to innovation, we uncovered several crucial attributes of these elements, such as the types of actor roles relevant for cluster innovativeness, the multi-dimensionality of cluster value propositions, the presence of both formal and informal governance mechanisms, the importance of both tangible and intangible resources and value flows and the existence of five types of value-creating activities in innovation-centric clusters.

The remainder of this article is structured as follows. Section two provides a theoretical background applying the meta-organisational perspective to clusters and discussing the implications of such a perspective for cluster business model design. Section three describes the research design. In section four, we present our findings along the four dimensions of the 'CIMO' framework. Section five discusses the theoretical and practical implications of the study as well as its limitations and provides suggestions for future research.

Theoretical background

The understanding of 'innovation' and that of 'clusters' and their role as the drivers of the knowledge economy has been evolving over the past decades. In what follows we will present a brief overview of that evolution to make a case for the meta-organisational approach in cluster studies.

Clusters, innovation, and meta-organisations

Innovation in spatial agglomerations of firms was noted by Alfred Marshall already in 1890 when he observed that these facilitate knowledge transfer and promote innovation through co-location (Marshall 1890). This line of thinking was further advanced by the Italian school of the 'new industrial districts' (e.g. Becattini 1987; 1989) and the GREMI school of the 'milieux innovateurs' (Aydalot 1986; Camagni 1995; Castells 1996) in the 1970s – 90s. These schools of thought shed light on several important elements of inter-firm network innovativeness, notably, the combination of competition and co-operation between the actors; their conscious engagement in networking activities, and synergies between them. Further to this 're-discovery' of Marshall's industrial districts and the new understanding of the drivers of their innovativeness, the first organised support initiatives were launched in the Italian 'new industrial districts' in the 1970s - 80s. These aimed at supporting the development of already existing industrial districts through the provision of collective research and business services to their members (European Innovation Monitoring System (EIMS) 1993; OECD 2011).

Another important development in the understanding of innovation in the inter-organisational settings came from the fields of economic geography and organisation and business studies. Notably, two key concepts have been gaining increasing attention: the 'innovation systems' (e.g. Lundvall 1992; Nelson 1993; and Edquist 1997 on national systems of innovation; Cooke, Gomez Uranga, and Etxebarria 1997 on regional systems of innovation; and Breschi and Malerba 1997 on sectoral systems of innovation) and the 'ecosystems' (Adner 2006; Adner and Kapoor 2010; Shaw and Allen 2016). These perspectives shed light on the importance of the socio-institutional settings, interfirm communication, interactive learning, and knowledge flows between a variety of actors in driving technological change and innovation.

This changing understanding of innovation as a collaborative phenomenon rather than an undertaking of a 'lone entrepreneurial hero' was further reflected by the advent of the concepts of the 'Triple Helix of University-Industry-Government relations' (Etzkowitz 1993; Etzkowitz and Leydesdorff 1995) and of 'open innovation' (Chesbrough, Van Haverbeke, and West 2006). Both models highlight the need to bring industrial innovation closer to public R&D but are different in their focus (Leydesdorff and Ivanova 2016). The latter is firm-centric and highlights the importance of the firms' relations with external actors for innovation. The former, on the other hand, provides a new understanding of the interactions and the roles of academia, government, and industry in the innovation process. The Triple Helix model implies that academia assumes a novel role in addition to education and research and acts a source of firm-formation and regional development. Governments, in turn, support the new enterprises by creating a favourable regulatory environment, providing tax incentives and public venture

capital, and engaging in public-private partnerships. Finally, industry plays an important role in training and research together with the universities. This model is commonly instantiated by networks of innovation, clusters and university centres (Etzkowitz 2012; Etzkowitz and Klofsten 2005; Etzkowitz 2002).

These developments show a shift of our understanding of both innovation and clusters: the former is now seen as a collaborative phenomenon, while the latter are increasingly perceived as results of conscious efforts of the key innovation actors, rather than spontaneous agglomerations of organisations. Indeed, clusters are increasingly perceived as 'managed' entities or 'meta-organisations' representing a new form of a 'decided social order' (cf. Gadille, Tremblay, and Vion 2013; Leys and Joffre 2014; Lupova-Henry, Blili, and Dal Zotto 2019b; Viachka 2013). This 'meta-organisational turn' in cluster studies has several important implications.

First, viewing clusters as meta-organisations implies a two-way relationship between clusters and their environments: these are not only shaped by their contexts but can deliberately act upon and transform these, just like individual organisations (B. G. King, Felin, and Whetten 2010). This contrasts with the more 'traditional' perspective seeing clusters as spontaneous spatial phenomena which can or should be acted upon by the policy-makers (e.g. Porter 1998b; Motoyama 2008). This calls for a more rigorous analysis of the cluster-environment interactions, taking into account different contextual levels (e.g. regional vs. national) and their influence on deliberate cluster design in its quest for innovation (Bunnell and Coe 2001).

Second, viewing clusters as meta-organisations means that they can be deliberately "shaped through design-based interventions by their founders and other change agents..." (van Aken and Romme 2009, 6), again, just as individual organisations. While most current research focuses on the role of the 'cluster management organisation' in cluster development (e.g. Coletti and Di Maria 2015; Ingstrup 2010; Lefebvre 2013), in a meta-organisation, a broader range of actors is involved in strategy- and decision-making (cf. Gulati, Puranam, and Tushman 2012). Furthermore, in such a context, the role of managers becomes increasingly complex as they face the challenge of managing assets which are not directly owned by their firms (Iansiti and Levien 2004). This requires new analytical and managerial tools, as the traditional ones, such as the value chain or the 'Diamond Model' (Porter 1998b), are less well suited to the network forms of organisation (Normann and Ramirez 1993; Stabell and Fjeldstad 1998; Gulati, Puranam, and Tushman 2012).

Several concepts have been proposed to reflect the networked nature of innovation, such as 'virtual' or 'meta-value chains' (Raymond and Blili 1997) and 'value networks' (Stabell and Fjeldstad 1998; Allee 2000; Lusch, Vargo, and Tanniru 2010). These emphasise the importance of complex dynamic exchanges between the actors in the process of value creation. Moreover, such new organisational tools as business models – notably 'open' and 'network-embedded' business models – were proposed to better reflect the firms' value creation and capture mechanisms through their exchanges with external stakeholders (Chesbrough 2007; Zott, Amit, and Massa 2011; Markides 2013; Palo and Tähtinen 2011; Bankvall, Dubois, and Lind 2017).

Towards an innovation-centric cluster business model

Research has highlighted the potential of business models for identifying, delineating, and analysing the structuring of meta-organisations (Arend 2013). Indeed, business models can be seen as 'recipes' which describe the elements of the organisation's activities and the way these interact to produce certain outcomes (Baden-Fuller and Morgan 2010). For individual firms, these elements often include customers, network, resources, financial aspects (revenues and costs) as well as combinations of value-creating activities and governance mechanisms which allow creating and appropriating value (Fjeldstad and Snow 2018; Wirtz et al. 2016). In the meta-organisational context, however, these elements and relations between them will significantly differ (see Figure 1 for an overview).

First, the concept of 'customers' is more complex in the meta-organisational setting. Indeed, meta-organisations involve a broad range of stakeholders who may not necessarily be formal members (Berkowitz 2018). On the other hand, the formal members can simultaneously be the owners, co-producers and end-users of the collectively created value (Berkowitz and Bor 2018). The meta-organisational view places the network of actors at the core of its business model since attracting and retaining the 'right' categories of members – the strongest ones – is crucial for its survival (Berkowitz and Dumez 2016). Thus, in contrast to the single-firm approaches, where the network is external and complementary to the focal firm, in the meta-organisational setting, the network of actors collectively creating value is a core element with no single actor being central.

Second, when speaking of 'resources', in contrast to individual firms, meta-organisations do not own or control resources which are made available by the participants (Gulati, Puranam, and Tushman 2012). Both tangible and intangible resources are present in a meta-organisational context: rather than being driven by solely financial considerations, the members exchange knowledge and can tap into the pool of resources outside the boundaries of their organisations (Gadille, Tremblay, and Vion 2013).

Third, while the firm-level view focuses on the intra-firm flows of resources and finance, the meta-organisational approach crosses the firm boundaries to bring to the fore the inter-firm exchanges (Leys and Joffre 2014). Indeed, meta-organisations need to reconcile different identities, facilitate value flows and build trust between the stakeholders pursuing different interests (Brès, Raufflet, and Boghossian 2018).

Fourth, within the firm-centric perspective 'governance' mostly concerns the value appropriation mechanisms by an individual business or their relations with external network actors (e.g. Amit and Zott 2001; Nenonen and Storbacka 2010). In the meta-organisational context, on the other hand, both the distribution of the results of activity between these and value appropriation are of key importance (Azzam and Berkowitz 2018). Furthermore, in meta-organisations, governance combines formal and informal mechanisms and focuses on building the organisational identity, reaching an equilibrium between competitive and cooperative behaviour of its actors, and ensuring that individual values are aligned with those of the meta-organisation as a whole (Brès, Raufflet, and Boghossian 2018; Gadille, Tremblay, and Vion 2013; Gimet and Grenier 2018).

Furthermore, the 'value proposition' or 'value creation' element in a meta-organisation is multidimensional. Internal value is created by the meta-organisation for its members by allowing to reduce uncertainty and shape a negotiated environment (Azzam and Berkowitz 2018). Internal value proposition depends on the ability of the meta-organisation to provide benefits which otherwise would not be accessible to members (Azzam and Berkowitz 2018; Berkowitz and Dumez 2016). On the other hand, institutional and organisational settings within which meta-organisations function impose external demands and expectations (Brès, Raufflet, and Boghossian 2018; Jarzabkowski and Fenton 2006). Indeed, often used as economic development tools, organised clusters are expected to bring value to a broad range of stakeholders in their regions and nations by improving or revitalising regional or national economies (Berkowitz 2018; Porter 1998a).

Finally, concerning the 'value-creating activities', in contrast to the intra-firm perspective which describes the activities of a single focal firm, in the meta-organisational context collective activities are at the fore (Ahrne and Brunsson 2005; Gadille, Tremblay, and Vion 2013; Gimet and Grenier 2018). In meta-organisations, four types of innovation-related activities can be identified: the orchestration of knowledge capabilities, ongoing strategizing, developing public policy and theorising innovation, i.e. developing common frames of reference or value systems (Dougherty and Dunne 2011; Gimet and Grenier 2018). Thus, meta-organisational value-creating activities are of a higher order than the activities of its constituent members.

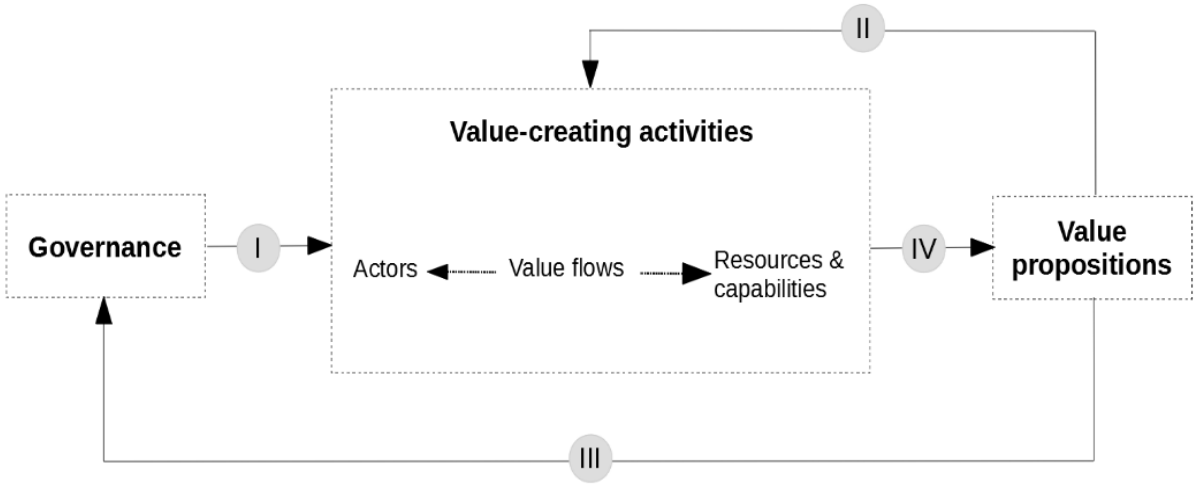

Figure 2: Conceptualising the relations between the cluster business model elements

Figure 1 summarises the discussion above by identifying the main elements of a cluster business model and the relationships between them. Thus, we propose to distinguish between six business model elements shaping the value created by a cluster: actors and their roles, resources and capabilities, value flows, governance, value proposition and value-creating activities. Cluster governance mechanisms are crucial in defining what types of actors will participate in a cluster and how these will exchange their resources and capabilities while engaging in value-creating activities (link I). On the other hand, the external and internal value propositions shape both the governance (link III) and the ways actors engage in value-creating activities (link II). Indeed, cluster value propositions attract those actors who identify themselves with the cluster's

goals, influence the way these collaborate and the value these obtain from participating in the cluster. Finally, by exchanging resources and capabilities and performing a set of value-creating activities actors shape the unique external and internal value propositions (link IV).

Research design

The goal of our paper is to provide actionable recommendations for innovation-centric cluster business model design and thus enable evidence-based management in clusters. In choosing the most appropriate research design, we were guided by three key considerations. First, due to the orientation of our research towards developing practical recommendations, the methodology had to allow for the formulation of actionable design propositions and to account for the difference in the cluster contexts and their goals. Moreover, to obtain reliable results we aimed at avoiding the potential bias of narrative literature reviews and strived for the transparency and replicability of our study. Finally, given the fragmented nature of the field of research and the large number of studies adopting quantitative methodology, we needed a method flexible enough to integrate both quantitative and qualitative studies. To ensure that these criteria are met, we adopted the systematic literature review method combining it with the design-oriented synthesis approach (Tranfield, Denyer, and Smart 2003; Denyer and Tranfield 2006; Denyer, Tranfield, and van Aken 2008).

The design-oriented synthesis proposed by (Denyer, Tranfield, and van Aken 2008) follows the 'CIMO-logic' where in certain Contexts (C), a number of Interventions (I) may be taken to trigger Generative Mechanisms (M) leading to certain Outcomes (O). This framework fits our needs in that it allows to formulate actionable guidelines or propositions for cluster design leading to the desired outcomes, i.e. cluster innovativeness. It also accounts for the various contextual characteristics which may influence the appropriateness and effectiveness of different approaches to stimulate cluster innovativeness.

The design-oriented synthesis approach, however, does not outline a transparent and replicable process of literature search and selection, being guided by 'the pragmatic principle of what works' (Jones and Gatrell 2014, p. 259). Thus, we chose to combine the design-oriented synthesis with the systematic literature review approach as a way to corroborate the findings of different studies seeking to answer similar questions and, at the same time, avoid any possible bias in selecting the literature sources (Rousseau 2012; Jones and Gatrell 2014).

We thus followed the three stages of a systematic literature review methodology involving (1) planning the review; (2) conducting the review and (3) reporting and dissemination (Tranfield, Denyer, and Smart 2003). At the same time, we integrated the 'CIMO-logic' in each of these stages, adopting a customised process based on the combination of methodologies proposed by Tranfield et al. (2003), Denyer et al. (2008), and Briner and Denyer (2012). Table 1 describes our research design.

Stage 1	1.1. Scoping the literature to assess its relevance and size 1.2. Determining the types of studies and data that will answer the research question 1.3. Definition, clarification, and refinement of the research question with the use of the 'CIMO-logic'
Stage 2	2.1. Identification of keywords, search terms and formulating the search strings 2.2. Formulating the inclusion/exclusion criteria 2.3. Querying the literature database 2.4. Selecting the studies according to the pre-defined exclusion/inclusion criteria 2.5. Extracting data from the literature following the elements of the 'CIMO-logic' 2.6. Conducting a descriptive analysis following the elements of the 'CIMO-logic' 2.7. Conducting a thematic analysis following the elements of the 'CIMO-logic'
Stage 3	3.1 Writing up the article: following the 'CIMO' logic to present the findings of the review

Table 1: Research design – combining the systematic literature review with the 'CIMO-logic'. Source: adapted from Tranfield et al. (2003), Briner and Denyer (2012)

Stage one of the literature review included initial exploratory literature reviews and scoping studies to delimit the boundaries of the research question. An analysis of the available sources of literature was carried out and a decision was made to only include academic peer-reviewed articles and book chapters to ensure higher reliability of the retained literature sources.

Stage two drew upon the information about the field of study obtained during the preliminary exploratory literature review. At this stage, we identified the keywords and search strings. In doing so, we adopted a narrow focus on clusters rather than a broader perspective which would include technoparks, science parks and other instantiations of the Triple Helix model of interactions. This choice was made to ensure the feasibility of our study and the possibility to formulate cluster-specific design interventions. We also formulated the exclusion criteria for the consecutive literature search stage (see Table 2). In doing so, we were guided by two key considerations. First, we sought to only focus on 'organised' or 'managed' clusters which can be considered as meta-organisations. We thus excluded the studies focusing on the whole industries or other broad concepts such as national innovation systems and cluster policies. Second, we targeted only the studies focusing on the drivers or key success factors of cluster innovativeness and thus allowing to answer our research question. We thus excluded papers which did not describe the relationships between certain aspects of cluster activity and its innovative outcome.

Area 1: clusters and meta-organisations	Area 2: innovation	Area 3: business model	Exclusion criteria
manag* cluster, cluster manag*, cluster initiative, cluster organis*, organis* cluster, self-aware cluster, cluster orchestr*, cluster design, pole de competitivite, industr* cluster, innovat* cluster, m?ta-organis* design, m?ta organis* manage*, cluster facilit*, m?ta-organi*	innovat*	govern*, financ*, value flow, value *creat*, value capture, value offer*, value propos*, business model	(1) Lack of focus on the drivers of cluster innovativeness, (2) micro-level approach with the predominant focus on individual cluster members, (3) macro-level focus on policies, industries, innovation systems, (4) cluster analysis as a technique

Table 2: Keywords and exclusion criteria

We carried out the search and selection of the literature in three phases: (A) initial search, (B) refinement and (C) final selection. Each of the phases resulted in a narrowed down list of the retained literature – respectively lists A, B, and C. See Table 3 for an overview of the selection process.

The initial search (phase A) was conducted by querying Scopus database and involved six iterations with different search strings based on the pre-defined keywords (Table 2). The choice of the database was guided by the practical considerations of the availability of institutional access to it and the transparency of the search process. To ensure the inclusion of the studies at the intersection of innovation, cluster and business model fields, we only retained the articles that contained at least one keyword from each of the three keyword domains in their titles, abstracts or keyword lists. The period covered all articles available in the database. Only publications in English, French and Russian languages were considered based on the authors' proficiency in these. The initial exercise was conducted in March 2017 and a subsequent search was carried out in September 2019. After the removal of the duplicates and retracted articles from the query results, we obtained List A comprising 387 entries.

Phase B involved the refinement of the literature list by analysing the titles and abstracts of the articles to retain only those fitting the scope of the research based on the exclusion criteria. This phase led to the narrowing down of the number of articles to 160 (List B). The most common reason for article exclusion was the lack of focus on the drivers of cluster innovativeness (61% of excluded articles), the second most common reason was a macro-level focus on national innovation systems, innovation and cluster policies or whole industries (35%).

The final selection (phase C) involved analysing the full texts of the 160 articles in List B and retaining those fitting the scope of the study based on the same exclusion criteria. At this stage, the most common reason for article exclusion was, again, the absence of the focus on the drivers of cluster innovativeness. This phase resulted in List C comprising 46 articles.

Literature selection phase	**Level of analysis**	**Retained articles**
Phase A: Initial search	Titles, abstracts, keyword lists	List A: 387 articles
Phase B: Refinement	Titles and abstracts	List B: 160 articles
Phase C: Final selection	Full text	List C: 46 articles

Table 3: Literature selection process

The retained articles were then subject to data extraction which was carried out with the use of NVivo software and was guided by the 'provisional coding' approach (M. Miles, Huberman, and Sdana 2014). The initial set of categories was based on the 'CIMO-logic' and included the contexts, the interventions concerning each of the cluster business model elements, the generative mechanisms which stimulated cluster innovativeness and, finally, the cluster innovative outcome. During the coding process, we identified additional sub-categories of codes, notably in relation to the context and generative mechanisms.

We then conducted a descriptive and a 'thematic' analysis of the literature. The aim of the former was to provide insight into the contextual characteristics covered in the articles, the authors' understanding of the concept of 'cluster innovativeness' and the generative mechanisms triggering it. Finally, during the 'thematic' analysis we focused on the six cluster business model elements and distilled the findings of the literature review in the form of design interventions ($I_1 \ldots I_n$) aimed at shaping these to foster cluster innovativeness.

Findings

Descriptive analysis

To provide a deeper insight into the reviewed literature, we will first describe the findings of our descriptive analysis focusing on the contexts of the studied clusters, the generative mechanisms of cluster innovativeness and the innovation outcomes sought in the reviewed literature. Such an analysis will help understand to what extent the findings of these articles can be generalisable to other contexts.

Contextual settings

Our literature review revealed that the contextual factors influencing cluster innovativeness are multi-scalar and include such dimensions as the national, regional, and sectoral contexts as well

as the life-cycle stage and the institutional mode. Most of the reviewed articles (41 out of 46) are empirical research papers analysing clusters in a variety of contexts. However, while most reviewed papers provide some basic information into the national, regional, and sectoral settings of the studied clusters, the majority do not specify the implications of the context for cluster innovativeness.

Concerning the national contexts covered, most papers focused on the European context with 27 papers (or 65% of the total). Other four articles covered China, three focused on North America, three on Australia and New Zealand, two on Taiwan, while Singapore, Russia, South Africa, Chile, South Korea and the United Arab Emirates each were covered once in separate articles. Only 19 papers provided some insight into the implications of the national context for cluster innovativeness (e.g. Isaksen 2007; Arthurs et al. 2009; Calzonetti, Miller, and Reid 2012; Gebhardt 2013; Gebhardt and Pohlmann 2013; Giest 2015). In most cases, these implications were related to the fact that the studied clusters were supported through targeted cluster or innovation policies of their national governments. Several authors, however, went further in their analysis of the national contexts and mentioned several important factors which may impact cluster design. Specifically, such aspects as the variety of capitalism (Capellin 2003; Isaksen 2007), the level of government involvement (Fromhold-Eisebith and Eisebith 2005; Giest 2015; Ai and Wu 2016; Wei et al. 2016; Huang and Wang 2018), and the broad institutional conditions (Parto 2008; Bek et al. 2013) surfaced as some of the national level factors which may have an impact on cluster innovativeness.

Moreover, although most papers mention the regional characteristics of the studied clusters (32 out of 46), they do not provide deeper insight into how these may have influenced the results of their research. However, 13 papers dive deeper into a discussion of regional characteristics. We have been able to identify two regional factors which may play a role in cluster innovativeness: the pre-existing relations between cluster actors (Sellitto and Burgess 2005; Viljamaa 2007; Parto 2008; Eklinder-Frick, Eriksson, and Hallén 2012; 2014; Gretzinger and Royer 2014; Leroux et al. 2014) and the resource endowment defining the historical evolution and orientation of the regional economy (Sellitto and Burgess 2005; Callagher 2012; Calzonetti, Miller, and Reid 2012; Zettinig and Vincze 2012; Basco and Calabrò 2016; Kim and Shim 2018). These papers have shown the importance of a deep understanding of the regional and demonstrated that there can be no common recipe for success as the pre-existing conditions in each location are unique.

Concerning sectoral specifics of the clusters studied, the papers show great variability, with sectors ranging from high- (13 articles), medium-high and medium-low (11 articles) and low-technology (4 articles) fields, as defined by Eurostat and OECD (Hatzichronoglou 1997; Eurostat 2016). Another 8 articles covered a combination of sectors. Again, only a limited number of studies (14 papers) offered a detailed insight into the implications of the sectoral specifics for cluster innovativeness. Two sectoral factors influencing cluster innovativeness emerged from these studies: (1) sectoral knowledge bases defining the key sources of knowledge needed for innovation (Renko et al. 2005; Viljamaa 2007; Burger, Karreman, and van Eenennaam 2015; Aslesen and Isaksen 2016; Wannenmacher and Antoine 2016; Aslesen and Pettersen 2017) and (2) sectoral trends towards vertical disintegration and collaborative

innovation (Fromhold-Eisebith and Eisebith 2005; Burger, Karreman, and van Eenennaam 2015; Giest 2015; O'Dwyer et al. 2015) or, on the contrary, towards secrecy (Mendel and Bardet 2009). These studies show that although collaboration is often considered a pre-condition for innovation, it is necessary to understand the dynamics of the sector and the distribution of innovation activities within it to design cluster interactions accordingly. Table 4 provides an overview of the national and sectoral contextual settings covered by the reviewed articles.

Finally, two more contextual factors have been covered in the reviewed articles: cluster life-cycle stage and its institutional mode. While 12 articles mentioned the life cycle stage of the studied clusters distinguishing between emergent, developing, stabilising and mature clusters, only four papers provided insight into the cluster life-cycle theory and specified the implications of the life-cycle stage for cluster innovativeness (Arthurs et al. 2009; Callagher 2012; Calzonetti, Miller, and Reid 2012; Castro 2015). These suggested that the roles played by the cluster actors as well as the geography and type of knowledge flows and resources needed for cluster innovativeness significantly vary at the different stages of cluster evolution.

Finally, three articles explicitly focused on clusters' institutional modes or the predominance of the private ('bottom-up') vs. public ('top-down') sector actors (Fromhold-Eisebith and Eisebith 2005; Connell, Kriz, and Thorpe 2014; Giest 2015). These suggested that the level of involvement of private and public actors shapes the interests at play, the goals of the cluster actors and the approaches to cluster development.

National context	Sectoral context				
	High-tech	**Medium-high, medium-low**	**Low-tech**	**Combination**	**N/a**
Europe (EU, Norway, UK, Russia)	(Aliouat and Thiaw 2018; Burger, Karreman, and van Eenennaam 2015; Gebhardt 2013; Giest 2015; Isaksen 2007; Matinheikki et al. 2017; Messeni Petruzzelli, Albino, and Carbonara 2009; O'Dwyer et al. 2015; Renko et al. 2005)	(Eklinder-Frick, Eriksson, and Hallén 2012; 2014; Fromhold-Eisebith and Eisebith 2005; Gretzinger and Royer 2014; Mendel and Bardet 2009; Wannenmacher and Antoine 2016; Zettinig and Vincze 2012)	(Leroux et al. 2014; Scott, Hughes, and Kraus 2019) Total= 2	(Aslesen and Isaksen 2016; Aslesen and Pettersen 2017; Castro 2015; Jankowska, Götz, and Główka 2017; Klofsten et al. 2015; Yström and Aspenberg 2017a)	(Bek et al. 2013; Forest 2010; Gebhardt and Pohlmann 2013; Lefebvre 2013; Morgulis-Yakushev and Sölvell 2017)
North America, Australia, New Zealand	(Callagher 2012; Giest 2015)	(Viljamaa 2007)	(Sellitto and Burgess 2005)	(Arthurs et al. 2009; Calzonetti, Miller, and Reid 2012; Connell, Kriz, and Thorpe 2014)	-
Asia (China, Taiwan, South Korea, Singapore)	(Ai and Wu 2016; Chiu 2009; Giest 2015; Zhong and Tang 2018)	(Huang and Wang 2018)	(Kim and Shim 2018)	(Wei et al. 2016)	-
Other (Chile, South Africa, Egypt, UAE)	-	(Basco and Calabrò 2016)	-	(Connell, Kriz, and Thorpe 2014; Parto 2008)	-
N/a	-	(Capellin 2003)	-	-	(Berkowitz 2018; Günther and Meissner 2017)

Table 4: An overview of the national and sectoral contexts covered in the reviewed literature

N.B. Some articles covered several countries and have been mentioned in the table more than once. Some articles did not focus on any specific sectoral or national context (conceptual/theoretical papers and the ones using quantitative methods on a range of clusters in different sectors). These have been noted within the 'n/a' columns.

This analysis shows that a variety of factors influence the propensity of cluster members to innovate and the approaches to innovation these adopt. Some of these are exogenous and relate to the external environment of the cluster: its national, regional, and sectoral context. Others are endogenous and pertain to internal conditions specific to the cluster: its life-cycle stage and institutional mode (the level of participation of private and public sector actors). This suggests that no single 'one-size-fits-all' approach to fostering cluster innovativeness can be designed and the set of specific interventions and policies should be carefully crafted based on the cluster context.

Cluster innovativeness and its generative mechanisms

Finally, we analysed the approaches to defining and measuring cluster innovativeness in the reviewed literature. Although several authors highlighted the importance of cluster evaluation and performance measurement (e.g. Gebhardt 2013; Giest 2015; Scott, Hughes, and Kraus 2019), our research shows that innovation performance measurement is an under-developed topic in the cluster field, confirming the general trend in innovation studies (Lupova-Henry and Dotti 2019; R. A. Wolfe 1994).

Only 5 articles of the whole set provided a clear conceptualization of 'innovation' for their study (Aslesen and Isaksen 2016; Basco and Calabrò 2016; Berkowitz 2018; Kim and Shim 2018; Morgulis-Yakushev and Sölvell 2017), and 11 articles proposed indicators for innovation performance measurement (Sellitto and Burgess 2005; Arthurs et al. 2009; Chiu 2009; Messeni Petruzzelli, Albino, and Carbonara 2009; Cappellin 2012; Gebhardt and Pohlmann 2013; Giest 2015; Ai and Wu 2016; Basco and Calabrò 2016; Morgulis-Yakushev and Sölvell 2017; Kim and Shim 2018). An important finding from this analysis is the difference in innovation performance indicators for cluster operating in low and medium-low technology fields versus those in high and medium-high technology sectors. For the firms in the former fields, such measures as new product development and continuous improvement and adaptation of existing products and processes were mentioned (Capellin 2003; Sellitto and Burgess 2005; Basco and Calabrò 2016; Kim and Shim 2018). On the other hand, to gauge the innovativeness of cluster firms in high and medium-high technology fields the reviewed articles suggest such indicators as R&D efficiency, time-to-market, successful new product developments (Chiu 2009), R&D spending, relative innovativeness, new product revenue (Arthurs et al. 2009) as well as patents granted and patent citation (Messeni Petruzzelli, Albino, and Carbonara 2009). While the aforementioned articles focused on the firm-level innovativeness, Gebhardt and Pohlmann (2013) suggested a set of indicators allowing to evaluate cluster-level innovativeness such as the number of R&D personnel and science and technology spending, turnover with innovative products, patents, number of publications, and new firm formation in the cluster.

Although the reviewed articles covered a variety of contexts as described above, we found that there is some agreement in the literature as to the generative mechanisms of cluster innovativeness. Most articles (28 papers, or 61% of the total) focused on a set of generative mechanisms which we termed 'learning and knowledge'. These highlighted the importance of such elements as the external knowledge (Messeni Petruzzelli, Albino, and Carbonara 2009), the capabilities to explore new knowledge and to exploit the existing sources (Zettinig and

Vincze 2012) and absorptive capacities (Giest 2015). The articles referring to this generative mechanism covered a range of sectors, from high-tech (8 articles) to medium (8 articles) to low technology (2 articles), while 7 articles covered a combination of industries.

The second most important group of generative mechanisms in the reviewed literature pertained to 'networking and collaboration' with 14 articles. These focused on such aspects as the boundary permeability between the Triple Helix actors (Klofsten et al. 2015), intra-cluster collaboration (Jankowska, Götz, and Główka 2017) as well as cognitive convergence (Aliouat and Thiaw 2018) and actors' network competence (Chiu 2009). Again, the articles are distributed among a variety of sectors with 3 articles covering high-tech fields, 3 articles for medium-tech, 4 papers for low-tech and 3 studies covering a combination of sectors.

Four more papers highlighted the role of sound management and governance in driving cluster innovativeness (Gebhardt 2013; Gebhardt and Pohlmann 2013; Matinheikki et al. 2017; Berkowitz 2018). Finally, two papers focused on other generative mechanisms, such as R&D (Lefebvre 2013) and current cluster conditions (supporting organisations, cluster factors and competitive environments) (Arthurs et al. 2009).

This analysis shows that cluster contexts need to be carefully considered to devise a relevant set of indicators of firm-level or cluster-level innovativeness. However, several generative mechanisms of cluster innovativeness have been found relevant regardless of the innovation outcomes sought or the cluster contexts. This allows formulating a set of interventions which would trigger these generative mechanisms leading to improved cluster innovativeness.

Thematic analysis

In what follows we will present the findings of our literature review along the six business model dimensions. As the above analysis shows, the reviewed literature covers a very broad range of clusters in different contextual settings. We thus focused on formulating both general interventions – applicable in a variety of settings – and context-specific ones, where it was possible.

Actors & their roles

24 articles out of the total set explicitly focused on the cluster actors and the roles these play in its development. From these studies, two key sub-themes emerged:

1. Broadening the scope of cluster actors involved in cluster steering
2. Focusing on the definition, distribution, and evolution of the actors' roles

First, while some papers focused on the cluster management organisation as a key actor (e.g. Lefebvre 2013; Burger, Karreman, and van Eenennaam 2015; Giest 2015; Klofsten et al. 2015; Aslesen and Pettersen 2017; Morgulis-Yakushev and Sölvell 2017), most articles highlighted the importance of other actors for cluster steering and facilitation (Viljamaa 2007; Arthurs et al. 2009; Gebhardt and Pohlmann 2013; Castro 2015; Wannenmacher and Antoine 2016; Wei et al. 2016; Günther and Meissner 2017; Huang and Wang 2018; Scott, Hughes, and Kraus 2019).

The reviewed articles showed that a cluster can be driven by a variety of actors – from universities (Calzonetti, Miller, and Reid 2012) to public bodies (Connell, Kriz, and Thorpe 2014; Zhong and Tang 2018), to individual firm representatives with a high level of network competence (Chiu 2009). Gebhardt and Pohlmann (2013) show that the capabilities of the actors in charge of cluster management are crucial. To be able to foster cluster innovativeness, actors steering a cluster need to be reflexive, focus on the programmatic design, have general management competences, and decision-making autonomy.

Thus, there is a need to broaden the understanding of 'cluster management' and go beyond the activities of the 'specialised cluster organisation' to involve other actors such as academia, firms, and public bodies. To be successful, however, these need to have the competencies needed to steer such a complex entity. To synthesise, cluster innovativeness can be fostered by:

> *I_1: Ensuring the participation of various competent cluster actors in cluster management*

The second trend that emerged from the literature is related to the need to distinguish between the different roles actors can play in cluster development and clearly define these (Arthurs et al. 2009; Calzonetti, Miller, and Reid 2012; Eklinder-Frick, Eriksson, and Hallén 2012; Burger, Karreman, and van Eenennaam 2015; Castro 2015; Klofsten et al. 2015; Matinheikki et al. 2017; Yström and Aspenberg 2017b; Scott, Hughes, and Kraus 2019).

Within this dimension, 7 articles explicitly referred to the Triple Helix approach as a framework explaining the dynamics of interactions of different cluster actors and the distribution of their roles (Viljamaa 2007; Calzonetti, Miller, and Reid 2012; Eklinder-Frick, Eriksson, and Hallén 2012; Klofsten et al. 2015; Günther and Meissner 2017; Yström and Aspenberg 2017b; Huang and Wang 2018). Importantly, Calzonetti et al. (2012) indicated that the roles of the Triple Helix actors may differ for medium-high and low technology clusters. Although the role of the university for the medium-high technology cluster fits into the traditional Triple Helix framework (i.e. research, training, technology transfer and incubation), for a low technology cluster, its role is a 'developmental' one. This implies liaising with regional and state stakeholders, advancing the cluster through public policy efforts and developing cluster promotion strategies with regional stakeholders (Calzonetti, Miller, and Reid 2012).

This brings us to the second important dimension of the reviewed articles. Thus, our analysis allowed to identify three key roles which different actors may assume in the cluster: facilitators (Eklinder-Frick, Eriksson, and Hallén 2012; Connell, Kriz, and Thorpe 2014; Leroux et al. 2014; Burger, Karreman, and van Eenennaam 2015; Castro 2015; Giest 2015; Aslesen and Pettersen 2017), sponsors and/or stakeholders (Arthurs et al. 2009; Giest 2015; Berkowitz 2018; Zhong and Tang 2018) as well as visionaries or champions (Klofsten et al. 2015; Wei et al. 2016; Yström and Aspenberg 2017b). The facilitation role can include a broad range of activities such as the creation of conditions conducive to knowledge sharing, collective learning, trust- and capability-building (e.g. Calzonetti, Miller, and Reid 2012; Lefebvre 2013; Yström and Aspenberg 2017b). The sponsor or stakeholder role includes actors providing financial support to the cluster and thus having an influence over its strategic direction and/or external actors holding relevant knowledge for cluster development (Giest 2015; Berkowitz

2018; Scott, Hughes, and Kraus 2019). Finally, the visionary role – also referred to as a 'champion' or 'enthusiast' role – is often played by an (informal) leader having high innovation capabilities and a high level of engagement in the cluster activities (Klofsten et al. 2015; Wei et al. 2016; Yström and Aspenberg 2017b). These actors are crucial in defining the vision of the cluster and communicating it internally to create cohesion and externally to obtain support for cluster activities. To synthesise these findings, we formulate the following proposition:

> *I_2: Identifying actors playing the roles of facilitators, sponsors and/or stakeholders and visionaries*

We further identified a range of success factors for each of these roles. Thus, concerning cluster facilitation, the literature highlights the importance of identifying the needs, capabilities and barriers to the innovation of cluster actors and adapting the facilitators' approaches accordingly (Basco and Calabrò 2016; Jankowska, Götz, and Główka 2017; Klofsten et al. 2015; Lefebvre 2013; Leroux et al. 2014). Furthermore, to facilitate knowledge flows between different parties, such actors should be able to recognise the differences in their respective language and practices to then be able to alleviate any potential conflicts (Wannenmacher and Antoine 2016). Cluster facilitators should adopt an entrepreneurial approach focusing on market penetration in a pro-active and systematic way, facilitating collective decision-making, and developing competence in both local and global networking (Gebhardt and Pohlmann 2013). Moreover, cluster facilitators need to gain legitimacy and trust of the other cluster actors (e.g. Giest 2015; Leroux et al. 2014; Viljamaa 2007). Finally, literature drawing on the 'varieties of capitalism' approach suggests that the facilitation role is more important for the innovativeness of clusters in countries with coordinated market economies (Cappellin 2012). We thus formulate the following design propositions:

> *I_3: Ensuring that cluster facilitators have a high level of network competence, legitimacy and understanding of actors needs*

> *I_4: Strengthening the cluster facilitation role in the coordinated market economies*

Sponsors and stakeholders may comprise both public and private actors or a combination of the two (Connell, Kriz, and Thorpe 2014; Giest 2015; Scott, Hughes, and Kraus 2019). The inclusion of a broad range of regional stakeholders has been found conducive to cluster innovativeness as it allows to integrate the local knowledge into the cluster's business activities (Berkowitz 2018). Where the main sponsors are cluster members (financing the cluster activities through their fees), the needs and possibilities of smaller companies and start-ups need to be taken into account to ensure a balanced representation of different stakeholders in a cluster (Giest 2015). Furthermore, soliciting financial support of external partners can help to build the cluster's credibility and prestige (Scott, Hughes, and Kraus 2019). Finally, the involvement of external stakeholders, such as public bodies is more important at the early stages of cluster development, where they help promote entrepreneurship and innovation (Huang and Wang 2018). At the later stages, their role should be minimal (Zhong and Tang 2018) and, if present, these should focus on knowledge diffusion and the formation of ties between cluster actors (Huang and Wang 2018). We thus suggest that cluster innovativeness can be fostered by:

I_5: Ensuring a balanced representation of stakeholders, both internal and external

I_6: Ensuring the support of sponsors and/or stakeholders at early cluster life-cycle stages

Concerning the third type of cluster actors – 'enthusiasts' and 'visionaries' – these should have an entrepreneurial approach, charisma and legitimacy, as well as a vast personal network and a deep understanding of the cluster activities and focus area (Connell, Kriz, and Thorpe 2014; Klofsten et al. 2015; Mendel and Bardet 2009; Scott, Hughes, and Kraus 2019; Yström and Aspenberg 2017b). However, such individuals should also be empowered, have the internally authorised autonomy and be supported in their activities by agents in the periphery who can infuse core members with new knowledge (Klofsten et al. 2015; Scott, Hughes, and Kraus 2019). The ability of visionaries to lead also depends on power asymmetries in the cluster (Mendel and Bardet 2009; Wei et al. 2016). Thus, the visions and strategic directions of dominant actors are more conducive to cluster innovativeness where these are oriented towards knowledge creation and collaboration (Mendel and Bardet 2009; Burger, Karreman, and van Eenennaam 2015). However, the role of focal enterprises as champions of cluster development is more important at the early stages of cluster life-cycle (Huang and Wang 2018). To synthesise, we propose the following interventions for innovation-centric cluster design:

I_7: Ensuring that the goals and values promoted by visionaries support the innovation and knowledge-creation orientations

I_8: Strengthening and supporting the visionaries at the early cluster life-cycle stages

Resources and capabilities

In the set of reviewed articles, 33 papers covered the aspect of resources and capabilities needed for cluster innovativeness. Among these, we identified two major common themes: the types of resources present in the cluster, and their variety and complementarity.

With respect to the first topic and confirming our preliminary findings, the literature showed that both tangible and intangible resources can be present in a cluster (Fromhold-Eisebith and Eisebith 2005). Several articles focused on the material or 'tangible' resources and highlighted the importance of the available finance, talent pool, infrastructure and regional resource endowment (Fromhold-Eisebith and Eisebith 2005; Arthurs et al. 2009; Callagher 2012; Gebhardt 2013; Burger, Karreman, and van Eenennaam 2015). The majority of articles, however, focused on the 'intangible' aspects and identified the following key resources and capabilities influencing cluster innovativeness: social capital (Sellitto and Burgess 2005; Eklinder-Frick, Eriksson, and Hallén 2012; 2014; Gretzinger and Royer 2014; Kim and Shim 2018), network competence (Chiu 2009), collaborative and absorptive capacity (Giest 2015; Aslesen and Pettersen 2017), as well as technological and market capabilities (Renko et al. 2005; Isaksen 2007). The literature showed that insufficient development of tangible or intangible resources and capabilities can impede successful cluster development and limit its innovation potential. We synthesise this into the following design propositions to foster cluster innovativeness:

I_9: Ensuring the balanced development of both tangible and intangible resources

However, different types of tangible and intangible resources may be needed depending on the clusters' exogenous and endogenous contexts. Several studies have drawn attention to the social capital as one of the crucial resources of clusters conducive to their innovativeness (e.g. Eklinder-Frick, Eriksson, and Hallén 2014; 2012; Kim and Shim 2018; O'Dwyer et al. 2015). However, Eklinder-Frick et al. (2012) show that social capital in a cluster is a multidimensional construct and implies both bonding and bridging forms. The former is associated with a single and cohesive network structure with trust-based relations, while the latter refers to social capital reached through diverse connections and sparse network contacts. Interestingly, these forms of social capital can be shaped by the pre-existing regional culture and can have both positive and negative effects on innovation outcomes in clusters (Eklinder-Frick, Eriksson, and Hallén 2012; 2014). We propose the following intervention fostering cluster innovativeness:

I_{10}: Leveraging the enablers and alleviating the impediments of the pre-existing social capital

Furthermore, to be innovative, cluster actors should have the capabilities to generate, share and utilize knowledge (Forest 2010; Isaksen 2007). In this respect, the building of cluster members' absorptive and collaborative capacity is key for innovation development in clusters (Aslesen and Pettersen 2017; Giest 2015). Other important capabilities include technology orientation and R&D capabilities in high-technology clusters, as well as the ability to identify problems, understand and research markets or, in other words, the market orientation in both high, medium and low technology fields (Ai and Wu 2016; Aliouat and Thiaw 2018; Forest 2010; Jankowska, Götz, and Główka 2017; Renko et al. 2005). To synthesise, we suggest the following innovation-centric design interventions:

I_{11}: Ensuring the development of capabilities for knowledge generation, sharing and utilisation

I_{12}: Ensuring the development of both technology and market orientation in high-tech clusters and focusing on market orientation in low-tech fields

Finally, the variety and complementarity of the resources and capabilities available in the cluster have surfaced as some of the key elements in a range of studies (Mendel and Bardet 2009; Messeni Petruzzelli, Albino, and Carbonara 2009; Forest 2010; Zettinig and Vincze 2012; Wannenmacher and Antoine 2016; Matinheikki et al. 2017; Aliouat and Thiaw 2018).

While some authors advocate for the need to ensure the variety of resources and capabilities in the cluster as it can allow accessing new types of knowledge and experiences (Forest 2010; Klofsten et al. 2015; Günther and Meissner 2017), other suggest that such a variety can have negative effects. Indeed, it can negatively affect trust, prevent the development of collaborative relationships and may eventually lead to cluster dissipation (Mendel and Bardet 2009; Gebhardt 2013). Involving too great a variety of actors can also lead to difficulty in tailoring the cluster activities to the needs of the members, thus limiting their value (Yström and Aspenberg 2017b). On the other hand, excessive similarity should also be avoided as it may lead to increased rivalry (Matinheikki et al. 2017), and be counter-productive for knowledge generation (Forest 2010).

Thus, moderate similarity has been found most conducive to cluster innovativeness (Matinheikki et al. 2017).

I_{13}: Ensuring the moderate similarity of actors' resources and capabilities

Finally, several authors suggest a range of mechanisms enabling the cluster firms to draw on the resources and capabilities available in the cluster. Thus, Wannenmacher and Antoine (2016) show that a variety of resources may be a pre-requisite for multi-disciplinary cluster projects. In such cases, a peer-mediation process can help enable productive dialogue and knowledge exchange by raising awareness of the different value systems, goals and language of the participants and transcend the barriers between different actor communities (Wannenmacher and Antoine 2016). Moreover, Castro (2015) highlights that the practices of sense-making and sense-giving can be critical in mediating between the different cluster communities. These imply raising awareness of the cluster actors about the added value of knowledge, competences, and the potential of other members. We thus synthesise into the following design intervention for cluster innovativeness:

I_{14}: Ensuring the awareness of the cluster members of the variety and value of the available resources and capabilities in the cluster

Value flows

While 27 articles in our database focused on the value flows, one article has been found especially relevant for setting the framework for analysing and discussing these. Specifically, Morgulis-Yakushev and Sölvell (2017) identify seven relational channels in a cluster – firm-to firm, firm-to-research, firm-to-education, firm-to-capital, firm-to-public bodies, firm-to-other clusters, firm-to-global – and suggest that value flows between cluster actors can be sub-optimal if the 'gaps' exist in these channels. We will now discuss the findings of the other articles through the prism of these seven types of value flows.

Concerning firm-to-firm interactions, the willingness of the cluster members to invest their resources in collective actions and projects is one of the key drivers of clusters' collective innovativeness (Matinheikki et al. 2017). Maintaining connectivity between member firms is one of the major priorities for mature clusters to ensure continuous knowledge flows as the number of members grows (Connell, Kriz, and Thorpe 2014). Furthermore, firm-to-firm interactions are more relevant for less R&D-intensive industries relying on innovations developed through problem-solving by companies and drawing upon applied research and learning through interactions with customers and suppliers, i.e. the 'synthetic' knowledge base (Aslesen and Isaksen 2016; Calzonetti, Miller, and Reid 2012; Cappellin 2012). We synthesise this into the following innovation-centric design propositions:

I_{15}: Ensuring that cluster actors are willing to engage in firm-to-firm interactions and share both tangible and intangible resources

I_{16}: Focusing on maintaining firm-to-firm connectivity and knowledge flows in mature clusters and those relying on the 'synthetic' knowledge base

The relevance of firm-to-research and firm-to-education depends on the knowledge base the cluster firms draw upon in their innovation activities (e.g. Aslesen and Isaksen 2016; Aslesen and Pettersen 2017; Calzonetti, Miller, and Reid 2012). Thus, firms operating in high-tech, R&D-intensive, industries draw upon fundamental research – or 'analytic' knowledge base – and are more likely to perform in-house R&D and engage with universities and research centres conducting fundamental research (Aslesen and Isaksen 2016; Calzonetti, Miller, and Reid 2012). Moreover, the importance of firm-to-education and firm-to-research connections has been found more important at the early cluster life-cycle stages as well as at 'transformation' stages, which occur when the current dominant technological paradigms are exhausted, and new sources of opportunities are needed (Viljamaa 2007). Relations with the academia may be transformed from the generative (new venture creation and technology development) to developmental once the cluster reaches a more stable trajectory and is able to sustain the momentum itself. In this case relationships with the university may help the cluster build its brand and image, reach new markets and gain recognition at the regional and national levels (Calzonetti, Miller, and Reid 2012). On the other hand, in clusters operating in less technologically sophisticated sectors of activity, the relationships with academia may also matter, however, they are likely to draw less on the Triple Helix interaction model (Calzonetti, Miller, and Reid 2012). Indeed, in such clusters, links with academia may prove to be more valuable in terms of building social capital and developing cluster brand and image as well as its representation nationally and internationally (Calzonetti, Miller, and Reid 2012). We thus propose the following interventions improving cluster innovativeness:

> *I_{17}: Ensuring firm-to-(fundamental) research connectivity for clusters operating in sectors drawing on 'analytic' knowledge bases*
>
> *I_{18}: Ensuring firm-to-(applied) research connectivity for clusters operating in sectors drawing on 'synthetic' knowledge bases*
>
> *I_{19}: Ensuring and strengthening firm-to-research and firm-to-education connections at the formation and 'transformation' cluster life-cycle stages*

Firm-to-capital relations have been found important, especially, for SME clusters having limited resources (Renko et al. 2005). Foreign direct investment attraction – often considered an efficient way to finance regional development – has been found a controversial approach (Burger, Karreman, and van Eenennaam 2015; O'Dwyer et al. 2015). Indeed, it is necessary to distinguish between two types of MNC subsidiary activities: low-value-added activities such as production plants and sales and marketing offices, and high-value-added business functions, such as R&D and education (Burger, Karreman, and van Eenennaam 2015). While most clusters succeed in attracting low-value-added investments, these do not have a significant effect on the innovativeness of local firms (Burger, Karreman, and van Eenennaam 2015). On the other hand, for high-value-added investments, it is necessary to develop the appropriate specialised location factors, such as unique and 'sticky' knowledge in the cluster, the pool of high-skilled workers and high-tech culture (Burger, Karreman, and van Eenennaam 2015; Isaksen 2007). We synthesise into the following innovation-centric design interventions:

I_{20}: Distinguishing between low- and high-value-added foreign direct investments and focusing on the latter

Concerning firm-to-other-clusters and firm-to-global interactions, being able to tap into regional, national and extra-national (global) sources of knowledge has been found an important driver of cluster innovativeness (Ai and Wu 2016; Isaksen 2007; Messeni Petruzzelli, Albino, and Carbonara 2009; Wei et al. 2016). These value flows can be even more important where the regional resource endowment is not sufficient for innovation (Callagher 2012). For instance, international public and private donors and international powerful actors can be important for the development of clusters in developing countries with weak institutions (Parto 2008).

Such outreach, however, necessitates cognitive, organisational and institutional proximity between the actors, i.e. respectively a common knowledge base, formal organisational structures (e.g. strategic alliances, mergers and acquisitions) and a joint understanding of what is needed to achieve competitiveness (Isaksen 2007; Messeni Petruzzelli, Albino, and Carbonara 2009). Moreover, the relevance of inter-regional or inter-national connections depends on the geographical distribution of innovation activities in the sector (Ai and Wu 2016). For instance, in the countries where major R&D capacities lie with nation-level organisations, the cluster actors rely on these for the building of their innovation capacities (Isaksen 2007). Furthermore, the relevance of external connections is higher for companies drawing on fundamental research and R&D ('analytic' knowledge bases) as these represent codifiable, i.e. less geographically-bound knowledge (Aslesen and Isaksen 2016). To synthesise, we suggest the following interventions conducive to cluster innovativeness:

I_{21}: Establishing external links with cognitively, organisationally, or institutionally proximate actors

I_{22}: Establishing external connections with the major sources of innovation in the sector

I_{23}: Establishing external connections allowing to compensate for the lack of regional or national resource endowment

Several articles have highlighted the importance of virtual communication and bidding platforms and marketplaces as some of the tools facilitating knowledge flows between cluster actors and contributing to their innovativeness (e.g. Gebhardt and Pohlmann 2013; Sellitto and Burgess 2005; Zhong and Tang 2018). Such tools, however, are more effective where relationships between cluster actors already exist as it will contribute to strengthening these rather than establishing them (e.g. Sellitto and Burgess 2005). Finally, balancing weak and strong ties – or exploration and exploitation relations respectively – is crucial and requires the cluster as a whole to remain adaptive to external change and to create and re-create routines allowing it to repeatedly reap the benefits form the value it generates (Zettinig and Vincze 2012). Synthesising these findings, we propose the following innovation-centric design interventions:

I_{24}: Establishing virtual platforms facilitating knowledge flows

I_{25}: Balancing ties allowing the exploitation of the available opportunities and the exploration of new ones

Governance

22 of the reviewed articles covered the subject of governance. Confirming our preliminary findings, the reviewed literature distinguishes between formal and informal governance mechanisms in clusters (e.g. Cappellin 2012; Gretzinger and Royer 2014; Isaksen 2007; Wei et al. 2016). Although the informal governance mechanisms – such as unwritten agreements and trust-based relations – are important, over-reliance on these can prevent the cluster from developing a goal-oriented formal structure, the absence of which can be a barrier to creating partnerships and building social capital (Gretzinger and Royer 2014). Moreover, structured organisational arrangements have been found more conducive to trust-building and knowledge flows between the parties than ad hoc arrangements (Connell, Kriz, and Thorpe 2014). Formal rules for leadership and collaboration should be transparent (Gebhardt 2013) and governance should be based on negotiations and agreements (Cappellin 2012). Thus, a balance between formal and informal governance mechanisms should be established for a cluster to be innovative, where formal contracts are used along with unwritten agreements (Isaksen 2007; Wei et al. 2016). This is particularly relevant for clusters in unsupportive institutional settings, e.g. lacking the protection of property rights, where these may act as 'safe environments' if appropriate governance mechanisms are devised (Bek et al. 2013). We synthesise these findings into the following design propositions to foster cluster innovativeness:

I_{26}: Balancing formal and informal governance mechanisms

I_{27}: Ensuring the governance mechanisms provide a 'safe environment' for clusters operating in unsupportive contexts

Furthermore, where the public bodies play an important role in cluster governance, effort should be made to establish transparent communication and governance structures so that the public authorities and the clusters' self-regulatory bodies are well-connected and aware of each other's goals, needs and priorities (Parto 2008; Wei et al. 2016). We synthesise into the following innovation-centric design interventions:

I_{28}: Ensuring the connectedness and transparent communication between public and private sector cluster actors

Given the complexity of the network relations in the cluster, where actors have different motivations and goals (for example, market value creation versus knowledge creation), multi-level formal governance mechanisms are needed (Scott, Hughes, and Kraus 2019). Specifically, an overarching governance board and a master agreement should co-exist with more specific governance arrangements suited to the needs of individual actors and projects (Scott, Hughes, and Kraus 2019). A feasible and clear strategy is crucial, however, cluster actors should identify with it as such commitment contributes to more robust management and facilitates conflict settlement (Gebhardt 2013). Moreover, the actors involved in cluster governance can be viewed as important resources and pools of knowledge and cluster governance structures should be

reflexive, adaptive and 'porous', allowing to absorb new knowledge (Castro 2015). We propose the following set of intervention to enhance cluster innovativeness:

> *I_{29}: Ensuring the participation and commitment of different cluster actors in its governance*
>
> *I_{30}: Establishing adaptive and 'porous' governance arrangements facilitating the absorption of new knowledge*
>
> *I_{31}: Establishing multi-level governance arrangements*

Value proposition

The subject of cluster value proposition was covered by 9 articles. In line with our preliminary findings, the reviewed literature distinguishes between value created for clusters' external stakeholders, i.e. contributing to regional development, and for its internal actors, i.e. enhancing the competitiveness of their members and contributing to their financial and non-financial performance (Klofsten et al. 2015; O'Dwyer et al. 2015; Matinheikki et al. 2017). A clearly defined and viable external value proposition or 'idea' of a cluster originating in a real market need has been found one of its key success factors (Klofsten et al. 2015). We propose the following intervention for innovation-centric cluster design:

> *I_{32}: Clearly defining a viable external value proposition based on a real market need*

However, internal and external value propositions are inter-related: the presence of a clearly-articulated system-level goal (external value proposition) offers a sense of community to cluster members, improves their participation and willingness to share resources (internal value proposition) (Klofsten et al. 2015; Matinheikki et al. 2017). Successful innovation-centric clusters can identify with nation-wide economic development goals and contribute to these at the same time presenting important opportunities for learning and knowledge-sharing for the participants (O'Dwyer et al. 2015). Indeed, the motivation for individual members to participate in a cluster can be both externally-motivated – for instance, by the desire to contribute to nation-wide development of the knowledge economy – and internally-driven by the need to find new, innovation-based, sources of competitive advantage (O'Dwyer et al. 2015). We thus propose the following set of innovation-centric design interventions:

> *I_{33}: Aligning the external goals with the motivations, capabilities, and goals of individual members*
>
> *I_{34}: Identifying with broader national or regional development priorities*

Value-creating activities

20 articles in our selection focused on value-creating activities. These fell within the four previously identified innovation-related activities in a meta-organisational setting: the orchestration of knowledge capabilities, ongoing strategizing, developing public policy and theorising innovation (Dougherty and Dunne 2011; Gimet and Grenier 2018). However, we also identified an additional category, the 'generative' activities, i.e. the generation or provision

of resources needed for cluster development, such as scientific knowledge, talent and university spin-offs (Calzonetti, Miller, and Reid 2012). This type of activity, however, has been found more relevant for high-technology, than medium-technology clusters (Calzonetti, Miller, and Reid 2012). We synthesise these findings into the following propositions for innovation-centric cluster design:

> *I_{35}: Engaging in five innovation-related activities: the orchestration of knowledge capabilities, ongoing strategizing, developing public policy, theorising innovation, and resource generation*

> *I_{36}: Focusing on the 'generative' activities in high-technology clusters*

Concerning the orchestration of knowledge capabilities, it includes activities that aim to create, share and combine knowledge (Castro 2015). Yström and Aspenberg (2017) refer to these activities as enabling cluster actors to act in a collaborative space by forging relationships, facilitating projects, and offering a forum for sharing knowledge. Other articles noted such activities as the development of capabilities for learning and knowledge-sharing as well as searching for innovation opportunities (e.g. organising peer-learning groups, fairs and trade missions as well as networking events) (Connell, Kriz, and Thorpe 2014; Lefebvre 2013). We thus suggest that cluster innovativeness can be enhanced by:

> *I_{37}: Orchestrating knowledge capabilities with respect to the knowledge bases and innovation modes of cluster actors*

Ongoing strategizing refers to cluster's ability to position itself, formalise its structure and goals (Gretzinger and Royer 2014), be adaptive and reflexive (Castro 2015) and involve a wide range of stakeholders to integrate local knowledge (Berkowitz 2018). Developing public policy as well as regional networking have been found some of the key 'developmental' activities of cluster actors especially relevant for medium-technology clusters (Calzonetti, Miller, and Reid 2012). We formulate the following design proposition conducive to cluster innovativeness:

> *I_{38}: Focusing on public policy development activities in medium-technology clusters*

Concerning 'theorising innovation', Yström and Aspenberg (2017) refer to 'narration' activities of cluster actors implying storytelling and agenda-setting practices to forge cluster identity and foster a sense of membership (Yström and Aspenberg 2017b). Developing cluster identity, international visibility and brand-building has been commonly highlighted in the literature as crucial activities for the development of cluster image, attracting members and external funds (e.g. Connell, Kriz, and Thorpe 2014; Gebhardt 2013; Morgulis-Yakushev and Sölvell 2017). These activities, however, may be more relevant for clusters at the formation and 'transformation' stages (e.g. Connell, Kriz, and Thorpe 2014; Ingstrup and Damgaard 2013; O'Dwyer et al. 2015). We synthesise these findings into the following design proposition for cluster innovativeness:

> *I_{39}: Focusing on 'theorising innovation' activities for agenda-setting and brand-building at the formation and 'transformation' stages of cluster development*

Discussion and conclusions

In this article, we set out to explore the premises of the innovation-centric cluster design by taking stock of the extant research in this field. We adopted the business model lens to identify cluster elements which, if shaped appropriately, can produce the desired results. We identified six cluster business model elements: actors and their roles, resources and capabilities, value flows, governance, value propositions and value-creating activities.

Our goal was two-fold: to both advance our understanding of the value creation in 'managed' clusters seen here as 'meta-organisations' and pave the way for evidence-based management in these. We thus adopted the design orientation in this paper and applied the 'CIMO' framework (Denyer, Tranfield, and van Aken 2008) throughout the article. We thus analysed the Contexts covered in the reviewed articles, innovation outcomes sought and generative mechanisms triggering these. We then distilled the findings of our literature review in the form of interventions for the innovation-centric design of a cluster business model. In line with the design-science approach, we suggest that these interventions are not used as "a set of instructions or fixed protocols, but as input to the creative and innovative process of designing…" (van Aken and Romme 2012, p. 43)

Four important insights and further research paths emerged from our literature review. First, we identified the lack of a systematic approach to the analysis of exogenous factors and their influence on cluster innovativeness. Although some articles provided insights into the contextual influences by focusing on the national (e.g. Bek et al. 2013; Cappellin 2012), regional (e.g. Eklinder-Frick, Eriksson, and Hallén 2014; 2012) or sectoral (e.g. Aslesen and Isaksen 2016; Calzonetti, Miller, and Reid 2012) specifics, none of these investigated the interplay between the three scales. Thus, the call for a multi-scalar approach in innovation studies voiced by Bunnell and Coe (2001) still goes largely unanswered in the field of cluster research which suggests an interesting path for future studies. These could explore the cluster-environment relations building upon the literature analysing organisation, strategy and environment interactions (e.g. Chakravarthy 1982; Jennings and Seaman 1994; Volberda et al. 2012). For instance, it may be interesting and worthwhile to explore whether and how clusters design their business model to fit their environment and if this helps them achieve better innovation performance. Furthermore, interesting insights into cluster strategy and structure may emerge from comparative studies applying the business model framework to clusters at different life-cycle stages, having different institutional modes and operating in different national, regional, and industrial contexts. Such studies could draw upon the 'comparative institutionalism' perspective in organisation studies (e.g. Hotho and Saka-Helmhout 2017; Jackson and Deeg 2006).

Second, a careful reading of the articles shows that there is a confusion in the cluster studies between the various concepts of clusters, technoparks or Science Parks and innovation networks. In some cases, these are used interchangeably (e.g. Capellin 2003; Ai and Wu 2016; Zhong and Tang 2018), while some articles see clusters as parts of science parks (Chiu 2009). Such inconsistent use of the terminology may be misleading. Indeed, some researchers have suggested that clear differences may be drawn between the various forms of the spatial

organisation of innovation activities including science parks, clusters, and networks (e.g. Rosenfeld 1997). To bring more conceptual clarity to the field, we see a potential for the application of the 'meta-organisational' perspective to refer to the organised forms of collaboration, such as managed clusters, managed science parks or managed networks. This approach has been adopted by several articles in our literature review (Matinheikki et al. 2017; Berkowitz 2018). The umbrella term of 'meta-organisation' may also be valuable in highlighting the crucial differences between the organised and non-organised forms of clustering. The extension of the meta-organisational approach to other forms of collaborative arrangements such as science parks, technoparks and innovation networks calls for more theoretical and empirical investigations of these forms of organising to allow drawing parallels with the meta-organisational research. This may be a fruitful undertaking for future studies in this field.

Third, analysing the literature through the prism of six cluster business model elements we were able to gain a detailed insight into each of these elements thus extending the meta-organisational research. Notably, we have been able to identify three major roles played by the actors of clusters as meta-organisations: facilitators, sponsors and/or stakeholders and visionaries. Contrary to the mainstream cluster studies, our findings suggest that cluster facilitation role is not reserved to any single actor (such as a dedicated cluster organisation) and can be played by other actors, such as academia, labour unions and individual companies. Our research confirmed the presence of tangible and intangible cluster resources and capabilities and related value flows and highlighted the importance of the intangible ones for innovation. We also found support for the importance of both formal and informal governance mechanisms for cluster innovativeness. Concerning cluster value propositions, our research confirmed its multi-dimensional nature, whereby both internal and external value propositions are critical for cluster innovativeness. Finally, we found that cluster studies support the relevance of the four previously identified innovation-related activities but also identify the fifth type of activities: generative, i.e. the generation and provision of resources relevant for cluster development. Thus, by identifying the elements of a cluster business model, we made the groundwork for future research which could focus on different configurations of these to identify different types of clusters with relation to their strategy-making. Such research could draw inspiration from the configurational approach to strategy (cf. A. D. Meyer, Tsui, and Hinings 1993).

Finally, we identified a lack of a systematic approach to measuring or, at the very least, defining cluster innovativeness. Although this is partly explained by the predominance of qualitative approaches in the reviewed articles, this limits the development of a more holistic understanding of the outcomes clusters are expected to deliver.

Our study is, of course, not without its limitations. First, by choosing to focus exclusively on academic articles, we excluded 'grey' literature, such as reports by specialised cluster organisations or policymakers which, potentially, could provide additional insights. This, however, can be explored in future studies that may take a broader stance and analyse 'grey' literature as well.

Article 3: Do clusters act? Understanding clusters' ability to change their environments[5]

Abstract

In this paper, we aim at exploring whether and how 'organised' clusters can be conceived of as deliberate actors within their contexts. Seeing such clusters as meta-organisations, we suggest that these can make 'organisationality' design choices, or decisions regarding full or partial implementation of the five elements constitutive of formal organisations: membership, hierarchy, rules, monitoring, and sanctions. To explore the relationship between clusters' organisationality and actorhood, we conduct two qualitative case studies of 'organised' clusters in Australia. We find that clusters can deliberately 'construct' themselves both as organisations and social actors. Furthermore, drawing upon the institutional work perspective, we find evidence that clusters can engage in deliberate identity, boundary, and practice work. However, in doing so, they address both internal and external legitimating audiences. Finally, our findings show that clusters' 'organisationality' design choices influence the locus of their actorhood resulting in more or less collaborative approaches to institutional work.

Keywords

Clusters; organisationality; actorhood; institutional work; identity work; boundary work, practice work; meta-organisation.

Introduction

Recent scholarship in the field of organisation studies has been paying increasing attention to non-traditional organisation forms such as meta-organisations or 'organisations of organisations' which have become a ubiquitous – but a somewhat overlooked – phenomenon in the modern world (Ahrne and Brunsson 2008). In particular, the meta-organisational perspective has been gaining scholarly attention as a way to better understand the logic, structure and nature of 'organised' clustering (cf. Fen Chong 2009; Gadille, Tremblay, and Vion 2013; Kadenic 2017; Lupova-Henry, Blili, and Dal Zotto 2019a; Viachka 2013).

In contrast to 'spontaneous' clusters, which have been defined as 'geographic concentrations of organisations' (Porter 1990), 'organised' clusters are driven by common goals or strategic directions, have dedicated 'cluster managers' facilitating and coordinating the relationships between the members and, in many cases, receive financial stimuli from the national and regional authorities to whom they are accountable (cf. Lindqvist, Ketels, and Sölvell 2013; Müller et al. 2012; Sölvell, Lindqvist, and Ketels 2003).

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However, while stimulating the 'organised' clustering has become one of the preferred approaches to reshaping the regional development paths, driving innovation and the transition towards the knowledge economy (cf. Aziz and Norhashim 2008; Etzkowitz 2012; Rosenfeld 2002), on many occasions, 'organised' clusters failed to fulfil their promise as the drivers of regional transformation (cf. Hospers, Desrochers, and Sautet 2009). In this paper, we suggest that seeing 'organised' clusters as meta-organisations can help better understand their dynamics and nature and thus allow to steer these more deliberately.

Indeed, while the benefits, disadvantages and dynamics of clustering have been extensively studied by economic geographers, industrial economists and researchers in regional studies (Lazzeretti, Sedita, and Caloffi 2014; Hervás-Oliver, Gonzalez, and Caja 2014), these have mostly seen clusters through the 'determinist lens' as geographical areas shaped by external forces (cf. Moulaert and Sekia 2003). On the other hand, adopting the meta-organisational perspective on 'organised' clusters represents a shift towards the voluntarist approach and suggests that similarly to individual-based organisations, 'organised' clusters can be designed (cf. Romme 2003), be considered as deliberate actors capable of shaping their environments (B. G. King, Felin, and Whetten 2010), and be held collectively responsible for their actions (e.g. Berkowitz 2018). Moreover, their 'organisationality' design choices – i.e. the decisions to fully or partially implement the elements of formal organisations – may influence their ability to engage in deliberate social action (e.g. Ahrne and Brunsson 2011; Dobusch and Schoeneborn 2015).

In this paper, we aim at exploring whether and how 'organised' clusters can be conceived of as deliberate actors within their contexts and how their 'organisationality' design choices mediate their actorhood, i.e. their ability to engage in social action and be perceived as actors by their legitimating audiences. To elaborate on the concept of 'actorhood' we ground our research in the neo-institutionalist theory, and, in particular, the institutional work perspective and distinguish between three types of agency available to an organisation as a social actor: identity work, boundary work and practice work (Clegg, Rhodes, and Kornberger 2007; Lawrence and Suddaby 2006; Zietsma and Lawrence 2010). We see 'actorhood' not as a precondition or outcome of organisation but as an evolving capability to enact, sustain and change institutions (Hwang, Colyvas, and Drori 2019; Migdal-Picker and Zilber 2019).

Thus, seeing 'organised' clusters as ever-changing entities in the process of 'becoming' full-fledged organisations and social actors (Clegg, Kornberger, and Rhodes 2005; Tsoukas and Chia 2002), we formulate the following research questions: How do clusters engage in social action as organised collective entities? How do clusters' 'organisationality' design choices influence their actorhood?

To answer these research questions, we use the theory-elaborating case study approach (Eisenhardt and Graebner 2007; Ketokivi and Choi 2014) and extend the existing organisation theories to the context of clusters seen as meta-organisations. We conduct two case studies of organised clusters located in Australia and operating in food processing, sustainability, machinery manufacturing, and defence sectors. Our study suggests that 'organised' clusters can, indeed, be viewed as intentional actors rather than passive elements within their contextual

settings. However, their actorhood is a property deliberately 'constructed' rather than 'innate'. Moreover, the ways clusters practice their actorhood is shaped by their design choices concerning the implementation of the five elements of formal organisations. Specifically, these choices have an influence on the locus of clusters' actorhood resulting in more or less collaborative approaches to institutional work.

This article is structured as follows. First, we examine the theoretical background related to clusters seen as meta-organisations and discuss the elements of 'organisationality' in the cluster context. We also discuss cluster 'actorhood' conceptualising it as the types of agency clusters can engage in to create, maintain, or disrupt institutions. We then describe our research design. Following this, we present the findings of our case studies. Based on these, we formulate a set of theoretical propositions regarding the clusters' organisationality design choices and their ability to engage in social action and be perceived as actors by their legitimating audiences. Finally, we conclude and propose avenues for future research.

Theoretical background

Clusters as 'organisations of organisations'

Traditionally, clusters have been defined as 'geographic concentrations of interconnected companies and institutions in a particular field' (Porter, 1998: 78). This perspective on clusters adopts a determinist view whereby clusters are seen as 'geographical areas' (cf. Moulaert and Sekia, 2003) or 'populations of organisations' (Astley and Van de Ven, 1983) shaped by external forces, such as national contexts, industrial dynamics and regional specifics (e.g. Markusen, 1996; Paniccia, 1998; Porter, 1990). The studies adopting this perspective have been analysing cluster development through the prism of evolutionary processes of variation, selection and retention where the 'cluster management' role is inexistent (Astley and Van de Ven, 1983; Dotti and Lupova-Henry, 2020; Giuliani, 2010).

However, in the decades following the introduction of the cluster concept by Porter (1990), the whole 'idea of clustering' has been undergoing a transformation. Indeed, the introduction of the cluster concept allowed to legitimise the policy intervention for their (trans-)formation, and led to the ever-growing popularity of the 'organised' clusters as tools of regional development (Lindqvist et al., 2013; Motoyama, 2008; Sölvell et al., 2003). Such clusters manifest a certain level of coordination between members – often facilitated by dedicated 'cluster managers' - and, in many cases, receive financial stimuli from the national and regional authorities. This suggests that 'organised' clusters are driven by different logics, and display different dynamics as compared to 'spontaneous' clusters (cf. Kadenic, 2017). Indeed, the motivation of a company to locate within a geographical agglomeration may be completely different from its motivation to become a formal member of an 'organised' cluster (cf. Viachka, 2013).

Following a recent line of studies adopting a meta-organisational perspective on clusters (e.g. Fen Chong, 2009; Gadille et al., 2013; Gimet and Grenier, 2018; Leys and Joffre, 2014; Lupova-Henry et al., 2019b; Viachka, 2013), this paper conceptualises 'organised' clusters as 'organisations of organisations' whose constituents retain their autonomy and are not bound by formal authority but are driven by a system-level goal (Ahrne and Brunsson, 2008; Berkowitz

and Dumez, 2016; Gulati et al., 2012; Lupova-Henry et al., 2019b). This approach leans towards a voluntarist perspective and suggests that a cluster is "not an incoherent agglomeration, but a coherent organization" (Astley and Van de Ven, 1983: 258).

In this paper, we adopt the decision-based approach to conceptualising organisations (Ahrne et al., 2016; Ahrne and Brunsson, 2011; Apelt et al., 2017; Dobusch and Schoeneborn, 2015; Grothe-Hammer, 2018) which suggests that in organised settings joint decisions are made concerning five elements constitutive of formal organisations: membership, hierarchy, rules, monitoring and sanctions. Membership decisions imply defining who makes part of the organisation, while hierarchy entails a form of organised power which can be given to certain individuals or be represented as a form of a decision mechanism. Rules are explicit and written and organisation members are expected to comply with these. Monitoring in organisations aims at both ensuring compliance with the rules and estimating how well organisation members perform their work. Sanctions can be both positive and negative and can serve to promote or recognise members' performance or punish undesirable behaviour (Ahrne and Brunsson, 2011).

These elements are also present in cluster literature which highlights the importance of formal cluster membership (Ketels et al., 2012) and designing appropriate governance mechanisms regulating the relationships in a cluster and allowing monitoring and sanction (e.g. Capellin, 2003; Connell et al., 2014; Gebhardt, 2013).

Recent research demonstrates that a deliberate design choice may be made to implement only some of the elements of formal organisations leading to 'partial' organisation (Ahrne et al., 2016). Such a choice is often driven by the goals of organisations, their contexts and internal resources and capabilities (Ahrne et al., 2016). Finally, varying degrees of 'organisationality' – i.e. the extent to which the elements of formal organisations are present – mitigate the ability of the organisations to enforce their strategic decisions and influence their interactions with external stakeholders (Ahrne et al., 2016; Dobusch and Schoeneborn, 2015; Grothe-Hammer, 2018). However, there is still a need for a deeper understanding of how entities which only partially implement the elements of formal organisations can impact society and under which conditions they are accepted and legitimised (Apelt et al., 2017).

To sum up, the 'meta-organisational' view on clusters implies that these are not mere geographic areas but are coherent organisations which display joint decision making and are driven by common goals. Leaning towards a voluntarist approach, this perspective suggests that, as a form of organisation, clusters may be deliberately designed. Specifically, they can make a deliberate design choice to fully or partially implement the elements of formal organisations – membership, hierarchy, rules, monitoring and sanctions – which may then influence their ability to enforce their strategic decisions, impact society as well as be accepted and legitimised by it.

Constructing cluster actorhood

Clusters are often created to re-shape their contexts and re-direct the development paths of their regions (e.g. Berkowitz and Bor, 2018; Etzkowitz, 2012; Hospers et al., 2009; Rosenfeld, 2002). Representing collaborative settings, they can be seen as 'protected spaces' for the introduction

and dissemination of new institutions – rules, technologies and practices – through inter-organisational collaborations within their boundaries (cf. Lawrence et al., 2002). At the same time, as meta-organisations, clusters can become 'orchestrators' of institutional change by defining and creating broader rules and scripts and thus shaping institutional fields (Semper, 2019).

Organisation scholarship has recently highlighted the expanding 'actorhood' of organisations whereby these are expected to respond to the ever-growing number of stakeholder demands and to take action on a wide variety of societal concerns (cf. Bromley and Sharkey, 2015; Halgin et al., 2018; Meyer, 2010; Meyer and Jepperson, 2000). However, the nature of organisational actorhood has often been taken for granted and not clearly defined in organisational research (Hwang et al., 2019). In contrast to some recent explorations of actorhood assimilating it to the 'external attribution of the capability to act' (Dobusch and Schoeneborn, 2015; Grothe-Hammer, 2018; Halgin et al., 2018), we adopt here a broader perspective, suggesting that actorhood is defined both by the organisation's capability to act purposefully (intentionality) and the perception of this capability by the external audiences (external attribution) (Bromley and Sharkey, 2015; King et al., 2010). Furthermore, we follow recent research into actorhood suggesting that it is "a model whose approximations may be a variable" (Hwang et al., 2019: 17). In other words, we see actorhood as a property being 'constructed' by organisations depending on their context and their goals, rather than a pre-condition, outcome, or a necessary attribute of an organisation (Migdal-Picker and Zilber, 2019).

To conceptualise 'what it means to be an actor' we build upon the definition of actorhood seen through the lens of intentionality and external attribution of the capability to act and draw upon the institutional work perspective (Lawrence et al., 2009; Lawrence and Suddaby, 2006; Zietsma and Lawrence, 2010). We thus suggest distinguishing between three types of agency an organisation can engage into as a social actor: boundary work and practice work (Zietsma and Lawrence, 2010), and identity work (Clegg et al., 2007).

Identity work

Organisations shape their identities so that their internal and external audiences perceive them as legitimate actors in given contexts (Bridwell-Mitchell and Mezias, 2012; Clegg et al., 2007; Suchman, 1995). Organisational collective identity, i.e. "communicative claims on what the organization is and what it is not" (Dobusch and Schoeneborn, 2015: 1010) can be seen as the organisation's character or self-image (Gioia et al., 2013). It is manifested through such features as key values, labels, products, services, or practices, which allow the organisation to collectively define "who we are" (Gioia et al., 2013). Collective identity is constructed thought the 'bricolage' of the elements existing in the institutional environments (symbols, values, meanings) which are (re-)combined in new ways to introduce 'institutionally sanctioned' variations (Glynn, 2008). To achieve legitimacy through identity work, organisations are expected to balance between similarity and differentiation, i.e. while striving to be perceived as a representative of a legitimate type of organisation, they are at the same time working to differentiate themselves from all other representatives of this type of organisation (Clegg et al., 2007).

Boundary work

Boundary work is defined as "the attempts of actors to create, shape, and disrupt boundaries" (Zietsma and Lawrence, 2010: 190). Boundaries help distinguish the organisation from its environment and can be defined either through formal membership (Ahrne and Brunsson, 2008) or, in the absence of the latter, through the adherence of organisation members to common goals, identity or an overarching agenda (Crespin-Mazet et al., 2018; Dobusch and Schoeneborn, 2015; Gulati et al., 2012). Thus, the previously defined 'organisationality' design choices play a role in the boundary work (see also Barberio et al., 2018). The relationship between boundaries and identity are mutual and decisions on who makes part of the formal organisation and who does not affect its identity and allows to reach a critical mass necessary to legitimise the organisational action in the eyes of external stakeholders (Crespin-Mazet et al., 2018). It also works the other way around: by deliberately shaping the collective identity by assembling elements from different institutional categories, organisations can disrupt the boundaries between these categories (Glynn, 2008).

Practice work

Finally, practice work is conceptualised as "actors' efforts to affect the recognition and acceptance of sets of routines, rather than their simply engaging in those routines" (Zietsma and Lawrence, 2010: 190). This type of work implies actors' efforts to affect the practices that are considered legitimate within a certain domain (Zietsma and Lawrence, 2010). Practices can also relate to the way organisations 'perform' their identities in specific contexts and though such performances transform institutions (Glynn, 2008) and 'construct' themselves as legitimate actors in the eyes of their external audiences (Crespin-Mazet et al., 2018)

Thus, the three types of agency while being distinct, exist in a recursive relationship (Zietsma and Lawrence, 2010) whereby the identities may help shape group boundaries and identity performances may disrupt existing practices (Clegg et al., 2007; Glynn, 2008). At the same time, boundaries delimit legitimate practices, while practices support specific group boundaries (Zietsma and Lawrence, 2010). The creation of a new organisational form itself is a way to alter identities, boundaries, and practices (Clegg et al., 2007; Zietsma and Lawrence, 2010). With respect to each of these types of agency, social actors can engage in creating, maintaining, and disrupting institutions (Lawrence and Suddaby, 2006). By making certain design choices concerning their organisationality, actors can create, maintain, and disrupt identities, boundaries and practices and construct their actorhood.

The three types of agency can be relevant in the cluster context. Cluster literature highlights the 'narrativisation' of cluster development and its vision as one of the drivers allowing the alignment of diverging interests of cluster actors and articulation of a shared vision situated within the broader national and sectoral discourses (O'Dwyer et al., 2015). Due to the engagement of a wide variety of actors in cluster development, a system-level goal or a common vision may be some of the key elements 'glueing' different actors together (Gebhardt, 2013; Matinheikki et al., 2017). The adherence to a 'collective identity' can also substitute formal membership allowing to 'demarcate' the ground between inclusion and exclusion of organisation members (Dobusch and Schoeneborn, 2015; Gulati et al., 2012). Thus, while a

decision can be made to not establish formal cluster membership, a cluster can still be considered a meta-organisation and, as such, a deliberate actor, if it exhibits a 'collective identity'. The latter would then play a key role in delineating the conceptual and geographical boundaries of a cluster.

Finally, one of the interesting questions that can be raised concerning clusters' intentionality is the locus of their actorhood. While some research highlights the role of individuals or organisations adopting the leadership role to drive the institutional work (Dorado, 2005; Lawrence et al., 2002; Wijen and Ansari, 2016), others suggest that institutional work may be conducted by multiple actors working towards similar goals without any joint agenda (Dorado, 2005; Semper, 2019). As complex organisations driven by plural intentions and motivations (Brès et al., 2018), meta-organisations rely on 'soft' law, voluntary agreements and compromises (Ahrne and Brunsson, 2008; Berkowitz and Dumez, 2016) and involve a complex power and authority interplay between its members (Gulati et al., 2012). Thus, the locus of actorhood and the degree to which the institutional work is coordinated within a cluster may depend on its organisationality design choices – such as the presence of formal membership, the role distribution between members and the availability of the critical mass of members, as well the presence of formal or informal secretariat coordinating and managing the activities (Ahrne and Brunsson, 2011; Crespin-Mazet et al., 2018; Gulati et al., 2012).

To sum up, the meta-organisational view of clusters suggests that these can be seen as deliberate social actors which, through their boundary, practice and identity work can re-shape existing institutions and create new ones. However, their ability to do so and the way they 'construct' and perform their actorhood may depend on the organisationality design choices they make.

Methodology

Research design

For this research, we chose a qualitative approach and a multiple-case study method (Yin, 2008). Acknowledging the complexity of the subject at hand and the current lack of research which would allow to develop and test hypotheses, we have aimed to elaborate on the existing 'general' theories and explore their applicability in the specific context of clusters (Ketokivi and Choi, 2014). In this respect, our research aims to be generalisable to theoretical propositions rather than entire 'populations' and focuses on developing a deep understanding of a specific situation (Daft and Lewin, 1990; Easton, 1995).

Case selection

Coming back to the voluntarism-determinism dialectic in organisation studies, the process of defining and delimiting clusters was guided by the manner in which these perspectives address the unit of analysis, or 'the population'(Astley and Van de Ven, 1983). 'Traditional' cluster theories, such as those rooted in industrial economics, see the unit of analysis as a relatively homogenous population of organisations (Astley and Van de Ven, 1983). Delimiting and identifying clusters within this perspective has been a question of measuring the density of economic activity in a given geographic location, be it through patent data (Alcácer and Zhao,

2016), industry concentration (Ellison and Glaeser, 1994); or input-output relationships between industries (Feser and Bergman, 2000).

On the other hand, the meta-organisational approach to clusters leans towards the voluntarist perspective which sees a population as a 'coherent organization' (Astley and Van de Ven, 1983: 258). Delimiting the geographical and conceptual boundaries of clusters seen as meta-organisations is thus a matter of identifying clusters characterised by the presence of joint decision-making concerning the five elements constitutive of formal organisations (Ahrne et al., 2016; Ahrne and Brunsson, 2011).

From this discussion as well as the preceding literature review, we drew two operational criteria for cluster identification. First, we focused on clusters perceiving themselves as such and engaging in deliberate joint decision-making concerning the elements constitutive of formal organisations. Second, to get a deeper insight into how the presence or absence of the attributes of formal organisations may mediate cluster actorhood, we gave preference to cases displaying varying degrees of 'organisationality'.

A set of general criteria was developed based on Miles et al. (2014). These included (1) the relevance of the case, i.e. its capacity to provide fruitful ground for the study of theoretical concepts, (2) the potential for knowledge production in terms of the willingness of key cluster actors to participate in the study and the availability of supporting documentation; and (3) the feasibility, whereby proximate and easily accessible cases were given priority provided that they also met other general and operational criteria.

The initial screening process was guided by the data on Australian clusters provided by the Australian chapter of the Competitiveness Institute (TCI) Network. The database listed 45 'organised' clusters, providing details of the cluster location (state, city), sector of activity, and contact details. Additional input was then sought through consultations with industry experts and academics in Australia to identify clusters that would present different levels of 'organisationality' at the same time meeting the general selection criteria. As a result, two clusters in neighbouring regions (the Central Coast and the Hunter) in the state of New South Wales have been selected. The choice of these particular clusters was made due to their capability to provide fruitful ground for analysis displaying different levels of organisationality and being located in regions presenting different institutional contexts while being at the same time geographically proximate to the first author.

Case description

The setting

While there is recognition of the importance of cluster development for economic growth in Australia (cf. Australian Government, 2016), the public support for and interest in cluster policies has not been consistent over the years (Connell et al., 2014; Innovation and Science Australia, 2016). This is also the case for broader innovation support policies, their frequent changes and fragmented nature hindering innovativeness of Australian businesses (Australian Council of Learned Academies (ACOLA), 2014; Howard, 2011).

Both selected clusters operate in a variety of sectors although the bulk of their activity is in the manufacturing sector. The sector is dominated by small and medium enterprises and plays an important role in the Australian national economy reporting the highest proportion of innovation-active firms (Australian Council of Learned Academies (ACOLA), 2014; Australian Government, 2017). Finally, the Australian manufacturing industry has been found one of the most volatile in the world, whereby upcycles and downturns affect Australian manufacturers more than those located elsewhere (AMGC, 2018).

The clusters

Cluster Alpha is located in the Central Coast region of the state of New South Wales between two major cities of Sydney and Newcastle. The region has a population of about 327,000 people (Australian Bureau of Statistics, 2017) and its major areas of economic activity are retail and construction, manufacturing and logistics, health care, tourism, music, social enterprise and food processing (Connell et al., 2014). The region is dominated by small and medium businesses, most of which are in the population-related service sectors (Australian Bureau of Statistics, 2017; Wilkinson, 2012). The knowledge-intensive business services sector is underrepresented, and many residents employed in the knowledge sectors commute to Sydney (Wilkinson, 2012).

Cluster Alpha was initiated in 2011as a not-for-profit and non-membership-based organisation. Currently, the cluster is specialised in food manufacturing which is reported to be the largest value-adding sub-sector on the Central Coast (CCMC, 2014).

Cluster Beta is located in the Hunter region of New South Wales. The region has a population of about 630,000 people and a range of industries including mining, wine, defence, manufacturing, horse breeding and training (Connell et al., 2014). Manufacturing is one of the largest industries of employment in the region, behind health and social assistance, and retail trade (Bill et al., 2015). The region makes up over 30 per cent of state exports (Connell et al., 2014) and hosts some of the most innovative companies in the country reporting higher rates of innovation activity than the national average (HRF, 2019).

Cluster Beta was incorporated in 1992 as a registered, member-funded, not-for-profit co-operative. At the time of the study, the cluster included around 150 members - manufacturing firms, engineers and consulting companies in the Hunter, Upper Hunter, and Central Coast Regions of New South Wales. Table 1 provides an overview of the two clusters.

	Cluster Alpha	Cluster Beta
Year of the formal foundation	2011	1996
Organisationality elements	No formal membership, although a hierarchy exists (the Board of Directors and an Advisory Committee). Due to the absence of membership, the rules, monitoring, and sanctions are difficult to enforce	All elements of formal organisations are present (formal fee-based membership; the Board of Directors; a Charter setting rules in writing; monitoring, and sanctioning by the Board)
Sectoral context	Food processing, sustainability, machinery manufacturing	Machinery manufacturing, defence
Regional context	The Central Coast, New South Wales A tourism-oriented region, variety of resources but a lack of regional specialization	The Hunter region, New South Wales Natural resource-rich environment, strong mining, agriculture

Table 1: Case overview

Data collection and analysis

To conduct case studies, a data collection protocol was designed. It included an interview guide and data coding procedures. To ensure construct validity of the study and allow for the methodological triangulation (Stake, 1995; Yin, 2008), we used multiple sources of data: interviews and observations as primary sources and documentation as a secondary source.

The interviews took place in April - June 2018 and were conducted according to an interview guide including semi-structured and unstructured questions to allow for an in-depth exploration of the topic. The themes of the interviews were established to gain insight into the cluster design and cluster-environment interactions and the potential mediating effect of cluster 'organisationality' level. The interview themes included cluster membership (key actors and relations among these, membership fees, admission procedure and rules), governance structures (decision-making mechanisms, rules, monitoring and sanctions), regional and national specifics (available resources and capabilities, barriers to cluster innovativeness), cluster strategy-making process, shared values and norms, innovation capabilities and performance.

The interviewees were selected so as to represent the key groups of cluster stakeholders: industry, academia, cluster management organisations and government. The selected interviewees either had knowledge of both clusters' activities or were directly involved in steering the two clusters, and we treated all interviews as relevant to the two case studies. Table 2 describes the interviewees and their involvement with the clusters.

Inter – viewee Nr.	Position	Relevance for research
1	Academic	Involved in strategy development for both clusters as an external consultant.
2	Business development manager (Cluster Beta)	Acts as a cluster facilitator, has deep knowledge of the cluster companies. Present on the Board of Directors of Cluster Alpha.
3	CEO (Cluster Alpha)	The key driver of cluster development, one of the key actors in cluster strategy- and decision-making.
4	Government official	As a government-appointed innovations facilitator for the Central Coast Region, the interviewee works with the clusters as well as the regional companies not making part of the cluster and has a deep understanding of their needs and capabilities.
5	CEO (Cluster Beta)	Drives strategy- and decision-making of the cluster organisation.
6	Start-up founder, entrepreneur (Cluster Beta member).	Due to his previous experience in a large manufacturing company where he was the contact point for the cluster, the interviewee provided relevant information from the perspective of both large and small cluster members.

Table 2: Interviewees' description

Additionally, for Cluster Beta, it was possible to collect observations during several events, such as strategic planning and knowledge-sharing sessions. Several informal conversations were held with cluster members during a peer-learning event. During these, the first author asked some of the interview questions, however, due to the informality of the setting, these conversations were not recorded but noted in the research diary. The formal interviews were recorded and transcribed. The average duration of an interview was around 60 minutes. Some of the participants were interviewed more than once. The total duration of the audio material collected was close to 12 hours.

Regarding the secondary data, for Cluster Alpha, several important internal documents were shared by the cluster management, including strategy-related materials. Other documents and information were retrieved from open sources, such as the cluster website, industry reports, newspaper articles and academic articles. For Cluster Beta, several presentations were shared by the cluster management, other publicly available documents and information were retrieved from the cluster website and other open Internet sources. The total volume of the written material amounted to about 320 pages.

For data analysis, we applied the 'provisional coding' approach (Miles et al., 2014). We established provisional codes based on the preliminary literature review and identified additional codes during the coding process. Two matrices have been developed for data analysis. A categorisation matrix (Elo and Kyngäs, 2008) established the relationship between the elements of the theoretical framework, interview themes and their codes. An observations coding matrix (Miles et al., 2014) was used to systematise and analyse the memos produced during the research process. The data was categorised, coded, and analysed with the help of NVivo software.

Findings

In presenting our findings, we will first describe the instances of boundary, identity and practice work in which clusters engaged and then discuss the links between the 'organisationality' design choices of the clusters and the ways these constructed and practised their actorhood.

Instances of institutional work

Our data allowed to uncover the instances of institutional work in both clusters as these aimed at establishing new organisational boundaries and identities, as well as new practices of collaboration where none existed before and building the perception of themselves as legitimate collective actors.

Boundary work

Throughout its history Cluster Alpha has been looking for ways to find a niche for specialisation and thus to differentiate itself and define its boundaries. Indeed, the history of the cluster begins in 2010 when the current cluster CEO – at the time employed by a regional food producing company - created a regional manufacturing group on the Central Coast which can be considered as a first step in the creation of the cluster later on. In 2011, the cluster was initiated as a part of 'Innovative Regions Centre' initiative launched by the Australian Government. The initiative implied the creation of 10 innovative regions in the country – the Central Coast being one of them – which received financial support for cluster development and benefitted from a dedicated innovation facilitator (Connell et al., 2014).

At this point, the cluster operated under the commercial arm of the local University which provided ample opportunities for collaboration with academics and allowed to launch several sub-clusters specialised in a range of fields from food processing, to sustainability, to music. The collaboration lasted for several years, but around 2014 the restructuring of the University's commercial unit and the discontinuation of the public funding meant that the cluster organisation no longer had the support from the academia and the government. In 2015, the cluster management faced a difficult choice – to shut down or to continue its work under a different structure and banner. By the end of 2016, the cluster redefined itself to broaden its boundaries and involve other industry players thus creating more development opportunities.

At this stage, Cluster Alpha had to make another difficult decision: should it be incorporated as a cooperative or a not-for-profit company? A cooperative would mean establishing a formal membership where the members would pay a membership fee and share the outcomes, while

the not-for-profit company structure would not allow it, thus reducing the possibilities for financing the cluster activities. However, creating a membership-based organisation would entail a competition for members with the other industry bodies present in the region – such as professional associations – and a potential loss of their support.

Finally, the choice was made in favour of forming a not-for-profit company and positioning it as a collaboration between three major industry bodies present in the region: "We didn't want to have another [membership-based] organisation, so we don't have members. Our members initially came from their membership" (Interviewee 5).

However, the lack of formal membership means lower engagement of the participants in cluster activities, and limits the funding available to finance these: "We have a pretty successful penetration to our database compared to industry standards, but there's no compulsion for people to come to our database because they are not paying a membership fee." (Interviewee 3). The lack of membership also makes it difficult for the cluster secretariat to identify and differentiate between the 'customers' and stakeholders and, in fact, to delimit its boundaries and define its value proposition.

The boundary work, in this case, does not rely on the formal membership admission rules but is driven by the development of a system-level goal and overarching agenda which would allow creating a stimulus for the key regional actors to start working together. At the time of the study, one of the key focus areas for the cluster has been finding a distinctive niche and a specialisation which would mean narrowing the boundaries of its activities. Further to a series of round tables with the key regional stakeholders facilitated by the cluster secretariat, a 'common denominator' has been found: "We're at a point now where we've got government, university and industry starting to work." (Interviewee 2). These consultations allowed to identify a niche in food innovation and nutrition to establish the cluster as the centre of excellence in these fields. The cluster has been successful in obtaining funding for this initiative and is now supported through a Cluster Programme launched by 'Food Innovation Australia Limited', a government-funded not-for-profit organisation encouraging connectivity and collaboration in the food manufacturing and agribusiness sectors.

Cluster Beta demonstrates a very different picture. Established as a not-for-profit membership-funded co-operative, over the years the cluster has been developing its membership base having started with 14 companies and involving around 150 by the time of the study. The cluster has different categories of membership with varying membership fees as well as the rights and responsibilities of formal members.

Over the years, however, the cluster turned into a closed 'old boys club' with limited access of new members. As another crisis in the coal mining industry hit a decade ago, a regional economic downturn followed. The cluster collective did not have enough capabilities and lacked external outlook to see it coming in time to take countermeasures. Many cluster companies went out of business, others struggled to keep afloat.

Boundary work has been one of the important elements in the efforts made by the secretariat and the Board of Directors to help the cluster to collectively overcome the regional economic

downturn caused by a mining crisis a decade ago. Indeed, the redefinition of the membership base has been one of the key instruments for Cluster Beta allowing to re-shape its boundaries and its collective capabilities. Specifically, one of the steps in this process has been the deliberate reduction of the number of cluster members – from about 170 to 150 – as the decision was made to go after the 'quality' of members rather than their quantity: "It's not a "free-for-all", it's better quality. Some of that has been because of the economic situation but some of that has also been because if the type of member you want and the type you don't want." (Interviewee 1).

Furthermore, the focus has been on the companies that are regionally 'sticky' and are displaying a steady-growth trend: "We're trying to get the businesses that are in the system to another level, more around that 'hidden champion', German mittelstand approach, family companies, because they are stickier in the region, they'll hang tough…" (Interviewee 1). One of the key membership requirements stipulated in the cluster's Constitution is that the members have a "substantial interest in the economic development of the Hunter region". The cluster's Board of Directors – composed of the elected representatives of member companies – has the powers to sanction and exclude members who 'do not play by the rules' and thus to regulate the boundaries of the meta-organisation as well as enforce its decisions. While some of the criteria for member exclusion have to do with their ability to pay membership fees and perform an economic activity, others can be applied at the discretion of the Board and concern more 'intangible' aspects such as the adherence of the members to common values and principles, and the influence of the members' actions on the cluster's collective reputation and image.

Finally, some of the boundary work is done by the cluster members. Indeed, strong network connections allow to spread the word about the opportunistic and otherwise unwanted behaviour: "If something is not quite right, there'll be enough people...the "kangaroo court" will come into play and that will correct it… The thing about this region is that everybody knows each other or knows someone who knows someone..." (Interviewee 2).

Practice work

Cluster Alpha is located in a setting characterised by the predominance of small firms and 'lifestyle' businesses, where owners "just want to create themselves a job so that they can go surfing when they want to." (Interviewee 4). Most companies have a low level of capabilities: "90% are just not interested in doing anything, 5% are really engaging and you've got 5% you can work on to get them into that level." (Interviewee 3). While several large national firms and MNCs are located in the region, these are "not sticky in terms of thinking about... that they belong to this region because they have a national view or a global view of who they are." (Interviewee 4).

From the outset, the aim for the creation of Cluster Alpha was to re-shape the existing practices in the region by improving actors' capabilities and re-shaping the entrenched culture of working in 'silos': "It's been a cultural thing here for quite while... a lot of big heads". (Interviewee 2). To change the existing practices and create new ones, Cluster Alpha's secretariat has been working to establish an alignment between the key regional stakeholders which has been a long journey: "That's taken quite a few years for all the planets to line up." (Interviewee 4).

The practice work has mostly been conducted by the cluster secretariat by organising capability-building activities, workshops, and round tables. The secretariat played the facilitation role in identifying the direction of cluster development in collaboration with the regional stakeholders: we have to build the relationships and I've been very fortunate, I've built a lot of relationships, so that's why we can bring people in, that's why the University wants to connect with us." (Interviewee 3).

Another facet of the practice work was the long-term engagement of several academic consultants who established collaborative relationships and research projects with the key regional stakeholders "... a year it took us to understand them and their behaviours and to now understand transitioning for them". (Interviewee 1). These efforts finally allowed to create an initial understanding of the desired direction for the cluster development and to break the barriers between the regional actors. Finally, some of the practice work is conducted by active regional companies and entrepreneurs who come up with initiatives, such as regional newsletters which promoting new practices of collaboration and knowledge-sharing, previously absent in the region.

Cluster Beta, to the contrary, is located in a region rich in natural resources and a strong specialisation in mining. However, although the geographic agglomeration of companies supporting the mining industry, steelworks and shipbuilding existed in the region before the establishment of the formal cluster organisation, there was virtually no collaboration among smaller firms. The discontinuation of shipbuilding and the recession which hit the steel industry in the 1990-s stimulated the smaller companies to see the potential of working together to benefit from larger contracts: "They realised that if they helped each other and talked to each other they'd actually identify and discover other opportunities, so they thrived then." (Interviewee 2). There was also a push from the large companies in the region for more consistent quality standards of their suppliers – small and medium regional firms. Thus, the setting up of the formal cluster in 1991-1992 pursued the aim of developing members' capabilities, growing market opportunities and reducing the cost of supplying services.

Creating a network consisting of competing companies was not a common practice back in the early 1990s: after having been first exposed to the idea by the Chamber of Manufacturers in 1991, the regional companies were suspicious and pessimistic about the idea of collaborating and sharing their practices and innovations. Even those who supported the idea had to make sense of it and find the ways to implement it - a process that only after 12 months resulted in the creation of the cooperative by 14 companies.

Thus, throughout its history, one of the important facets of practice work for the cluster has been changing the 'mentality' of the regional companies used to extreme competition and secrecy: "That's one of the biggest barriers I see that people sort of close up and they don't allow people to work out who you are and how you function and generally that's the sign of how the business functions as well and that's the sign of whether or not people would want to engage with you. So, if you are open and you're happy to talk about your business […], I think you're a lot further ahead of the game." (Interviewee 2). To promote collaboration, the cluster secretariat emphasises the importance of trust and openness: "We like to make sure everybody

has a trusting nature, that everybody's integrity be extremely high, we also want people to be able to open up, and […] we actually tell our new members that if you are not prepared to open up, and talk about your business or talk about your activities, you are not going to get the value out of the collective." (Interviewee 2).

This practice work has allowed establishing a close-knit community: "It's not just totally business or totally work, it's a good social atmosphere as well. Look, that part of it has always been there at [the cluster] and I think it's even more and more important, especially when the time comes for doing it tough…" (Interviewee 2). While the collaboration within the cluster helped the companies to survive the crisis and thrive, over time the role of the cluster shifted from the business to social activities: "It wasn't about coming to our fence to get opportunities, it was just about getting that social side. Life was easy." (Interviewee 2). However, the crisis which hit the mining industry a decade ago has led the cluster secretariat to the realisation that strategic action was necessary: "A lot of people put all eggs in that one basket. And that was what we could always see - that we need to look at different fields." (Interviewee 2).

The cluster secretariat together with an academic consultant then took a leading role in re-shaping the existing practices within the cluster. Having focused on the development of collective capabilities, they aimed at diversifying the existing members' capability pool: "we started re-defining the business model for [the cluster] to spread it to more than just mining and try to help the members to get into other areas like medical equipment, food, and a whole range of things. We probably did it too late, but it was still better than what would have happened if we had just been a mining cooperative." (Interviewee 1). Another important element in this strategy has been the internationalisation programme which allowed to build and diversify members' capabilities, networks and discover new business opportunities

This work is mainly conducted by the cluster secretariat through face-to-face contact and through the events they organise for their members, such as peer-learning sessions and the industry forums: "The other thing we do in these forums is to make sure that people are aware of what they actually do in their business, what I mean by that... because a lot of people will say they work in the mines for example, but that's not really what they do, that's just a sector they work in, so we help people to try and understand what they do within their business for them then to transfer over into other areas they can work in, so that they don't have a narrow focus and that allows their business to grow a bit more." (Interviewee 2).

Identity work

Throughout its history, Cluster Alpha has been facing the challenge of a lack of regional identity. Although the Central Coast region can boast a diversified regional resource base, it has no clear specialisation or a field of excellence. Moreover, the region's population is transient, lacking place-attachment: "It's not a place, it's a congregation of villages and there is no ownership." (Interviewee 1). The closeness of two major cities – Sydney and Newcastle – results in the outflow of talent from the Central Coast region.

Countering these challenges and building the regional identity through the cluster collective identity has been one of the cluster's raisons d'être. The consultations with regional

stakeholders allowed to define a niche for the specialisation at the intersection between the health, nutrition, food processing, tourism and manufacturing sectors and the cluster now sees the opportunity in developing the region as the 'Centre of Excellence for Food Innovation'. This would allow it to differentiate itself: "It's not Sydney, it's not Newcastle, food innovation is actually the Central Coast" (Interviewee 3). It would also allow bringing together the different sectors present in the region and the capabilities of the regional actors.

For Cluster Alpha, the achievement of some 'early wins' and success stories has been one of the crucial elements for its becoming perceived as a legitimate social actor by its internal stakeholders: "…we have to build the trust, deliver against that, so that they are comfortable, and they can see where we are heading, and they are on the journey with us." (Interviewee 3).

On the other hand, being seen as a legitimate and powerful actor by the state and federal authorities is another key element for the cluster, allowing it to have an influence on policy-making and to secure the funding necessary for its development: "It's really about trying to gain support for what we're doing and being included in what they are doing... and that's how eventually potentially we could have some influence on policy." (Interviewee 3). The cluster 'constructs' it image and actorhood by positioning itself as a collaboration between the major industry bodies present in the region: "That gives us a lot of strength because when you go and talk to somebody, particularly in the government, and you say you're a collaboration between three major industry groups in the region, it's a very powerful position to be in." (Interviewee 3). The cluster collective identity is built and reinforced by the Board of Directors and the Advisory Committee who are seen as 'agents of legitimacy' for the cluster helping to craft and promote its vision.

For Cluster Beta, again, the situation has been different. Indeed, since its foundation, the cluster leveraged the already present strong resource-base and specialization of the region. However, as discussed previously, the strong regional specialisation resulted in a 'lock-in' where the cluster members became vulnerable to the economic downturns in the mining industry. To 'break out' of this developmental trajectory, the cluster secretariat deliberately re-crafted the cluster's values and identity, and, by doing so, re-shaped its boundaries and practices: "We've worked on that for the last couple of years and [...] we are really insistent about the values and living those values." (Interviewee 1). The emphasis has been on openness, transparency, inclusiveness, and innovation. These values are reflected through the composition of the Board and the membership base: "Some of the older members weren't really happy [...] when we got some women on the Board […] but that's end-of-century stuff […]. That old mentality - long gone now - and so are those members, they liked the fact that it was just a boys' club and they liked the fact that they could sit there and have a drink with the blokes." (Interviewee 2). Similarly to Cluster Alpha, Cluster Beta sees its role as a driver of regional development and one of its aims has been in promoting the region as a whole as a centre of excellence for manufacturing and engineering thus attracting more business opportunities for the cluster members.

Furthermore, the cluster secretariat is present on various regional and national committees which ensured the cluster's recognition as an important regional actor by the external

stakeholders: “[the cluster] does have a place in the industry, like people trying to break into Australia need someone they come and talk to about Hunter area and trying to get into it.” (Interviewee 6). This has also been the case outside Australia: “So, when you go to China they treat us very, very well and take it very seriously because they are not dealing with [the cluster secretariat], a small business, they are dealing with [the cluster’s] power of many, all those businesses including the mines, including the supply chains, and including the port. So, suddenly [the cluster] is like a huge conglomerate in China to the Chinese rather than a few businesses.” (Interviewee 1)

The cluster works closely with the government, at the state and federal levels, which allows providing new opportunities to cluster members: “…they would be a conduit for the State government and [...] if the Federal government has got an initiative, they'll use [the cluster] to get that out to manufacturers...” (Interviewee 1). The achievement of the critical mass allowed the cluster to be recognised by the external stakeholders as an important collective actor: “[the government] will generally talk to us because they know we are a big block, we've got a big voice.” (Interviewee 2).

Maintaining a coherent identity throughout the cluster’s existence has been important to ensure both federal and state-level support and maintain cluster legitimacy. One of the crucial elements in this identity work is maintaining the cluster’s image as being a-political: “So, we are a-political, we play nicely with everybody and every party, and they all love us... we think.” (Interviewee 2). The members of Cluster Beta are seen as the carriers and embodiments of the collective identity and values of the cluster. The expression of political opinions contrary to the collective cluster values under the cluster banner is not tolerated and has in some cases led to the members’ exclusion: “... If you're a representative of [the cluster] you've got to be straight down the middle”. (Interviewee 2).

Linking clusters’ organisationality and actorhood

The discussion above demonstrates that both clusters engaged in institutional work and social action, however, we also saw that their organisationality design choices influenced the ways clusters performed their actorhood.

The key difference between the two clusters is in the presence of all the elements of formal organisations in Cluster Beta and the absence of formal membership in Cluster Alpha which limits the possibility for its governing actors to enforce rules, monitoring and sanctions. This has important implications for the way the clusters construct and practice their actorhood.

Indeed, to construct itself as a legitimate social actor, Cluster Alpha emphasises its image as a collaboration between the major industry bodies present in the region. Thus, even though it does not have a formal membership base, it has been able to reach a critical mass allowing it to be perceived as an important regional actor by the relevel government stakeholders and obtain support from them.

On the other hand, for Cluster Beta, due to the presence formal membership, the achievement of the collective actor has been dependent both on the presence of the critical mass of members as well as their alignment with the cluster’s values and goals since the members are seen as

embodiments and carriers of the cluster's collective identity. Maintaining a coherent identity throughout the cluster's existence has been an important element for maintaining the support of the government bodies.

Furthermore, while the availability of all the elements of 'formal organisations' in Cluster Beta allowed the cluster to act as a single entity, wielding important resources and power, it also led to a concentration of power and actorhood in the hands of a limited group of individuals and a gradual disengagement of cluster members. Indeed, due to the presence of formal membership and relatively high fees of certain categories of membership, the cluster secretariat is experiencing a pressure to bring 'value for money' which leads to the secretariat's taking on more and more responsibilities and results in the disengagement of the members: "the companies at [the cluster] don't appreciate the full value they are getting, they are not participating as much as they should." (Interviewee 1).

Moreover, the strategic direction of the cluster is increasingly set by a limited number of actors where the secretariat - or the cluster facilitators - along with an academic consultant are setting the direction which is then presented to the Board. The participation of the cluster members and the Board in the strategic decision making of the cluster has been reducing over the years: "This used to be a lot bigger, we used to have a lot of members came to those strategy days". (Interviewee 1). Moreover, not all the Board members were present at the strategic session attended by the first author. The issue of decreasing engagement is recognised by both the academic consultant and its CEO: "We want more people, we want more buy-in, it shouldn't be just the Board. And the funny thing was - a lot of the Board members weren't there. […] There are key days in their calendar that they need to turn up, and that's one of them." (Interviewee 1).

This has shaped the way identity, boundary and practice work was carried out, forcing the key decision-makers to take the lead in shaping the strategies of the cluster and to ensure members' adherence by guiding them towards the identified directions: "That's by stealth as much as anything that we actually got a lot of companies to diversify in what they were doing. Because we don't go out and tell you how to run your business, all right, that's not what we do, what we do is trying to guide you..." (Interviewee 2).

On the other hand, for Cluster Alpha the construction of actorhood has been a collaborative process involving negotiations and collective sense-making by a number of actors. The cluster does have a hierarchy and is governed by the Board of Directors and the Advisory Committee. However, despite the presence of a governing body, the decision-making in the cluster is not centralised and depends on the consensus and the voluntary engagement of the key regional players – both firms and research and education organisations – whereby the cluster CEO, the Board of Directors and the Advisory Committee are more of facilitators of the process rather than the leaders in it: "We can only guide the industry to where they can go and what their capability is…" (Interviewee 3). Indeed, the lack of membership has meant that the decisions cannot be enforced and the strategic direction for the cluster and regional development needs to be embraced by the regional actors: "We have some ideas but we want the industry to come, not us, industry together to come to that conclusion.." (Interviewee 5).

Table 3 summarises our findings concerning the relationship between organisationality design choices and their influence on cluster actorhood.

Types of agency	**Approaches to constructing and performing actorhood**	
	Cluster Alpha (lack of formal membership, rules, monitoring and sanctions)	Cluster Beta (all elements of the formal organisation are present)
Identity work	Focus on creating the regional image through the cluster image. The Board of Directors and the Advisory Committee as 'agents of legitimacy' promoting the cluster's vision and values.	Focus on re-shaping the image of the cluster and the region to attract new business opportunities and re-orient the cluster from the undesirable developmental trajectory. The members are considered as carriers and embodiments of the cluster identity and their discourse is constitutive of the cluster image.
Boundary work	Boundaries are fluid and only depend on voluntary engagement and full 'buy-in' of the actors whose goals and interests shape the cluster and define what is included and what remains outside of its areas of activity.	Boundaries are well-defined through several categories of formal membership. The Board of Directors shapes membership through formal decisions of exclusion and inclusion based on formal criteria specified in the Constitution of the cluster. Shaping the values of the cluster and enforcing these contribute to boundary work by leading dissenting members to quit the cluster and attracting the desired types of actors.
Practice work	Focus on improving the regional actors' capabilities based on the identification of the existing strengths and the potential for developing a niche. Most of the institutional work is done through collaboration with the key stakeholders.	Focus on capability-building, diversification, and internationalisation. Most of the practice work is conducted by the cluster secretariat and the academic consultants 'by stealth' to guide the cluster out of the 'lock-in'.

Table 3: Overview of clusters' organisationality design choices and their actorhood

Discussion

If we were to choose one citation to demonstrate the findings of the case studies concerning clusters' ability to act deliberately, it would be this one: "you can transition a region very

deliberately, you can transition a cluster and make a big difference". (Interviewee 1). Located in neighbouring regions, only about a one-hour drive away from each other, Cluster Alpha and Cluster Beta face very different challenges and have adopted deliberate strategies to counter these by co-constructing the clusters' and the regional identities, establishing themselves as legitimate social actors regionally, nationally and internationally and creating new practices and boundaries for collaboration where none existed before. Organised clusters can thus be seen as 'becoming' organisations and simultaneously constructing themselves as actors whereby their members are seen as the embodiment and the carriers of cluster 'actorhood' (Bromley and Sharkey, 2015). These findings lead us to formulate the following proposition:

P1: Organised clusters can deliberately engage in collective social action.

Furthermore, our cases demonstrate that clusters can deliberately construct themselves as actors supporting other recent research (Migdal-Picker and Zilber, 2019). However, expanding this perspective, our data shows the importance of the directionality of institutional work in a meta-organisational setting. Specifically, our data demonstrate that the instances of identity, boundary, and practice work in both clusters aimed at constructing cluster 'actorhood' internally – towards their internal stakeholders (cluster members) – and externally - towards the general public and the government bodies. Cluster Alpha has been crafting its image and the image of its region in parallel and thus creating the institutions that have been missing in the region. In doing so, it has been negotiating its boundaries to differentiate itself from other regional industry bodies and, at the same time, differentiate the Central Coast region from the neighbouring Sydney and Newcastle currently drawing most of the knowledge-based workers. At the same time, Cluster Alpha built its legitimacy as a social actor by securing the support of powerful industry bodies present in the region and achieving early successes to mobilise other actors and gain their trust. Although to shape its identity and boundaries, the cluster drew upon the existing capabilities, resources and practices, it also aimed at altering the regional institutional practices, such as the lack of regional embeddedness and the low level of capabilities and willingness to collaborate among the regional companies.

Cluster Beta has been shaping its values internally as a way to disrupt the institutions within by breaking the 'old boys club' mentality. The boundary work which has been conducted by the cluster aimed at re-shaping cluster composition by altering the boundary between the cluster and its external environment. This was done through two mechanisms: deliberately excluding some of the members and shaping collective values allowing attract the desired categories of members. Building capabilities and re-directing the members towards new fields of activity allowed to change the existing practices within the cluster and 'get out of the lock-in' while at the same time helping promote the region as a centre of excellence for manufacturing and engineering. By leveraging the critical mass of actors and promoting its role as the driver of the regional transformation, the cluster 'constructed' itself as an important collective actor and obtained recognition from the external stakeholders both nationally and internationally.

P2: Clusters can deliberately 'construct' themselves as social actors and perform their actorhood by engaging into identity, boundary, and practice work directed at internal and external legitimating audiences.

P2a: Internally oriented identity, boundary and practice work allows clusters to construct their legitimacy as social actors in the perception of their members and build the internal cohesion necessary for collective action.

P2b: Externally oriented identity, boundary and practice work allows clusters to construct their legitimacy as social actors in the perception of their external stakeholders and thus to exert influence on their institutional environments and secure access to resources necessary for collective action.

Finally, our cases have shown that the organisationality design choices of the clusters have been driven by strategic considerations related to the institutional environments and have had an influence on the 'construction' and the 'performance' of cluster actorhood. For Cluster Alpha, one of the key decisions was whether or not to implement a membership-based structure. Due to the pre-existing institutional context of the region dominated by a large number of membership-based industry bodies, the decision was to avoid competition for members and to not implement formal membership. Further to this decision, we note the lack of rule enforcement mechanisms to monitor and sanction actors' behaviour and thus implement the decisions – a finding that goes in line with Ahrne et al. (2016) and Ahrne and Brunsson (2011). In addition, our findings suggest that this has led to a more collaborative approach to setting boundaries and negotiating the 'acceptable' practices in Cluster Alpha as compared to Cluster Beta where all elements of formal organisations are present. Thus, we note that the actorhood of Cluster Alpha was performed and shaped through a collective process of negotiation and sense-making aiming at creating place-embeddedness in the regional actors and uniting them around a common goal.

In Cluster Beta, where all the elements of formal organisations have been implemented, we observed a concentration of decision-making power in the hands of the limited number of companies, due to the presence of formal membership and high pressure to retain members for the cluster organisation to survive. The cluster secretariat along with an academic consultant have been the key actors driving the cluster strategy-making with an ever-diminishing involvement of cluster members. They carried out boundary, practice and identity work 'by stealth' adopting strategies and techniques to try and 'show the way' to cluster members leading them to re-orient their activities from the mining sector to a broader array of fields. These findings lead us to formulate the following propositions:

P3: The 'organisationality' design choices of clusters influence the way they construct and perform their actorhood.

P3a: The lack of formal membership, rules, monitoring and sanctions may require a collaborative approach to boundary, identity, and practice work.

P3b: The implementation of the full range of organisationality elements can lead to the concentration of actorhood within a limited group of individuals assimilating cluster 'actorhood' to the institutional work conducted by this group.

Conclusion

In this paper, we examined 'organised' clusters from the meta-organisational perspective (Ahrne and Brunsson, 2008) to analyse whether and how their organisationality design choices mitigate their ability to engage in social action. Indeed, while clusters are often expected to contribute to regional growth and transformation, the ways they can deliberately do so are not yet clearly identified. Our cases demonstrated that, indeed, organised clusters can be seen as coherent organisations, and deliberate actors, rather than aggregations of organisations, contrary to the dominant perspective in the 'traditional' cluster studies. We also demonstrated that clusters' actorhood – or their ability to act purposefully and to be perceived as actors by legitimating audiences – is not a necessary element or a precondition of their organisationality, but a property that can be deliberately 'constructed' by the cluster actors. Having grounded our analysis of actorhood in the institutional work perspective (Lawrence et al., 2009; Lawrence and Suddaby, 2006), we were able to identify three types of agency clusters engage in as social actors: identity work, boundary work and practice work. While 'constructing' and performing their actorhood across these dimensions, clusters work to differentiate themselves from their environment, legitimise their existence towards their members and the external stakeholders, as well as re-shape the existing practices and rules or establish new ones.

By positioning our research at the intersection of organisation and cluster studies we contributed to two streams of literature: we further the meta-organisational perspective in cluster studies and, at the same time, we contribute to the organisation studies - and the neo-institutionalist perspective in particular - by focusing on the concept of actorhood through the lens of institutional work perspective and exploring its relationship with 'organisationality' design choices clusters make. Thus, this research makes a step towards a better understanding of clusters as organisational phenomena, at the same time advancing our knowledge of 'organisationality' and its relationship with organisations' capability to engage in social action. We see three major theoretical contributions of this research, each of these opening new avenues for future studies.

First, our conceptualisation of clusters as meta-organisations with varying degrees of organisationality has allowed us to elaborate on the nature and logic of 'organised' clustering. Indeed, we showed that the meta-organisational perspective can be valuable in explaining the behaviour and the developmental paths of organised clusters. Although geography plays an important role in cluster development, our research suggests that deliberate collective action by the cluster is possible and can re-shape the regional dynamics. This proposition constitutes a contribution to cluster studies suggesting a shift of perspective from determinist where the cluster is acted upon to a voluntarist one, where a cluster can deliberately act upon its environment. This perspective suggests that clusters can potentially defy dominant institutional logics and act as change agents (cf. Crouch et al., 2009). In this respect, one of the interesting questions for future studies may be whether in some cases clusters can exhibit behaviour deviating from the dominant environmental patterns and institutional models and how such behaviour influences their legitimacy (King et al., 2010). Such further explorations could draw upon the contingency and configurational schools of thought in strategic management. These suggest that some strategies, structures or organisational 'configurations' produce better

outcomes in certain contexts and a 'fit' or 'alignment' is necessary (cf. Meyer et al., 1993; Mintzberg et al., 2005; Venkatraman and Prescott, 1990). However, the alignment can be multi-scalar and involve both market or sectoral dynamics and institutional models (Volberda et al., 2012), thus addressing the question whether and how clusters seek alignment with their environment can be of interest for future studies.

Second, by proposing a view of 'organisationality' and 'actorhood' as ever-changing and mutually-shaping, we have provided insight into the capability of 'partial' forms of organising to shape their contexts and the types of institutional work they can engage in. We further contribute to the institutional work perspective by addressing a less explored type of actor – a heterogenous network of independent organisations – and its role in institutional work (Hampel et al., 2017). Future research can advance this perspective by analysing whether and how a collective such as a cluster can engage in institutional entrepreneurship (e.g. Battilana et al., 2009; Dorado, 2005) and which institutional strategies it can adopt collectively (e.g. Lawrence, 1999; Oliver, 1991; Pache and Santos, 2010).

Our third contribution relates to establishing a link between the organisationality design choices – i.e. the decisions to implement the elements of formal organisations fully or partially – and their influence on the way clusters construct and perform their actorhood. Future studies may focus on advancing our understanding of power distribution in meta-organisations and the locus of their actorhood. In this respect, the 'power school' in strategic management can provide a suitable lens (cf. Mintzberg et al., 2005). This perspective addresses strategy-making as a process of negotiation within an organisation or between the organisation itself and its external environment. Furthermore, the 'communicative constitution of organisation" perspective can also provide insight into intra-organisational power and extra-organisational relationships of meta-organisations (Kuhn, 2008).

Finally, the findings of this article have implications for cluster practitioners and policymakers as they demonstrate the consequences of clusters' organisationality design choices for clusters' ability to engage in social action and to re-shape their regions. The study also provides insight into how clusters can manage their level of organisationality to have a better ability to change their contexts.

Our study is not without limitations. As we addressed clusters in a developed country setting, this may limit the applicability of the findings to the developing and emerging country contexts. In this respect, in future studies, it may be interesting and worthwhile to address cluster agency and 'organisationality' from the 'comparative institutionalism' perspective (Gadille et al., 2013; Hotho and Saka-Helmhout, 2017; Jackson and Deeg, 2006) and conduct multiple case studies comparing cluster design in different contextual settings. Furthermore, given the novelty of the approach, it was only possible for us to adopt a theory-elaborating approach and future studies could further test and extend the developed theories through larger-scale studies.

Article 4: Clusters as institutional entrepreneurs: lessons from Russia[6]

Abstract

In this article, we explore whether organised clusters can act as institutional entrepreneurs to create conditions favourable to innovation in their constituent members. We view self-aware and organised clusters as 'context-embedded meta-organisations' which engage in deliberate decision- and strategy-making. As such, clusters are not only shaped by their environments, as 'traditional' cluster approaches suggest, but can also act upon these. Their ability to act as 'change agents' is crucial in countries with high institutional barriers to innovation, such as most transition economies. Focusing on Russia, we explore two cluster case studies to analyse the strategies these adopt to alter and shape their institutional environments. We find that clusters have a dual role as institutional entrepreneurs. First, these can act collectively to shape their environments due to the power they wield. Second, they can be mechanisms empowering their constituent actors, fostering their reflexivity and creativity, and allowing to engage in institutional entrepreneurship.

Keywords

Cluster, meta-organisation, institutional entrepreneurship, neo-institutional theory, institutional strategy, transition economy

Introduction

In this paper, we explore whether and how clusters can act as intuitional entrepreneurs to create conditions supportive to innovation in transition economy contexts. Indeed, clusters can be crucial in transition economies characterised by high institutional barriers to innovation and entrepreneurship and missing or underdeveloped formal institutions (Lehmann and Benner 2015; Puffer, McCarthy, and Boisot 2010; Schrammel 2013). While traditionally clusters have been seen as '*geographic concentrations* of organisations' (Porter 1990), a recent line of studies suggests that self-aware and organised clusters can more precisely be described as '*organisations* of organisations' or meta-organisations (cf. Gadille, Tremblay, and Vion 2013; Lupova-Henry, Blili, and Dal Zotto 2019b). As such, these are not only acted upon by external forces but can themselves be deliberate actors and agents of change.

Recently, the interrelations between the organisational agency and the external environment have been increasingly drawing the attention of researchers within the neo-institutionalist stream of thought (e.g. Dorado 2005; Lawrence 1999; Marquis and Raynard 2015; Oliver 1991). Although providing valuable insight into the strategies organisations adopt to deal with external pressures, these studies do not take into account how different types of organisations vary in their strategic responses to institutional pressures (Greenwood, Hinings, and Whetten 2014;

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King, Felin, and Whetten 2010). While both the neo-institutional theory and meta-organisational approach can be promising for studying 'managed' clusters, these have not yet provided insight into clusters' agentic role in unsupportive institutional contexts.

This study aims to contribute to the institutional, meta-organisational and cluster theories by answering the following research question:

- How do clusters engage in institutional entrepreneurship in transition economies to alleviate institutional barriers to innovation?

Specifically, when looking into this research question, we are interested in two sub-themes: the role of institutional tensions and contradictions, and the types of strategies adopted in response to these in the cluster context.

Institutional contradictions – or inconsistencies between different institutions - enable institutional entrepreneurship (e.g. Battilana, Leca, and Boxenbaum 2009; Seo and Creed 2002). These, however, also influence the choice of strategies adopted by institutional entrepreneurs. Transition economies represent a fertile ground for a study of institutional contradictions as these are inherent in the institutional transition process (Li, Peng, and Macaulay 2013; Meyer and Peng 2005). In such contexts, multiple contradictions may co-exist, such as those between the legacies of the Soviet era and the 'new' market economy institutions, or tensions between market and political forces (Kalantaridis 2007; Li, Peng, and Macaulay 2013). Furthermore, organisational and individual actors adopt different strategies with respect to institutional contradictions depending on resources these have available and the way they experience these contradictions (Battilana, Leca, and Boxenbaum 2009; Pache and Santos 2013; 2010). Understanding how these influence clusters and, in turn, the ways clusters, as institutional entrepreneurs, cope with them may help inform both policy- and strategy-making in transition economy contexts.

To answer our research question, we adopt a theory-elaborating case study approach (Ketokivi and Choi 2014) and analyse two clusters in Russia. We extend the existing theories within the neo-institutionalist perspective to apply these in the context of clusters, seen as 'context-embedded meta-organisations'. Our study shows that transition economy clusters continuously manage multiple institutional contradictions and simultaneously adopt multiple institutional strategies in response to these. The choice of the strategies depends both on the power distribution within the cluster and the specific institutional contradictions the clusters deal with. Finally, we found that both clusters – as collective actors – and individual actors within these make use of 'bricolage' approaches to institutional entrepreneurship. These were found to serve three purposes: obtaining more resources in resource-scarce environments, creating the missing institutions, or avoiding the pressures of ineffective institutions.

This article is structured as follows. First, we provide a theoretical background for the study placing clusters within the institutional and organisational studies and discussing the role of institutional contradictions and strategies which may be adopted to cope with these. We then proceed to describe our research design. Then we present the findings of our empirical research. We proceed to a discussion whereby we formulate the propositions regarding the institutional

strategies in the cluster context. Finally, we conclude by outlining the contributions and limitations of our study and proposing avenues for future research.

Theoretical background

Clusters, organisations, and institutions

The institutional theory and innovation studies distinguish between organisations and institutions which interact and, in doing so, shape the dynamics and patterns of the innovation activity (Edquist and Johnson 1997; North 1991; 1990). Institutions are defined as 'sets of common habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups.' (Edquist and Johnson 1997, 46). Organisations are seen as players or actors and are 'formal structures with an explicit purpose and they are consciously created.' (Edquist and Johnson, 1997, p. 47). The neo-institutionalist theory, however, recognises that although institutions shape the ways in which organisations operate and interact, these latter do enjoy at least some discretion in crafting strategic responses to institutional processes (e.g. Oliver 1991; Heugens and Lander 2009). Thus, not only do institutions constrain and orient organisational action, but they at the same time enable it (cf. Cardinale 2018).

So, where do clusters stand in this stream of thinking? Traditionally, in the regional economics and economic geography studies, clusters have been seen as 'products' of their environments shaped by the historical development of their institutional environments, policies, regional path dependencies or industry dynamics (e.g. Arıkan and Schilling 2011; Markusen 1996; Paniccia 1998; Porter 1990). However, with the advent of the 'cluster' concept and the ensuing global interest in cluster policies, the nature of the phenomenon has changed (Motoyama 2008). Indeed, a new form of a 'managed' cluster has taken hold and has been spreading over the globe (Lindqvist, Ketels, and Sölvell 2013; Sölvell, Lindqvist, and Ketels 2003). Such clusters have – although to varying degrees – the attributes of formal organisations, such as membership, monitoring, rules, sanctions and hierarchy (Ahrne and Brunsson 2011; Leys and Joffre 2014; Lupova-Henry, Blili, and Dal Zotto 2019b). They can thus be seen as 'context-embedded meta-organisations', or 'organisations of organisations' whereby their constituents retain their autonomy but act collectively in the pursuit of common, system-level, goals (Ahrne and Brunsson 2008; Gadille, Tremblay, and Vion 2013; Gulati, Puranam, and Tushman 2012; Lupova-Henry, Blili, and Dal Zotto 2019c). On the other hand, clusters can be seen as institutions in their own right whereby an institutional environment conducive to innovation and learning is created within the cluster boundaries (Steiner 2006).

The view of clusters as 'context-embedded meta-organisations' thus suggests that these are not only shaped by their environments but can take deliberate actions to influence these, just as individual organisations (King, Felin, and Whetten 2010). As meta-organisations, clusters can be both seen as collective actors within broader institutional settings and an institutional environment in itself within which individual entrepreneurial action may take place (cf. Battilana, Leca, and Boxenbaum 2009; Berkowitz 2018; Sotarauta and Pulkkinen 2011; Steiner 2006).

Institutional contradictions in transition economies

Institutional contradictions – inconsistencies among and within institutions (cf. Seo and Creed 2002) – can lead to actors' reflexivity and their questioning of the institutional arrangements which used to be taken for granted (Battilana, Leca, and Boxenbaum 2009; Fligstein 1997; Pache and Santos 2013; Seo and Creed 2002; Suddaby and Greenwood 2005). Such contradictions may be more acutely experienced by organisations operating across different institutional fields or in settings undergoing profound institutional change, such as the transition economies (Jarzabkowski et al. 2013; Li, Peng, and Macaulay 2013; Marquis and Raynard 2015).

Transition economies represent a particularly challenging context for organisational actors as these display multiple institutional contradictions such as tensions between the newly created institutions and the legacies of the past regimes and market-political tensions (Kalantaridis 2007; Li, Peng, and Macaulay 2013; Marquis and Raynard 2015; Yakovlev 2006).

Thus, in transition economies, organisations have to interpret the new institutions superimposed on the previous institutional settings (Kalantaridis 2007; Marquis and Raynard 2015). New institutional logics – such as newly introduced regulations governing market relations – thus come into a conflict with the pre-existing informal institutions which, as is often the case in emerging and transition economies, had been substituting the missing or ineffective formal institutions (cf. Estrin and Prevezer 2011; Filatotchev, Jackson, and Nakajima 2013; Puffer, McCarthy, and Boisot 2010; Yakovlev 2006). Moreover, an important source of institutional contradictions is the heavy involvement of government in the markets, which can re-define the 'rules of the game' (Greenwood et al. 2010; Li, Peng, and Macaulay 2013). The state can directly influence market activities through its control of large state-owned enterprises which represent a significant share of the transition economy markets (Belloc 2014; Fainshmidt et al. 2018; Gershman and Thurner 2016). On the other hand, the state is indirectly involved in markets by providing subsidies and other financial stimuli for entrepreneurship and innovation (Fainshmidt et al. 2018). In transition economies, this source of funding is crucial and often significantly outweighs private funding of innovation activities and R&D (Fainshmidt et al. 2018; OECD 2017). Thus, organisations operating in transition economies need to sense and strategically respond to both market and government dynamics (Filatotchev, Jackson, and Nakajima 2013; Li, Peng, and Macaulay 2013; Volberda et al. 2012).

For clusters operating in such settings, these institutional contradictions are likely to be crucial. Indeed, in transition and emerging economies cluster policies aim at alleviating 'systemic failures', i.e. inconsistencies in the institutional environment governing interrelations between different actors of an innovation system (Andersson et al. 2004; Kutsenko, Islankina, and Abashkin 2017). In practice, this means that clusters are often created in a top-down manner as a solution to regional 'ills', such as over-reliance on natural resources and the lack of regional orientation towards the knowledge economy. Thereby, the newly created institutions are superimposed on the existing ways of doing business, challenging the status quo. As the analysis of cluster policy results in transition economies shows, actors do not react to these in the same manner, some leveraging the newly available institutions to facilitate change, others adopting

them only formally, while in practice sticking to the 'old' ways (cf. Kowalski and Marcinkowski 2014).

These contradictions, however, may be experienced by clusters to a different degree. Indeed, the composition of ownership shapes the relative receptivity of organisations to different logics and their strategic responses to these depend on the presence and interests of the powerful actors (Greenwood et al. 2011; Pache and Santos 2010). Indeed, multiple groups of powerful stakeholders or 'legitimating audiences' within a cluster may have different agendas, interests and contradictory prescriptions which must be managed in cluster's day to day operations (Berkowitz 2018; Brès, Raufflet, and Boghossian 2018; Jarzabkowski et al. 2013; Morgulis-Yakushev and Sölvell 2017).

Thus, a high level of government involvement in market activities means that government demands are represented in organisations both internally (e.g. where the government is the key shareholder) and externally if organisations rely on government funding (Greenwood et al. 2010; Pache and Santos 2010). In the case of transition economy clusters promoted in a top-down manner, the hand of the government is likely to be heavy. Indeed, the government may be a major source of funding and, at the same time, may be present as a shareholder in the state-owned enterprises making part of the cluster. Furthermore, transition economies rely on exogenous sources of economic growth, such as foreign direct investment (FDI), to fuel their economic growth and 'upgrade' their clusters (cf. Birkinshaw 2000; Grosse and Trevino 2005; Zukauskaite, Trippl, and Plechero 2017). The 'imported' actors from the developed economies may re-shape the dynamics of innovation systems, bring with them their own institutions and, in some cases, may deliberately defy the existing ones if these are not considered supportive (Crouch, Schröder, and Voelzkow 2009; Zukauskaite, Trippl, and Plechero 2017). Indeed, the subsidiaries of multinational corporations (MNCs) established in host countries' clusters have varying mandates and strategies depending on their innovation competencies as well as the external environment and resources and opportunities it provides; accordingly, these have varying influence on their host locations (Birkinshaw and Hood 2000; Dunning and Lundan 2008; Enright 2000; Frost 1998; Williams and Vrabie 2018; Zeller 2010). This implies that while MNCs can drive institutional change in their host regions, their presence in clusters may exacerbate the market-political institutional contradictions given the importance of the state actors in cluster development.

Coping with institutional contradictions

Actors operating in settings characterised by the presence of multiple and competing institutions face contradictory prescriptions from different constituents (Jarzabkowski et al. 2013). In such contexts, actors adopt deliberate strategies in response to these (Oliver 1991; Pache and Santos 2010). The deliberate nature of actors' approach to coping with institutional challenges has been the focus of the literature on institutional strategies (Kraatz and Block 2008; Lawrence 1999; Marquis and Raynard 2015; Oliver 1991; Pache and Santos 2013; 2010), institutional entrepreneurship (Battilana, Leca, and Boxenbaum 2009; DiMaggio 1988; Dorado 2005; Mair and Marti 2009) and institutional work (Lawrence, Suddaby, and Leca 2009; Lawrence and Suddaby 2006).

Much of this work (e.g. Kraatz and Block 2008; Pache and Santos 2010; Welter and Smallbone 2011) draws upon the typology of strategic responses to institutional pressures developed by Oliver (1991). These studies suggest that although institutional strategies may range from passive, such as conformity, to active, such as manipulation, in environments characterised by the presence of contradictory institutional logics, only the active approaches are applicable (Pache and Santos 2010). These can include (1) strategies satisfying only one pole of the institutional contradiction at the expense of the other; (2) those where a trade-off is found to satisfy, to some extent, both poles; and (3) those re-framing the contradictory logics to become complementary (Bjerregaard and Lauring 2012; Hargrave and Van de Ven 2009; Kraatz and Block 2008; Oliver 1991; Pache and Santos 2010).

The first set of strategies implies that the organisation chooses to avoid, defy, or manipulate one of the poles of the institutional contradiction while satisfying the other. The *avoidance strategy* may imply concealing the nonconformity, 'deleting' some of the institutional identities, and escaping from institutional rules or expectations by changing goals, activities, or domains (Kraatz and Block 2008; Oliver 1991). The *defiance strategy* implies ignoring or actively disrupting the norms, values and rules and/or assaulting the sources of institutional pressure (Hargrave and Van de Ven 2009; Lawrence and Suddaby 2006; Oliver 1991). Finally, the *manipulation strategy* implies attempting to change the institutional environment by 'importing' influential constituents or controlling or dominating institutional constituents and processes (Oliver 1991), shaping institutions through direct political action or by influencing the norms and belief systems (Kalantaridis 2007; Lawrence and Suddaby 2006; Marquis and Raynard 2015).

The second strategy implies that a *compromise* is found to satisfy to some extent both poles at once by establishing a trade-off or moderating between the poles (Hargrave and Van de Ven 2009; Kraatz and Block 2008). In doing so, organisations balance the expectations of multiple constituents, placate and accommodate different institutional elements and negotiate with institutional stakeholders (Oliver 1991). This strategy may also involve 'compartmentalising' of different institutional demands and responding to these sequentially or creating separate initiatives to demonstrate compliance to different constituencies (Hargrave and Van de Ven 2009; Kraatz and Block 2008).

The third strategy implies a *'creative embrace'* of conflicting logics (Bjerregaard and Lauring 2012; Hargrave and Van de Ven 2009; Kraatz and Block 2008) which requires to re-frame the issue, tailor the conflicting logics into becoming complementary and adopt new hybridised work practices and business models (Casasnovas and Ventresca 2019; Greenwood et al. 2011; Jarzabkowski et al. 2013). This may be possible if an organisation is able to forge a durable identity combining pluralistic legitimacy imperatives and becoming 'valued as an end in its own right, rather than a mere means for achieving pre-existing or externally-given ends' (Kraatz and Block 2008, 252). In doing so, institutional actors may be prioritising institutional work of maintaining the established institutional logics (Lawrence and Suddaby 2006).

The choice of the institutional strategy may depend on such factors as resource endowment of institutional entrepreneurs and the relative importance of the conflicting institutional logics

within the organisation (e.g. Battilana, Leca, and Boxenbaum 2009; Pache and Santos 2010). Thus, the choice of the institutional strategy will differ for collective and individual actors (Battilana, Leca, and Boxenbaum 2009; Pache and Santos 2013; 2010). Collectively, cluster actors could engage in direct political action (Kalantaridis 2007; Martí and Mair 2009; Welter and Smallbone 2011), while less powerful or peripheral individual cluster actors may be more prone to manipulating norms and belief systems or acting to obtain support and resources from the elites (Lawrence and Suddaby 2006; Martí and Mair 2009). Such actors can also use the 'bricolage' approach to construct opportunities for entrepreneurial action (Mair and Marti 2009; Phillips and Tracey 2007). This approach implies 'making do by applying combinations of the resources at hand to new problems and opportunities' (Baker and Nelson 2005, 333). Resources may imply organisational mechanisms, fragments of legal frameworks, other prior and existing institutions, among others (Baker and Nelson 2005).

To sum up, clusters operating in transition economy contexts may be subject to multiple institutional contradictions and are likely to adopt different strategic responses. These will vary depending on the actor composition of the cluster and its governance, i.e. the involvement of the state and the presence of 'imported' actors such as MNCs, as well as the goals and interests of these. Finally, different institutional strategies may be adopted depending on the level at which the acts of institutional entrepreneurship take place. Specifically, clusters may act collectively as institutional entrepreneurs to shape their broader institutional environments by wielding their collective power. At the same time, they can be seen as an 'arena' for individual entrepreneurial action of their members. While collective strategies may involve direct political action, individual actors are likely to favour less confrontational strategies and use the 'bricolage' approaches.

Research design

Methodology

Given the scarcity of research in organisational and institutional studies focusing on clusters as the object of analysis and recognising its 'agentic' nature, we opted for an exploratory, theory-elaborating approach to extend the existing theory (Ketokivi and Choi 2014). To do so, we adopted an embedded multiple case study methodology (Yin 2008) whereby the clusters were considered the main units of analysis and the individual acts of institutional entrepreneurship constituted the sub-units of analysis. Such an approach allowed to analyse both the acts of institutional entrepreneurship performed by the cluster actors collectively and by individual actors nested within the cluster context.

Case selection

Our case selection was based on the criteria of relevance, the potential for knowledge production and feasibility (Miles, Huberman, and Sdana 2014). The initial screening for potential candidates was made based on the data of the Russian Cluster Observatory openly available at the Observatory website (https://map.cluster.hse.ru/). We also made use of the reports and policy analysis papers produced by the researchers at the National Research University 'Higher School of Economics' hosting the Observatory. This stage resulted in a pre-

selection of around 15 clusters based on the perceived relevance and feasibility in terms of location and ease of access. This pre-selection was further refined after the discussions with three Russian academics specialised in the field. We then contacted the pre-selected clusters and held initial discussions with cluster managers and regional development authorities to evaluate the potential for knowledge production. This resulted in the final selection of two case studies.

To select the cases answering the relevance criterion, we gave preference to clusters located in innovation-active regions, supported through the government policies, and showing consistency in operation. By focusing on innovation-active regions, we limited our research to those displaying a significant level of contradictions between the 'old' and 'new' as well as market and political institutional logics. We thus assumed that these regions display tensions between the systemic institutional barriers present at the national level and the regional policies aiming at alleviating these. By focusing on clusters receiving government funding, we limited our research to those having better access to resources to engage in institutional entrepreneurship. We also assumed that due to the presence of public actors in cluster governance, these clusters face market-political institutional contradictions. Finally, by limiting our research to clusters showing consistency in operation, we focused on those which have been in operation since the start of the government cluster support policies in 2011-2012 and have benefited from these over several years. From this, we inferred that these either show consistently high performance over the years, and thus have high innovation resources and capabilities, or have a strong social position allowing them to wield government support. In either case, such clusters would have the attributes enabling them to engage in institutional entrepreneurship (Battilana, Leca, and Boxenbaum 2009).

We also chose two clusters representing 'extreme' cases in terms of their sector of activity to uncover the differences in their institutional strategies. Thus, one of the selected clusters operates in the pharmaceutical and biotech sectors, while the other - in oil extraction and refinery, automotive and machinery sectors. The sectors represent different innovation patterns which suggests that different actors and knowledge channels will matter most for the innovativeness of the cluster actors. Thus, for automotive and machinery manufacturing sectors the key learning and innovation sources are scale intensive firms whereby in-house R&D is critical and process and product technologies develop incrementally (Giuliani, Pietrobelli, and Rabellotti 2005). In oil and gas sectors innovation and learning are mostly driven by suppliers (e.g. of machinery and chemicals) and oilfield service companies (such as those contracted to find and extract oil), however, basic and applied research led by public research institutes is also critical (Giuliani, Pietrobelli, and Rabellotti 2005; Perrons 2014). Pharmaceutical and biotech sectors rely on in-house R&D and basic and applied research conducted in universities and other research organisations (Tödtling, Lengauer, and Höglinger 2011). Furthermore, although these sectors are considered of national strategic importance in Russia, they display different degrees of institutionalisation (Ponomarev and Dezhina 2016). While the petroleum, automotive and machinery sectors are highly institutionalised, the pharmaceutical and biotech sectors are less so in terms of the amount and effectiveness of government support and formal institutions regulating the sector (Ponomarev and Dezhina 2016).

Data collection and analysis

In this study, we combined two levels of analysis to focus both on cluster-level strategies and individual-level approaches to institutional entrepreneurship in cluster context. Thus, we included field-level data in the form of industry reports, policy documents (such as regional and national economic development strategies) and interview data. These data sources were treated as primary, while observations constituted a secondary data source.

We opted for semi-structured and unstructured in-depth interviews given the exploratory nature of the study. The interviews took place from November 2018 to January 2019 and were conducted according to the same interview guide in both cases. The interview guide outlined a set of themes rather than detailed interview questions. The themes were established to gain insight into cluster-environment interactions and included cluster membership (key actors and relations among these, membership fees, admission procedure and rules), governance structures (decision-making mechanisms, rules, monitoring and sanctions), regional and national specifics (available resources and capabilities, barriers to cluster innovativeness), cluster strategy-making process and key priority areas, ways of overcoming barriers to innovation, shared values and norms in the cluster; innovation capabilities and performance.

The interviewees were selected to represent the key groups of cluster actors: industry, academia, cluster management organisations and public bodies. This allowed uncovering institutional tensions and contradictions and the resulting conflicting demands of different stakeholder groups involved in the cluster. Table 1 describes the interviewees and their involvement with the clusters.

Kaluga Pharmaceutical Cluster (KFK) – pharma and biotech, Kaluga region	Innokam – automotive and petrochemicals, Republic of Tatarstan
• PAM founder – serial entrepreneur in the field of biotech, formerly an academic, currently manages and runs the 'Park of Active Molecules' (PAM) • Head of University department – academic in the field of pharmaceutical chemistry at the National Research Nuclear University MEPhI (Moscow Engineering Physics Institute) • Chairman of the cluster Board of Directors – a 'Big Pharma' representative (holds a top management position at the Kaluga subsidiary of AstraZeneca) • Cluster organisation representative - Executive director of 'Kaluga Pharmaceutical Cluster' (KFK) association • Regional government official – Director General at the 'Agency for innovative development – Centre for cluster development of the Kaluga region'	• High-tech SME owner-manager – entrepreneur (business process management, digitalisation for manufacturing companies), formerly an academic • Academic, high-tech entrepreneur – lecturer, researcher at Kazan National Research Technical University, runs an R&D services company • Chairman of the cluster HR committee – representative of one of the cluster's 'anchor' companies (Ford-Sollers), HR director • Cluster organisation representative 1 - Vice-president of 'Innokam' association • Cluster organisation representative 2 - Head of the Innovation Development Service at 'Innokam' • Regional government official – Director at the 'Centre for Cluster Development of the Tatarstan Republic'

Table 1: Interviewees' list

All interviews, presentations and other sessions were recorded and transcribed with one exception where the interview was noted down following the wish of the interviewee. The average duration of the interviews was around 60 minutes. Some of the participants were interviewed more than once. The total duration of the audio material collected was close to 14 hours.

To analyse field-level characteristics and the institutional contradictions present in cluster environments, we collected data from open sources, such as the clusters' websites (cluster strategy, performance reports, charters and press releases), industry reports, policy documents (regional strategy documents, national regulations relative to economic development, innovation and science as well as relevant industry regulations), press articles and academic articles.

For data analysis, we applied the 'provisional coding' approach (Miles, Huberman, and Sdana 2014). Thus, we established provisional codes based on the preliminary literature review but then identified additional codes or sub-categories of codes during the coding process. Two matrices have been developed for data analysis. A categorisation matrix (Elo and Kyngäs 2008) established the relationship between the elements of the theoretical framework, interview themes and their codes. An observations coding matrix (Miles, Huberman, and Sdana 2014; Lamb 2016) was used to systematise and analyse the memos produced during the research process. The data was categorised, coded, and analysed with the help of NVivo software.

Case description

The setting

In Russia, many of the current barriers to innovation, science and entrepreneurship can be traced back to the Soviet era or explained by the major socio-political and economic transformations that have been taking place after the demise of the U.S.S.R (cf. Graham 2013; Graham and Dezhina 2008; Yakovlev 2006; Dezhina and Kiseleva 2008; European University in Saint Petersburg 2010; Klucharev and Dezhina 2018). Specifically, the innovation and entrepreneurial orientation (or the lack of thereof), the structure of the science, research and education sectors and the market structure are some of the important institutional fields shaping the innovation activities in Russia today.

First, the science and innovation in the Soviet period was government-driven, whereby the directions of scientific research and the implementation of innovations was decided upon by the government and was mostly focused on the defence sector (Dezhina and Kiseleva 2008; European University in Saint Petersburg 2010; Kontareva 2015). This meant that there was no need or possibility for scientists to commercialise their innovations. Although the inventive activity itself was endorsed by the government, the commercialisation of innovations was not considered its logical continuation (European University in Saint Petersburg 2010). This has led to negative views of technology commercialisation and academic entrepreneurship which persist today (RVC 2017).

Second, government funding constituted about 97% of all R&D investment in the Soviet period (Graham and Dezhina 2008). This situation persists today, although to a lesser degree with about 70% of all funding for R&D coming from the government sources (Dezhina 2019). Moreover, the science and education sectors have traditionally been separated, whereby fundamental and applied research were the prerogatives of the Academy of Sciences and the education role was attributed to universities (Graham and Dezhina 2008; Dezhina and Kiseleva 2008). The situation mostly persists today despite government efforts to restructure the science and education system. Moreover, the severing of formal and informal ties within the innovation system and the drastic reduction in government funding after the collapse of the U.S.S.R. lead to the dissipation of the country's innovation potential (Graham and Dezhina 2008; Dezhina and Kiseleva 2008). On the other hand, due to the investments that had been made by the Soviet Union in the science and education sector, Russia still has a significant resource pool in terms of scientific and education organisations and an educated population (Cornell University, INSEAD, and WIPO 2019; Fainshmidt et al. 2018; Dezhina and Kiseleva 2008).

Finally, the wave of privatisations which happened after the demise of the Soviet Union resulted in an uneven distribution of resources and wealth in the country and is still visible today (Dezhina and Kiseleva 2008). The extreme concentration of ownership and lack of competition meant that businesses did not consider innovation a source of competitiveness and the introduction of foreign technologies has been one of the most common types of innovations in Russian businesses (Dezhina and Kiseleva 2008; European University in Saint Petersburg 2010). This resulted in low demand for local R&D and innovation which is still considered one of the key barriers to technology commercialisation in Russia (Frost & Sullivan 2014).

Furthermore, low innovation capabilities of local actors resulted in the dependence on foreign resources in Russian businesses. The political tensions of 2013-2014 made this dependence ever more apparent as many Russian companies faced the risk of having no access to foreign-sourced technologies, equipment, or pharmaceutical substances. In response, the policy of 'import substitution' was introduced by the Russian government as a way to decrease the dependence on the external sources of technologies and to stimulate the innovative activities of the Russian businesses. It included protectionist measures related to public procurement and support measures for industry-academia collaboration, among others (Komkov and Bondareva 2017). These measures mostly targeted the industries which heavily relied on the imports of foreign machinery and materials, including manufacturing and pharmaceuticals.

Finally, cluster-based development has been prioritized in Russia since 2008 as a mechanism of overcoming the 'systemic failures', or inconsistencies in the country's institutional environment governing interrelations between different actors of the innovation system (Andersson et al. 2004; Kutsenko, Islankina, and Abashkin 2017). In 2010, the Russian Ministry of Economic Development started to provide subsidies to regions to support the creation of regional 'cluster development centres' and launched two consecutive programmes to support 'innovation clusters' in 2012 and 2016 (Abashkin, Boyarov, and Kutsenko 2012; Bortnik et al. 2015; Islankina et al. 2017). In parallel, the Ministry of Industry and Trade launched its own cluster support programme focusing on 'industry clusters' and supporting cooperation projects for the production of goods under the import substitution programme.

The clusters

Kaluga Pharmaceutical Cluster

Kaluga Pharmaceutical Cluster (KFK) is located in the Kaluga region and is one of the largest pharmaceuticals and biotechnology clusters in Russia counting 63 companies and over 9,000 employees. The cluster was initiated in 2011 by the regional authorities and was incorporated in 2012 as an association.

Kaluga region has been repeatedly listed as one of the most innovation-active and 'investment-friendly' regions of the Russian Federation (Agency of Strategic Initiatives (ASI) 2019; Abdrakhmanova et al. 2017; AIRR 2018). The region is not rich in natural resources, in contrast to most Russian regions which have been successful in attracting foreign direct investment (FDI). It was one of the first to bet on the FDI attraction strategies for its development and introduced tax breaks for investors already in 1998-2001 (Zimin 2010). Further measures were

taken starting in 2005 when the regional authorities decided to invest in the development of industrial parks or industrial zones: several land plots were prepared by the public authorities for greenfield investment and a regional development agency was created to facilitate the interactions with potential investors (Zimin 2010). The strategy was successful and allowed to attract a number of foreign investors including one of the major pharmaceutical companies.

One of the unique characteristics of the Kaluga region is the presence of a relatively well-developed scientific and research capabilities. Indeed, the city of Obninsk where most members of the pharmaceutical cluster are located has the status of the so-called 'science city'. These are cities where the major local employment is ensured by the science and research organisations – mainly the institutes of the Russian Academy of Sciences and subsidiaries of Moscow-based universities (Pospelova 2016) - rather than the industry. Kaluga region is one of the leading in terms of the number of scientists and researchers in its population (Pospelova 2016). As mentioned by one of our interviewees: 'Back then, the best specialists from the whole Soviet Union were gathered here, in Obninsk, and there was a number of companies here in the 90s that were created by senior researchers' (PAM founder). Indeed, the Scientific Medical and Radiological Centre of the Russian Ministry of Health (previously under the Russian Academy of Medical Sciences) located in the city of Obninsk has produced a number of spin-offs in the 1990s, of which 4 have survived to date and grew to become medium companies. These companies, as well as the research institutions and universities located in the region along with the newly established subsidiaries of global pharmaceutical companies now constitute Kaluga Pharmaceutical Cluster.

Innokam cluster

'Innokam' is located in the Tatarstan Republic and is one of the biggest clusters in Russia. It was incorporated in 2011 as a non-commercial partnership and involves around 300 companies with approximately 110 000 employees in total. The cluster member companies operate in such fields as crude oil refining, petrochemicals, automotive components, and automobile manufacturing. A small number of companies are specialized in supporting industries such as robotics and IT and provide services to the 'anchor' cluster businesses, i.e. the biggest regional companies, such as Tatneft (petroleum) and KAMAZ (automotive). The cluster is governed by the Board which includes the representatives of the key 'anchor' enterprises, education and research organisations, public authorities (e.g. Minister of Economy of the Republic of Tatarstan) as well as representatives of Special Economic Zones, other regional clusters (e.g. IT cluster) and investment funds. The president of the cluster association is at the same time the director of 'Tatneftekhiminvest-holding', a powerful organization representing the interests of Tatarstan's oil and gas industry. The organisation plays the role of a coordinating and an expert body in the regional petroleum industry and a communication platform within the highest reaches of the republic's authorities (Yakovlev et al. 2018).

The Tatarstan Republic has been reported as one of the top-performing Russian regions in terms of innovation (Abdrakhmanova et al. 2017; AIRR 2018). The region has a well-developed and diversified industrial and innovation infrastructure which includes a number of science parks,

industrial parks and business incubators as well as engineering centres and venture funds (Zolotarev and Mukhlisova 2014).

In contrast to the Kaluga region, Tatarstan's economy has been dependent on its natural resources. During the Soviet era, Tatarstan was one of the major providers of raw materials for other Soviet republics. After the 1990s the major direction of the regional economic policy has been to create vertically integrated industries encompassing oil extraction, refinery, and the waste-free production of manufactured goods from crude oil (Belov and Ershova 2011). However, the oil and gas extraction and refinery enterprises dominating the regional economy have been traditionally characterised by low R&D intensity and stimulus to innovate (Dezhina and Frolov 2018; Zolotarev and Mukhlisova 2014; Kontareva 2015).

Tatarstan's regional governance system has its specifics such as a high level of regional autonomy, the presence of a strong regional leader, a high level of social capital and the cohesion and patriotism of regional elites who managed to retain control over the regional resources during the period of privatisations in the 1990s (Yakovlev et al. 2018). As one of the interviewees described it: 'Compared to other regions in Russia, the situation is better in Tatarstan, but it is a question of mentality. The region works as a team, there is a strong, active, open, and business-like leader. The Republic works to achieve specific and understandable results and does it with inspiration and patriotism.' (Cluster organisation representative 2, Innokam). Compared to Kaluga region, Tatarstan has a lower orientation towards international markets and FDI attraction has not been actively used as a mechanism of economic development by the regional elites in order to avoid any potential loss of control over regional strategic resources (Yakovlev et al. 2018; Zolotarev and Mukhlisova 2014).

Findings: Institutional entrepreneurship and institutional contradictions in clusters

We will describe our findings through the lens of four acts of institutional entrepreneurship that surfaced during our empirical research. Each of these demonstrates a range of institutional contradictions and respective institutional strategies used by entrepreneurial actors. In describing these acts, we use both the interview and the document data to contextualise the findings.

Cluster creation as an act of institutional entrepreneurship

Although cluster-based economic development has been prioritised by the federal government, the concept of an 'innovation cluster' has not been clearly defined in any of the relevant policy documents. As one of the interviewees put it: 'When I started [in this position] there was no understanding whatsoever of what a cluster development centre is supposed to do.' (Regional government official, Tatarstan). This ambiguity was leveraged by different institutional actors in a different manner. While some used the already existing holdings adapting their structure to fit the 'cluster' approach, others created clusters 'on paper' only to fulfil government KPIs: 'Companies were 'herded' into clusters not because they felt that they needed it but because they 'had to' do it. […] No one explained to us the goals or responsibilities, nothing…' (High-tech SME owner-manager, Tatarstan).

However, some used these enabling conditions to create new structures for cooperation and change the dynamics in their regions, as was the case with both studied clusters. While in both regions the geographical concentration of companies in respective fields had been present before the creation of formal membership-based clusters, there has been almost no collaboration between geographically proximate firms. With the introduction of cluster policies, regional entrepreneurial actors saw an opportunity to transform 'geographical concentrations of organisations' into 'organisations of organisations'. 'Thanks to the cluster, the localisation of the companies improves, they start expanding, new productions plants open. The cluster brings companies together. They can be located 50 metres from one another, but no one knows who does what, who needs what and who can do what – this is the trouble.' (Academic, high-tech entrepreneur, Tatarstan).

The vagueness of the concept was leveraged to 'mould' it into a form that would be understandable and acceptable for the local actors: 'So, I started thinking how we could really be helpful, and I personally visited a lot of companies asking them: "Guys, you make part of a cluster, what would you like to get out of it?"' (Regional government official, Tatarstan). 'This "cluster" idea was foisted upon us. But it's good that our people do not easily submit to these things. In Novosibirsk, they established their own model, and in Kazan yet another one. And everybody adapts in their own manner.' (PAM founder, Kaluga region).

In Kaluga region, the cluster model was traditionally based on the FDI attraction and centred around the major pharmaceutical companies present in the region. Thus, regional authorities, who have been the major driving force of cluster creation, initiated negotiations with these to find premises for cluster-based collaboration. These included the lobbying of the pharmaceutical industry interests, joint approach to human resources development, the development of joint-use infrastructure (e.g. pharmaceutical waste treatment facilities) and, finally, collaboration between the local and foreign companies. The significant research potential of the region allowed to also involve local biotechnology companies and research and education organisations thus helping the region re-establish the linkages in its innovation ecosystem.

In Tatarstan, the drive to create a cluster came from large regional state-controlled companies. As the region has long been prioritising the development of regional, localised value chains

based on petroleum-related industries, the cluster development followed this strategy as well. The idea has been to establish a value chain from oil extraction to the production of manufactured goods within the cluster.

The fact that two cluster approaches exist in Russia under different Ministries' mandates has been leveraged by the two studied clusters. While both have been enjoying government support under the Ministry of Economic Development 'innovation clusters' programme since 2011, these have also been taking measures to 'fit' the 'industrial clusters' support programme launched by the Ministry of Industry and Trade in 2016. This would allow obtaining additional support for collaborative innovation projects by the cluster firms.

The actor composition in the two clusters – the dominance of MNCs in Kaluga versus that of large state-controlled companies in Tatarstan – meant that these face institutional tensions and contradictions differently.

In Kaluga, the contradictions come from the 'production-orientation' of MNCs who are not necessarily looking for innovative drug development opportunities thus hampering the innovation potential of the local biotech companies. In 2009, the strategy of the pharmaceutical industry development in Russia was adopted by the Federal Government with the goal to increase the share of the locally produced drugs. Although it has meant that more stages of drug development have been localised in Russia by MNCs, the most knowledge-intensive stages are still performed in companies' R&D facilities abroad: 'The investment model in Russia at the time was and still now is… they do not build deeply integrated pharmaceutical production plants, they basically build packaging companies where they import substances, turn them into final drugs, package and sell them. It is the last stage in the process of drug development. Our goal was to try and deepen that.' (Regional government official, Kaluga region). Indeed, Russia, despite its knowledge potential, is not considered a 'hotspot' of pharmaceutical and biotech innovation by the major global pharmaceutical companies (Zeller 2010). This means that the Kaluga cluster has to manage these contradictions on a daily basis balancing the interests of the region's major investors and its local knowledge actors. One of the manifestations of these contradictions and the compromises that have been made to reconcile them is the collaboration between the educational organisations and the cluster's pharmaceutical companies: 'As most of the lecturers at the department are pharmaceutical companies' employees, we only have three full-time internal staff. Our dream is to set up science here, but we have these "scissors"… because I'm interested in having a lot of full-time internal researchers while the companies are interested in ensuring that the students – their future employees – have the most up-to-date knowledge. […] We try to find a compromise here, but for now, this compromise results in only three full-time researchers.' (Head of the university department, Kaluga region).

In Tatarstan, the petroleum and automotive sectors have been dominated by the large enterprises under the federal (e.g. one of the largest Russian car manufacturers, KAMAZ) or regional control (e.g. a major oil company 'Tatneft'). Until recently these have had little incentive to innovate: 'Most companies just sit there hoping that no one comes to bother them. Many order goods in China while we could have easily manufactured them here. But they just do not want to do anything. "Another day has passed, and we are fine" – this kind of mentality. Absolutely

no willingness to expand or diversify their production.' (Academic, high-tech entrepreneur, Tatarstan). While the initiative of cluster creation has come from big businesses, many have low innovation capabilities and a lack of collaborative approach. Furthermore, their low interest in local technologies and preference towards importing the ready and 'time-tested' solutions meant that there was no demand for local technologies. However, in 2010 the federal government introduced the legislation requiring joint R&D between the state-owned enterprises and the national research and education organisations (Federal government Decree No. 218). This has been a major stimulus for Tatarstan's companies to create the 'Innokam' cluster. In contrast to Kaluga, there has been a consensus among the regional authorities and the large businesses about the need to change the regional development path. Thus, cluster creation and development mostly aimed at defying the existing institutional barriers to innovation and breaking the 'silos' in which actors have been operating, as well as improving regional innovation and entrepreneurial culture through outreach and education activities. Such direct action was made possible due to the support of powerful regional players.

Finally, to be able to exist as an organisation, clusters need to prove their relevance, to continuously legitimize themselves in the eyes of their members and external stakeholders, such as the federal government providing funding. As the government cluster programme through which the clusters are now supported may be discontinued, there is a level of uncertainty. Should this happen, the cluster operation may be ceased if the cluster members are not ready to financially support it: 'I think that our members are not ready to finance the cluster in full. They are used to getting the services for free and they will only understand their value when the cluster dissipates.' (Cluster organisation representative 2, Innokam). Thus, building legitimacy and creatively embracing the logics of different internal cluster actors have been high on both clusters' agendas.

Park of Active Molecules (KFK cluster)

As mentioned previously, the lack of technology commercialisation has been a 'weak spot' of the Russian innovation system (Cornell University, INSEAD, and WIPO 2019; Frost & Sullivan 2014; Graham 2013; European University in Saint Petersburg 2010; RVC 2017). Some of the cultural factors, or informal institutions, are to blame such as the researchers' lack of willingness to commercialise their innovations and the generally negative perception of the academic entrepreneurship by the public. These issues are of key importance to the biotechnology sector which heavily depends on the fundamental research conducted by science and research organisations (Tödtling, Lengauer, and Höglinger 2011). Kaluga Pharmaceutical Cluster shows an interesting example of institutional entrepreneurship aiming at overcoming these seemingly unsurmountable challenges to promote and facilitate biotech innovation.

One of the members of KFK is the 'Park of Active Molecules' (hereafter, PAM). The organisation was created in 2011 on the basis of a group of biotech companies founded in 1998. The aim of the organisation is to help scientists commercialise their research results in the field of biotechnologies. Over its 20-year history, the organisation tried on different 'institutional identities', such as technoparks and clusters promoted by government policies in different points in time. However, they deliberately chose not to adhere to any of these due to the

limitations of these spatially bound cooperation forms especially important in the biotechnology sector relying on global fundamental research. Instead, they chose to create a new business model which they refer to as the 'competence alliance': 'Our format is the partnership, it is about building the relationships with universities. In comparison with the so-called clusters, we do not have boundaries. We collaborate with colleagues in Novosibirsk, in Saint-Petersburg, in Moscow, in Kazan, anywhere, because innovations do not have boundaries.' (PAM founder). Currently, PAM has in its portfolio about 100 active molecules (or active pharmaceutical ingredients) which can be used for the innovative drug development. The business model that the organisation has created allows scientists with innovative ideas to obtain the necessary competencies while sill focusing on research activities. Thus, the scientist retains 25% of the company, while the rest is owned by the technological and the business development sub-units of PAM. Thus, the organisation has been able to 'creatively embrace' the institutional contradictions stemming from the reliance of the biotech industry on research commercialisation and the inability or unwillingness of the scientists to engage in this process: 'One of the mottos of the Park of Active Molecules is that a scientist stays a scientist and continues doing what he [or she] does best. On the other hand, we add those competencies which are needed to create a business, to create a product. We do not make entrepreneurs from scientists.' (PAM founder)

Another characteristic specific to the biotech sector in Russia is its comparatively low level of institutionalisation, whereby the regulations and government support mechanisms are currently underdeveloped (Ponomarev and Dezhina 2016). This suggests that current institutional logic fails to support the long cycles of development in biotech, which can take up to 10-15 years before the business becomes profitable. PAM has been facing challenges in this respect: to help scientists develop their projects, these were registered as companies. However, R&D companies do not have a special legal status in Russia, which means that these are subject to the same requirements as other businesses. Specifically, under the Civil Code of the Russian Federation, the primary goal of commercial enterprises is to obtain a benefit. In cases where a company declares a loss, it is automatically subject to tax audits: 'We cannot "be in the red" as in the West, we cannot accumulate losses. They [the tax authorities] immediately rush in and ask how that could happen.' (PAM founder). To avoid these pressures, PAM has initiated a business accelerator whereby the innovative projects will not be registered as companies but will be run as projects: 'There is a whole range of limitations if one is to run a project under the small company framework. It is easier to develop these ideas not as companies but as projects in the accelerator.' (PAM founder). Such a structure also allows facilitating investment attraction to the innovative project in PAM's portfolio.

Dual education system (Innokam cluster)

The Russian labour market is characterized by high labour mobility which discourages firms' investment in personnel training (Dudyrev, Romanova, and Shabalin 2018). Furthermore, the quality of education in Russia has been insufficient and the university and technical colleges' education programmes have been lagging with respect to industry needs (Klucharev and Dezhina 2018). The creation of clusters and the related attraction of FDI have exacerbated the problem of the lack of talent in the regions which, potentially, could lead to unhealthy practices

of ‘talent poaching’ among cluster companies. ‘In fact, the problem is that few companies are ready to spend time and resources to build relationships with educational organisations. Many think that the task of the universities is to provide labour that can be “operational” in their companies from day one. In my opinion, our key goal is to build a relationship with the universities in such a way that they begin providing us with the labour we need.’ (High-tech SME owner-manager, Tatarstan).

One of the institutional innovations which was made possible due to the newly established cooperation and communication channels within Innokam cluster was the introduction of the ‘dual education system’ based on the approach applied in Germany, Austria, and Switzerland. However, the implementation of this programme in Russia has been extremely challenging due to the presence of significant institutional barriers, such as the absence of relevant provisions in federal education standards. ‘All this we need to overcome, get around, invent and re-invent and so on. For those who have introduced this system of dual education it is a real innovation in our country and a constant struggle.’ (Chairman of the cluster HR committee, Innokam). Various mechanisms have been used to implement the practice and overcome the rigidities of the current system, such as methodological recommendations for the on-the-job training or provisional cooperation agreements (Dudyrev, Romanova, and Shabalin 2018).

The role of the cluster has been crucial in making this happen. The coordination between the company and the educational institutions was facilitated by the HR committee meetings. The committee is composed of engaged and motivated individuals who see an important role of the cluster in re-shaping the regional industrial dynamics: ‘The role of the cluster is to commission the education organisations to provide human resources, to consolidate the knowledge of the future, of the industry plans and needs and of the job market in general.’ (Chairman of the cluster HR committee, Innokam). Currently, the committee is working to implement the dual education system on a larger scale and to involve smaller companies.

‘Innoscope’ (Innokam cluster)

To help ‘anchor’ companies find partners for their innovation projects, Innokam cluster facilitators launched an initiative to find innovative projects and start-ups beyond the cluster and regional borders. The cluster ‘anchor’ companies submitted to the cluster facilitators their innovation needs which were then distributed through a wide network of potential partners, such as universities, research centres and innovation companies. This allowed assembling a portfolio of 14 projects which were then presented to the ‘anchor’ companies. This experience showed the cluster organisation that there is a need for broader collaborations going beyond the cluster and even the regional border. It also demonstrated the potential of bringing together different and to date mostly disconnected actors of the ecosystem.

This experience triggered another project led by the cluster facilitators: the creation of a digital platform for open innovation. The platform allows users to post technological projects and competencies and requests for these, thus serving as a matchmaking tool which brings together the innovators and the potential users of their innovations. The platform is not limited to the cluster, nor to the region, it is national in scope and is also open for foreign users. The cluster facilitators have been deliberate about it to allow for global sourcing of ideas and knowledge

for the local companies: ‘When we ask our large regional companies “Why don’t you use the research potential of our local universities?” they reply “This is not enough for us. We work as “vacuum cleaners” gathering ideas from all over the world.”’ (Cluster organisation representative 1, Innokam). Tatneft – one of the more innovative petroleum companies (Dezhina and Frolov 2018) – has been one of the first cluster players to place technological requests for proposals on the platform. It has also been used by actors from other parts of the country. The cluster activities thus can have more far-reaching effects: ‘Innokam does not see itself as a regional cluster, but as something much bigger than that, as a cluster operating nationally.’ (High-tech SME owner-manager, Tatarstan).

This project reflects the vision of the cluster facilitators who see their role as going beyond the scope of the cluster and aim at creating the innovation ecosystem in the region by connecting the actors, mediating their interactions and helping the representatives of different spheres – such as the academia and the business – ‘speak the same language’ . ‘Our task is to find common interests among different cluster members […] because very rarely do companies themselves operate within this logic. This is the logic of a systems integrator who sees different needs and tries to tie them into one project, one initiative or one common interest.’ (Cluster organisation representative 1, Innokam). They also see their role in systematising the innovation infrastructure in the region and contributing to the creation of a steady flow of new ideas and entrepreneurial talent. They also challenge the cultural specifics, such as the negative views of entrepreneurship and, in doing so, go beyond the cluster and the regional boundaries: ‘Why are we always so self-critical? Yes, we have a lot of natural resources, and yes, we often use them ineffectively. But we shouldn’t forget that we have many success stories, such as “Yandex”, “Mail” and a lot of exporting companies which we are proud of. I think that we should popularize this and inspire people rather than belittle them.’ (Cluster organisation representative 2, Innokam).

Discussion

In this paper, we set out to understand whether and how clusters act as institutional entrepreneurs in unsupportive institutional environments to facilitate their members’ innovativeness. In particular, we have been interested in the role of institutional contradictions and the strategies adopted by clusters as institutional entrepreneurs. We will now discuss our findings with respect to these two topics.

Our case studies demonstrated that transition economy clusters operate in institutional settings characterised by multiple institutional contradictions. In Kaluga, the regional authorities have been the major driving force for cluster development. Their strong orientation towards FDI attraction means that important financial resources are being devoted to creating an ‘investment-friendly’ environment in the region, especially by developing ‘hard’ infrastructure and facilitating the construction of productions facilities. However, as the case studies have shown, the institutional set-up relevant to such an environment does not necessarily correspond to an institutional set-up conducive to innovation in the pharmaceutical and biotech sectors. The ‘imported’ cluster members have their own agendas which do not correspond to the national or regional innovation development priorities, such as the improvement of innovation potential of

the local actors. Thus, the cluster has created an additional source of tensions whereby the interests of the multinational companies may be out of line with the interests of the local players. The cluster thus faces contradictory logics emanating from the region's research tradition, the innovation patterns in pharmaceutical and biotech sectors, the economic development approach of the regional authorities and the needs and capabilities of the newly 'imported' actors, whose mandate is mostly in localised production while the R&D activities are conducted elsewhere.

In Tatarstan, the sources of contradictions are different. These are related to the region's strong reliance on natural resources, the lack of innovation orientation in the big local state-owned players and, as a result, the lack of small innovative companies and the innovation culture in the region. Due to the government push through several important federal policy initiatives, the cluster companies have been experiencing the growing need to innovate and to do so in collaboration with local actors. These have faced the challenges related to the limited capacity of the local markets and insufficient capabilities of the research and education organisations.

Moreover, both studied regions have been betting upon cluster-based economic development and using clusters to re-shape the regional institutional settings which puts these into the position of 'change agents'. Thus, cluster environment raises contradictions and tensions between the previously existing informal institutions and the newly created formal institutions, whereby the idea of clustering itself comes as an opposition to the 'old' ways of doing business.

Thus, while most previous research addressing organisational responses to institutional complexity focused on situations where two contradictory institutional logics are present (Greenwood et al. 2011), our study has shown that institutional actors may experience a multitude of institutional contradictions and adopt different institutional strategies simultaneously to cope with these. We thus propose:

> *P_1: As institutional entrepreneurs, clusters operating within multiple conflicting institutional logics adopt multiple institutional strategies simultaneously.*

So, what institutional strategies did our studied clusters adopt? Our studies have shown that clusters play a dual role in institutional entrepreneurship by acting collectively and, at the same time, by creating enabling conditions for individual entrepreneurial actors.

Seeing cluster creation as an act of institutional entrepreneurship showed that regional pre-conditions and power balance shape the institutional strategies adopted by entrepreneurial actors. Here, the support of powerful constituents is a crucial consideration. In Kaluga, the initiative to create the cluster came from the regional authorities while the major pharmaceutical companies located in the region were sceptical to the idea. This required negotiating and finding a compromise to balance and accommodate the requirements of different stakeholders operating within different market logics, i.e. a 'compromise' strategy (Oliver 1991). This strategy also involved the 'moulding' of the cluster's institutional identity to fit the expectations and demands of multiple stakeholders which was made possible by the ambiguity of the 'cluster' concept in Russia.

Tatarstan, to the contrary, has been recognized for its 'elite consensus' (Yakovlev et al. 2018) and the alignment between the strategies of the major regional players has been evident also in

the cluster development. Thus, when the push from the federal government came to stimulate collaborative innovation between state-controlled companies and national research organisations, the cluster adopted a defiance strategy. Cluster actors worked to break the 'silos' within which many of the firms and research and education institutions had been working after the demise of the Soviet Union and the ensuing disruption of ties within the innovation system. It did so, in particular, by developing an open innovation platform to help the local businesses look for innovative projects across the country. This has the potential to produce effects beyond the cluster or even the region and create linkages between actors located in different parts of the country.

> *P_2: The interests of dominant actors shape the direction of the clusters' institutional strategies*
>
> *P_{2a}: Where the initial support of powerful actors exists, clusters may rely on defiance strategies, by actively contesting norms, values, and rules*
>
> *P_{2b}: Where the initial support of powerful actors is lacking, the compromising strategies can be used to establish the premises for cluster-based collaboration.*

Moreover, both clusters recognise that their success and sustainability in the long run depend on their ability to become institutions in their own right by embracing the prescriptions of different stakeholders. The entrepreneurial work is conducted by various cluster actors (the regional authorities, active business community members, education professionals and the cluster organisation) to raise awareness about the need for collaboration, theorise innovation and narrativize the role of the cluster as an institution in itself.

> *P_3: Clusters can ensure their long-term survival by engaging in the 'creative embrace' strategy to become institutions in their own right*

Both clusters engaged collectively in 'manipulation' strategies (Oliver 1991) to shape their institutional environments. In the case of Kaluga cluster, by 'importing' influential constituents – major global pharmaceutical companies – the cluster gained leverage in influencing the institutional processes, such as the development of industry-related standards and obtained access to additional resources. In Tatarstan, both the weight of the 'anchor' companies and the connectedness of the regional elites with the federal authorities gave the cluster the possibility to engage in manipulations strategies.

> *P_4: Clusters in unsupportive institutional contexts can act as collective institutional entrepreneurs by engaging in manipulation strategies*

Not only did clusters act as institutional entrepreneurs collectively, but these also provided enabling conditions for individual entrepreneurial action by their constituent actors, as the embedded case studies have shown. For instance, the establishment of a formal cluster structure improved collaboration and communication between the actors and facilitated the creation of the dual education system in Innokam cluster. While the major drive came from individual entrepreneurial actors within the cluster, their participation in the cluster made the

implementation of the system possible by connecting actors and helping these find common goals, such as the development and retention of talent in the region.

> *P_5: Clusters in unsupportive institutional contexts can create enabling conditions for institutional entrepreneurship of individual actors within their boundaries*

Finally, the 'bricolage' approach has been evident in three acts of institutional entrepreneurship: the creation of the clusters, the development of PAM business model and the development of the dual education system in Innokam. Indeed, both clusters aim at leveraging the opportunities presented by the different conceptions of clusters existing in different government bodies to access additional resources. Given the multiplicity of cluster approaches in Russia (one led by the Ministry of Economic Development and the other by the Ministry of Industry and Trade), the clusters have been trying to leverage the resources provided by both cluster support programmes. PAM model demonstrated how existing institutionalised forms (such as that of a business accelerator) can be adapted and re-framed to support the emerging structures and business models lacking institutional support and subject to an excessive bureaucratic burden. Finally, the case of the dual education system in Innokam cluster demonstrated that new structures for collaboration between industries and education organisations can be created from scratch by entrepreneurial actors even in the absence of supporting formal institutions. While previous research demonstrated the value of the 'bricolage' approach for less powerful actors (Baker and Nelson 2005; Mair and Marti 2009), our study shows that in conditions of resource scarcity it is practised both by powerful and peripheral institutional actors. In each of the discussed cases, however, it served a different purpose: gaining access to additional resources by clusters, alleviating the bureaucratic burden for the Park of Active Molecules and compensating for the lack of formal institutions supporting the dual education system in Innokam.

> *P_6: 'Bricolage' as an approach to institutional entrepreneurship can be leveraged in unsupportive institutional environments both by the cluster collective and individual actors within it to obtain additional resources, alleviate the bureaucratic burden or compensate for the lack of formal institutions.*

Conclusion

Our analysis has shown that clusters, driven by entrepreneurial agents at different levels – be these government officials, individual entrepreneurs, or academics – can, indeed, become agents of change in their regions. Seeing clusters as meta-organisations allows to recognise their agentic role in creating a supportive environment for innovation in unsupportive contexts. We showed that such clusters can have a dual role as institutional entrepreneurs. First, these can be institutional actors themselves by allowing the cluster collective to wield more power and thus have a say in shaping institutions. Second, clusters can create an environment enabling individual entrepreneurial action by making the opportunities more apparent and more easily enacted through the pool of resources available to the entrepreneurial actors. Our study shows that self-aware and organised clusters can be much more than channels of information and business contacts for participants. They can be mechanisms empowering actors, fostering their reflexivity and creativity.

This non-conventional view of clusters as 'context-embedded meta-organisations' may have an impact in practice by providing new language to refer to 'managed' clusters, thus affecting how these are seen by external audiences and how they perceive themselves (Ferraro, Pfeffer, and Sutton 2005). Thus, seeing clusters as 'organisations of organisations' rather than 'geographic concentrations of organisations', can drive their empowerment and cohesion around common system-level goals, ultimately contributing to their innovativeness (Matinheikki et al. 2017). If one of the elements of institutional work implies changing the ways actors see things so that they could emancipate themselves and step out of their established roles, then this research can be a steppingstone for clusters to achieve agency and realise their potential as institutional entrepreneurs in unsupportive environments. Constructing agency through discourse, such as this very article, can help achieve legitimacy and establish clusters as important players in the organisational field rather than passive 'elements' of broader institutional environments.

The contributions of this research to theory development are threefold. First, we expand the cluster theory by focusing on self-aware and organised clusters and viewing these as deliberate actors rather than passive 'elements' of institutional setup. By analysing clusters through the lens of the neo-institutional theory, we were able to develop a novel perspective on the role of clusters as institutional entrepreneurs and their significance in the transition economies, such as Russia. Moreover, while most research on the 'managed' clusters focuses on the role of the cluster facilitators, our study shows that other cluster actors have a significant influence on the direction of cluster development. In fact, the roles, interests, power, and affiliations of cluster actors define to a large extent the cluster strategy and the way it interacts with its external environment. Future studies in this field could dive deeper into the analysis of power relations within clusters and their influence on cluster strategy making. The 'power school' in strategic management can provide a suitable lens: it sees strategy-making as a process of negotiation by conflicting groups within an organisation or between the organisation itself and its external environment (cf. Mintzberg, Ahlstrand, and Lampel 2005). Thus, it may be worthwhile to explore the differences between clusters' structures (e.g. mostly 'flat' structures in SME clusters vs. 'hierarchical' clusters dominated by large private or state-controlled companies, etc.) and their strategies.

Second, we contribute to the field of organisation studies by elaborating on a novel concept of 'meta-organisations'. We addressed a specific type of meta-organisations, such as 'managed' clusters and showed its distinctive characteristics, such as its context-embeddedness. Future research could explore other types of meta-organisations and their approaches to institutional entrepreneurship. Indeed, meta-organisations are often created to shape their environments and can wield important resources and power (cf. Berkowitz 2018). However, while the current research mostly focuses on the lobbying activities of meta-organisations (e.g. the 'manipulation' strategies in our framework), our research has shown that a wider range of strategic action is possible. Future studies could address this issue, bringing insight into the influence of meta-organisations on their institutional environments.

Finally, we contribute to the institutional theory field by examining the institutional action in the transition economy context characterised by the presence of multiple conflicting institutional logics. While most empirical studies of institutional contradictions assume that

organisations face two conflicting institutional prescriptions and adopt a single institutional response to address these (Greenwood et al. 2011), our research suggests that in environments characterised by multiple institutional pressures, several institutional strategies may coexist. We thus suggest that future research in the field of institutional strategies focuses on the ways different institutional strategies are combined by institutional actors.

This study's limitation is related to the previous point. Specifically, our research was based on Russia as an example of a transition economy. Although transition countries are similar in that they display a multiplicity of institutional logics, there may be important differences across countries in how specific institutional tensions and contradictions interact and shape actors' behaviour. Thus, our findings may not be generalisable to all transition economies. However, we did our best to distil the most general learnings from our cases. Future research could address this issue by adopting a comparative institutionalism approach to analyse the clusters' institutional strategies in different transition economies, in developed countries versus transition economies or in countries corresponding to different varieties of capitalism, i.e. liberal versus coordinated market economies (Hall and Soskice 2001; Hotho and Saka-Helmhout 2017).

4. Conclusions

4.1. Key findings and implications of the research

'The circumstances of men's lives do much to determine their philosophy, but, conversely, their philosophy does much to determine their circumstances.' (Russell 2010, 2).

This research was based on the premise of the intentionality of clusters as 'organisations of organisations', at the same time recognising their 'context-embeddedness' implying that these are both shaped by their environments and can deliberately influence these. This perspective challenges the received knowledge in the cluster field dominated by the determinist perspective and viewing clusters as 'aggregations' rather than 'organisations' or organisations.

First and foremost, this thesis offers one broad implication for cluster researchers, practitioners, and policymakers. By developing deeper insight into the functioning of clusters as meta-organisations, this research contributes to the consolidation of the 'meta-organisational' perspective and coins new language for addressing the topic of 'managed' or 'organised' clusters. While this perspective is novel and to date has not yet drawn wide attention in cluster research and practice, it can be valuable in empowering clusters and giving them practical tools to exercise their collective power to shape their environments and achieve better outcomes. In a way, this 'meta-organisational' view of clusters might become a 'self-fulfilling theory' (Ferraro, Pfeffer, and Sutton 2005) by re-shaping the perception of clusters as deliberate and organised actors, rather than merely 'theoretical aggregations' of organisations. By helping re-view the philosophy underpinning organised clustering, this research may thus contribute to empowering cluster actors to change their circumstances.

Furthermore, while a number of findings and research implications have already been presented for each article individually, this section provides additional, cross-study, insight and formulates broader implications of this dissertation. Thus, this research work aimed at elaborating on the 'meta-organisational' view of the cluster and pursued two major objectives with respect to (1) the strategic management of clusters, (2) understanding clusters' ability to act upon their environments.

The first objective – related to the development of a strategic management framework for clusters – was covered in Articles 1 and 2. This part of research drew upon the design science approach to develop a framework for business modelling in the cluster context and formulate a set of propositions for the design of an innovation-centric cluster. These articles leveraged the potential of business models to provide insight into the value creation in the 'non-traditional' settings (Arend 2013) and act as 'physical tools for thinking' (Boland and Collopy 2004a). These papers also allowed to identify a set of elements and relations between these describing the process of collective value creation in a cluster.

In contrast to most studies focusing on 'managed' clusters or 'cluster initiatives', this research does not support the view that cluster management is a task bestowed exclusively on a 'specialised cluster management organisation'. Indeed, seeing clusters as 'meta-organisations', this study suggests that cluster management is a collective task and should involve a broad range

of cluster actors and stakeholders. The 'cluster business model' framework developed in this thesis, thus, does not focus on one central cluster actor but allows to account for the whole collective of actors, interactions between them and the pool of resources and capabilities these make available to each other.

The research presented in Articles 1 and 2 has allowed formulating two key findings, each of these suggesting managerial and policy implications. First, as the design-oriented systematic literature review reported in Article 2 demonstrates, a broad range of cluster actors can and should be engaged in cluster activities by performing the roles of facilitator, visionary and stakeholder, and/or sponsor. This finding is revealing and highlights that various cluster actors can mediate or facilitate the relationships within the cluster contrary to the currently predominant view of the 'specialised cluster organisation' as a major facilitator. This suggests that more attention should be given in research and practice to the mediation and facilitation activities performed by cluster actors other than the 'specialised cluster organisation'. From the policy perspective, this may suggest that a broader view should be taken on cluster support. Indeed, while most cluster policies imply the financing of a 'specialised cluster organisation' charged with the promotion of networking and collaborative projects among cluster members, this approach may be overlooking the importance of the other actors involved in cluster facilitation. To recognise their role, cluster policies may focus on providing support funds to the whole cluster community rather than a single actor (i.e. a 'specialised cluster organisation'). By allowing other entrepreneurial cluster actors to leverage these funds for organising networking and knowledge-sharing events for cluster members, such support measures may empower the cluster community and improve their participation in the cluster activities.

Another key finding concerns the collective nature of strategy-making in the meta-organisational settings. The empirical work conducted in the framework of this research showed that some of the studied clusters struggled to maintain actors' engagement, yet others had only limited capability to engage in strategy-making. This research suggests that using the cluster business model framework can facilitate the development of cluster system-level goals, help empower cluster actors and engage them in cluster activities. However, due to the presence of actors coming from different backgrounds, a cluster business modelling exercise may be prone to tensions between participants defending their own interests and pursuing their individual agendas. Thus, although the business modelling approach in clusters can be a valuable tool allowing to formulate common goals and reach a compromise between different parties, a business modelling exercise should be mediated by experienced facilitators having deep knowledge of the cluster and being perceived as 'legitimate' actors by the cluster community.

The second objective of this study was to extend the existing theory regarding the intentionality and 'actorhood' of organised clusters and was developed in Articles 3 and 4. Specifically, Article 3 focused on analysing the effect of the clusters' level of 'organisationality' on their ability to act upon their environments. Through the theory-elaborating case studies conducted in two Australian clusters, it was possible to identify how the presence of such organisational attributes as membership, hierarchy, rules, monitoring and sanctions mediated the ability of clusters to mobilise collective action of their members with a view to transforming their environments. This research found that self-aware and organised clusters do, indeed, act

intentionally to transform their environments by engaging in various types of institutional work. This research has shown that clusters' actorhood is not a precondition of their organisationality, but a property that can be deliberately 'constructed' or developed by the cluster actors. These may engage in three types of agency: identity work, boundary work and practice work. While 'constructing' and performing their actorhood across these dimensions, clusters work to differentiate themselves from their environment, legitimise their existence towards their members and the external stakeholders, as well as re-shape the existing practices and rules or establish new ones. Finally, this research has shown that clusters' design choices with respect to their levels of organisationality may influence their locus of actorhood resulting in more or less collaborative approaches to social action.

Article 4 took these findings further and analysed the strategies adopted by organised clusters to shape their environments and cope with systemic barriers to innovation. This research was informed by the organisation studies adopting a neo-institutional perspective and suggesting that organisational action is at the same time constrained, oriented, and enabled by the institutional environments. Thus, focusing on clusters operating in unsupportive contexts – such as the transition economies presenting a range of institutional barriers to innovation – this research used a theory-elaborating embedded multiple case study method. Two clusters in Russia were studied and several acts of institutional entrepreneurship both at the cluster and individual levels were identified. This study has shown that when operating in complex institutional settings, clusters can simultaneously adopt several institutional strategies. Their choice of the strategies, however, depends on the power distribution within the cluster and the interests of the dominant players. Moreover, clusters play a dual role in institution-shaping by both acting collectively and by creating internal conditions within the cluster enabling individual actors to engage in institutional entrepreneurship. Finally, to ensure their long-term survival, clusters may need to creatively embrace the different institutional logics they are exposed to and work towards becoming institutions in their own right.

Several managerial and policy implications of the 'agentic' perspective on clusters can be identified. First, 'actorhood' can be externally attributed and implies that the external audiences see the organisation as being 'addressable' and socially legitimated to take control of situations calling for agentic action (Halgin, Glynn, and Rockwell 2018). This further suggests that attributing 'actorhood' to clusters means bestowing upon them responsibility for their collective actions. In times of increasing awareness of sustainability issues and growing environmental concern of the general public, the ability to attribute responsibility to clusters may help enhance their collective governance and business practices. Indeed, as organised clusters may have hierarchy, rules, monitoring and sanctions for their formal members, they may be in a position to promote certain kinds of values – such as sustainability and social responsibility – and expect their members to adhere to these. Since clustering is increasingly seen as a way to improve innovation outcomes of the cluster members, attributing more responsibility to clusters can help facilitate the adoption of sustainable and responsible innovation practices, provided that these are integrated into the overarching cluster values and system-level goals.

The second implication is related to the collective entrepreneurial orientation of clusters. Article 4 showed that despite the presence of enabling institutional conditions (e.g. cluster support

policies), different clusters leveraged these conditions to a varying extent. Thus, while some clusters, such as those discussed in this research, did adopt an entrepreneurial stance and leveraged the available support to re-shape the regional development paths and change the *status quo*, others only did so 'on paper'. This shows the importance of the entrepreneurial orientation and values of the individuals driving cluster formation and supports the findings of Articles 1 and 2. From the managerial perspective, these findings suggest that the decisions regarding the involvement of certain cluster actors in its steering should be strategic and based on their individual skills and competencies. With regards to policy implications, the composition of the cluster team should be one of the cluster evaluation factors and should be taken into account when selecting clusters which will benefit from financial support. On the other hand, clusters displaying high potential but lacking a competent driving team may benefit from intervention allowing to attract and retain new actors bringing the needed expertise and skills to the cluster.

4.2. Research limitations

Although the 'meta-organisational' perspective on clusters proved relevant for studying self-aware and organised clusters, this literature is still in its infancy. Certainly, on the one hand, the novelty of the 'meta-organisational' perspective in cluster studies is an advantage as it allows for an exploration of previously neglected research directions. On the other hand, however, it has been a challenge due to the lack of studies adopting a meta-organisational perspective to clusters and meso-level approaches to strategic management. 'Cross-pollinating' the meta-organisational perspective with the abundant cluster research allowed to partly compensate for this limitation. Furthermore, a number of evaluation mechanisms – such as expert evaluations and case studies – have been developed to analyse the relevance and accuracy of the developed framework. However, the theoretical framework for the cluster business models and its innovation-centric design (developed in Articles 1 and 2) could benefit from further empirical testing.

A second limitation of this research may stem from the philosophical stance of the researcher and the subsequent choice of the research methods. While this research adopts an 'intermediary' perspective on the subjectivist-objectivist continuum, it still leans towards a subjectivist view. Thus, on the one hand, this research admits the existence of an external reality independent of the individuals' subjective perceptions. However, on the other hand, it also suggests that individuals can still impact their contexts, their ability to do so depending on the specific enablers and constraints present in the external environments and their subjective perceptions of these. While there can never be a definite answer to the debate between the subjectivist and objectivist perspective, the proponents of the latter may be critical of the philosophical stance of this research for several reasons.

First, the theory-elaborating approach and inductive reasoning applied in the empirical studies may be criticised for the lack of generalisability. Moreover, due to the subjectivist leaning of this research, it may be criticised for being laden with subjective interests, values, concepts, hypotheses and culture-specific ontologies (Gordon 1991; Holden and Lynch 2004).

The generalisability criticism may be countered by recognising that while the findings of this empirical research may not be generalisable to entire 'populations' of the units of analysis (i.e. to all organised clusters), the presented case studies are, however, generalisable to the theoretical propositions. Thus, this research does not enumerate frequencies (statistical generalisation) but generalises theories (analytical generalisation) (Easton 1995). This research further concurs with the suggestion that the findings should be qualified as contextually explanatory and probably generalisable, rather than absolutely certain (Gordon 1991; Holden and Lynch 2004).

Furthermore, in relation to a possible criticism regarding the limited objectivity of the study, the researcher concurs here with a view posited by Max Weber. Specifically, the researcher recognises that while it is impossible for human beings to produce scientific knowledge completely devoid of any subjective values and interpretations, the best one can do is to be conscious about possible biases and to adopt 'meta-values' requiring to keep one's work value-free (Gordon 1991; Sharlin 1974; Weber, Gerth, and Mills 1946). Thus, the researcher's values have been subject to continuous questioning and have led to several iterative loops between theory-elaboration and theory-building prior to the development of the final theoretical framework presented in Articles 1 and 2. This reflective stance was also important with respect to the empirical work presented in Article 4 and conducted in the researcher's country of origin. To avoid any subjective judgements and interpretations related to the cultural specifics and personal values, the researcher sought to rigorously cross-check the empirical findings with the available documentation. Moreover, an effort has been made to account for the fact that the theories based on the Western culture, values and realities, currently dominating academic research, may potentially hinder the understanding of the non-Western contexts (Bothello, Nason, and Schnyder 2019). Finally, case studies within the Australian context in a way sensitized the researcher to the specifics of the Russian context. A citation of G.K. Chesterton offers an apt description of the researcher's viewpoint in this respect: 'The whole object of travel is not to set foot on foreign land; it is at last to set foot on one's own country as a foreign land.' (Chesterton 1909, 204).

A final limitation of this research is related to the absence of research funding. It restricted the researcher's ability to perform more extensive empirical work by conducting more interviews and/or increasing the number of case studies. Future research could thus elaborate on this work by performing larger-scale empirical studies and applying hypothetico-deductive methods.

4.3. Further research

In addition to the research directions already formulated in each article, this section proposes five more potential areas for future studies related to the key findings and implications outlined above.

First, while this research helps consolidate the 'meta-organisational' approach to studying self-aware and organised clusters, further research could continue this undertaking and develop even deeper insights within this perspective. This would help bring closer together the meta-organisational and cluster research. One potential research direction could address the

differences between clusters and other types of meta-organisations. This research provides the first insight into this question by highlighting the 'context-embeddedness' of clusters in comparison to the a-spatiality of other meta-organisations. Future studies could then focus on other aspects, such as the governance mechanisms or power relations between the actors shaping the logics of different types of meta-organisations.

Second, as one of the interesting and revealing findings of the research on cluster business model elements demonstrated, the cluster facilitation role, usually implicitly or explicitly assigned to a 'specialised cluster management organisation', can actually be performed by a variety of cluster actors. This finding calls for a shift of perspective in research focusing on cluster facilitation. Thus, future studies, rather than focusing on a single actor formally charged with the task of cluster facilitation, could examine how other cluster actors – such as academia, firms, government bodies or business service providers – engage in facilitation activities. Such studies could examine whether the approaches and strategies of such facilitators differ and what effect their activities have on cluster performance. Some authors have suggested that the involvement of multiple actors in facilitation, mediation and network-building is one of the key reasons for the success and resilience of entrepreneurial communities (Feld 2012). Exploring whether and how these findings apply in organised clusters can be an interesting and worthwhile undertaking.

Third, as mentioned previously, due to the presence in clusters of a broad range of actors with different goals and agendas – such as academia, government, and the industry – strategizing in the cluster context may be prone to tensions. Thus, it may be important to analyse how different actors' roles and power distribution in a cluster influence the way these engage in strategy-making. The stream of research in strategic management focusing on 'strategy-as-practice' can provide valuable theoretical underpinnings for such a study (e.g. Jarzabkowski and Wilson 2006; Jarzabkowski and Spee 2009).

A fourth interesting avenue for further studies is related to the implications of clusters' 'actorhood'. As the attribution of 'actorhood' to clusters may bring a positive effect in terms of their empowerment, it may be worthwhile to understand the mechanisms by which agency and 'actorhood' are attributed. The 'communicative constitution of organisations' perspective (e.g. Dobusch and Schoeneborn 2015; Schoeneborn, Kuhn, and Kärreman 2019) recently developed in organisation studies can be revealing in this respect. Insight into how the general public and clusters themselves construct their identity as being 'agentic' actors could be developed through the application of such techniques as discourse analysis (cf. Higgins and Coffey 2016; Alvesson and Karreman 2000; Fairclough 2005).

Finally, a fifth research path could be identified with respect to the entrepreneurial orientation of clusters and their individual actors. Indeed, as our empirical research has shown, not all clusters leverage favourable institutional settings and the available cluster support to re-shape their regions. Some actors use cluster funding opportunistically to further their own agendas. Thus, to better inform policymaking with respect to funds allocation in the framework of cluster policies, it may be important to understand the drivers, characteristics, and motivations of the entrepreneurial versus opportunistic cluster actors. This calls for studies focusing on the

individual psychological traits, motivations and backgrounds of different cluster actors and their resulting approaches to cluster management. Studies in entrepreneurial orientation can provide a steppingstone for such research (cf. Brockhaus 1982; Frese 2009).

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Annexes

Annex 1 – List of figures

Annex 2 – List of tables

Annex 3 – Literature review framework

№	Author	Article title	Year	Journal	Summary
1	Ai C.-H., Wu H.-C.	Where does the source of external knowledge come from? A case of the Shanghai ICT chip industrial cluster in China	2016	Journal of Organizational Change Management	The study analyses the relationships between the acquisition of external knowledge by cluster actors and their innovation performance. Specifically, the authors distinguish between the technical knowledge and market knowledge. While they find that both of these external knowledge flows improve cluster innovativeness, they note that the importance of the external knowledge sources is related to the specifics of the industry (most technological developments happen abroad, specifically, in the USA, thus the flows of knowledge and talent to and from the US to China largely shape these dynamics). Furthermore, national support for cross-regional interactions is one of the factors facilitating knowledge flows between different regional actors.
2	Aliouat B., Thiaw C.A.L.	Communauté épistémique et dynamique d'innovation collaborative: L'innovation contrariée au sein des pôles de compétitivité	2018	Communication et Management	The authors discuss a case study of a communication technologies cluster in France, making part of the 'pôles de compétitivité' government programme. Coopetition is seen as one of the drivers of collaborative innovation in such clusters, and three hypotheses are advanced as to the pre-requisites for the success of collaborative innovation: (1) innovative clusters gather actors with convergent profiles, there exist epistemic communities which (2) share market-orientation or (3) technology orientation. The authors, however, did not find support to these hypotheses and concluded that the lack of cognitive convergence between the actors may be inhibiting their collaborative innovation potential.
3	Arthurs D., Cassidy E., Davis C.H., Wolfe D.	Indicators to support innovation cluster policy	2009	International Journal of Technology Management	The article proposes a framework to analyse cluster development and performance and identify potential bottlenecks to innovation. It suggests that current cluster conditions or inputs define its current performance (outputs), i.e. innovation dynamism, significance and interactions. Having applied the framework to the study of 8 clusters in Canada, found that two major barriers to innovation are faced by all of these: insufficient resources for firm formation and growth and weakly developed linkages.

№	Author	Article title	Year	Journal	Summary
4	Aslesen H.W., Isaksen A.	Clusters initiatives, open innovation and knowledge bases	2016	Handbook on the Geographies of Innovation	The authors discuss the geography of innovation cooperation depending on the dominant knowledge base firms draw upon in their innovation processes. Distinguishing between analytical, symbolic and synthetic knowledge bases, they demonstrate that for companies drawing upon analytical knowledge base (fundamental research and R&D, more easily codifiable knowledge), international collaboration is more relevant and important than for companies drawing upon synthetic and symbolic knowledge bases. For these, major innovation sources are local. The key conclusion of the paper is that cluster facilitation which focuses on the regional networking is not always an adequate way to stimulate innovative activity and other approaches may be more relevant.
5	Aslesen H.W., Pettersen I.B.	Entrepreneurial firms in STI and DUI mode clusters: do they need differentiated cluster facilitation?	2017	European Planning Studies	The authors suggest that cluster facilitation for innovation has to take into account the mode of innovation the cluster actors are engaged in. Differentiating between Doing, Using and Interacting (DUI) and Science, Technology and Innovation (STI) modes, the authors suggest that cluster facilitation should focus on promoting and establishing different types of linkages between different types of actors and providing different types of resources in each mode. Thus, for the former, the buyer-supplier interactions are key, while for the latter, the main source of knowledge for innovations comes from the formal research organisations and universities.
6	Basco R., Calabrò A.	Open innovation search strategies in family and non-family SMEs: Evidence from a natural resource-based cluster in Chile	2016	Academia Revista Latinoamericana de Administracion	The article discusses the differences in cluster-based SME open innovation search strategies distinguishing between family and non-family SMEs. It finds that family and non-family SMEs engage in innovative behaviour, however, the sources of knowledge and innovation differ for these. Family firms look for innovative ideas in more proximate environment using suppliers, customers and competitors as sources of knowledge. Non-family SMEs engage in riskier entrepreneurial behaviour and tend to source more knowledge from in an unrelated environment such as universities, international agencies and public institutions.

№	Author	Article title	Year	Journal	Summary
7	Bek M.A., Bek N.N., Shereshev a M.Y., Johnston W.J.	Perspectives of SME innovation clusters development in Russia	2013	Journal of Business and Industrial Marketing	Analyses the factors inhibiting the innovative development of clusters in Russia. Find that unsupportive institutional environment and in particular, lack of private property rights protection are inhibiting the development of SMEs, entrepreneurship and innovation. This leads to the predominance of opportunistic behaviour in clusters, where members try to obtain benefit to the detriment of others. Thus, there is a lack of trust which further inhibits collaboration and innovation.
8	Berkowitz H.	Meta-organizing firms' capabilities for sustainable innovation: A conceptual framework	2018	Journal of Cleaner Production	The author conducts a literature review to analyse the organisational capabilities needed for sustainable innovation and the ways meta-organisational governance can contribute to their development. Six key organisational capabilities have been identified: anticipation, resilience, reflexivity, responsiveness, inclusion and accountability. The author suggests that meta-organisations are themselves meta-governance devices which can replace traditional top-down governance with 'soft' self-regulatory mechanisms as these have the necessary attributes. Notably, coopetition, collective learning and knowledge transfers, workshops, information production, outreach activities, flexibility, being consensus-based and heterarchical structures, and self-regulation.
9	Burger M.J., Karreman B., van Eenennaa m F.	The competitive advantage of clusters: Cluster organisations and greenfield FDI in the European life sciences industry	2015	Geoforum	The authors examine whether the presence and the type of activities of cluster organisations attract FDI in life science clusters. They find that regions hosting multiple cluster organisations are more likely to attract FDI compared with other regions. Moreover, those cluster organisations that are involved in international promotion and the facilitation of capital provision are more likely to attract FDI. One of the key findings regards the differentiation between high- and low-value-added activities of MNCs located in life science clusters. The authors find that cluster organizations only succeed in attracting the activities that are not location specific and low-value-adding, such as production plants, and sales and marketing offices. However, in order to attract high-value-added activities such as R&D, headquarters and education it is necessary to ensure the availability of

№	Author	Article title	Year	Journal	Summary
					specialised location factors and the minimum conditions required to host certain activities.
10	Callagher L.	Searching near and far: A practice perspective of knowledge access in emerging clusters	2012	International Journal of Entrepreneurship and Innovation Management	The author discussed the influence of geographic proximity, relational proximity and cluster life-cycle stage on knowledge search practices. She finds that cluster life-stage influenced search practices in two ways. First, technological heterogeneity and a weak knowledge infrastructure required searching for external knowledge sources and geographically distant partners. Second, the expertise required at certain stages of the innovation processes resided in cultural fields that were unfamiliar to many agents in the cluster and required interactions with relationally distant partners.
11	Calzonetti F.J., Miller D.M., Reid N.	Building both technology-intensive and technology-limited clusters by emerging research universities: The Toledo example	2012	Applied Geography	The article examines the role of the University of Toledo in driving two cluster initiatives in the region. It distinguishes between a generative and a developmental role of the universities in economic development. The former refers to universities acting as sources of knowledge, trained workforce, and spin-offs. The latter refers to their leadership role in regional governance, networking and capacity building. The article has found that universities may be relevant actors in cluster facilitation both in case of high- and low-tech clusters. While for the former both developmental and generative roles are important, for the latter only the developmental, i.e. leadership, role proved relevant.
12	Cappellin R.	Knowledge creation and innovation in medium technology clusters	2012	Contributions to Conflict Management, Peace Economics and Development	The author discusses the specifics of innovation in medium-tech clusters and suggests that the traditional, 'linear' approaches to innovation based on R&D expenditure are ill-suited to medium-tech sectors. He suggests that in this case a systemic approach is better suited as it focuses on creating knowledge and innovation networks between the various local and external actors in a regional innovation system, on the development of their internal capabilities, and on the exploitation of their complementarity. The suggest that R&D is not the main factor driving innovation in medium technology sectors, but rather tacit knowledge, human competencies, learning processes and networks.

№	Author	Article title	Year	Journal	Summary
13	Castro L.	Strategizing across boundaries: revisiting knowledge brokering activities in French innovation clusters	2015	Journal of Knowledge Management	The author analyses the role of knowledge brokers in fostering innovation in cluster members. She finds that the roles and activities performed by knowledge brokers evolve and mature with the evolution and maturation of the cluster. It is also suggested that knowledge brokers act as bridges between different communities of practice within a cluster. Their role in cluster governance implies balancing between organising and strategizing.
14	Chiu Y.T.H.	How network competence and network location influence innovation performance	2009	Journal of Business and Industrial Marketing	The article examines Southern Taiwan Science Park and the network relations between its members to identify whether these have an effect on their innovation performance. The results suggest that network competence and network centrality lead to better innovation outcomes. The article proposes 4 types of strategies for cluster actors depending on their level of network competence and centrality.
15	Connell J., Kriz A., Thorpe M.	Industry clusters: An antidote for knowledge sharing and collaborative innovation?	2014	Journal of Knowledge Management	The authors discuss the contribution of knowledge-sharing activities to cluster innovativeness based on four case studies of industry clusters located in UAE and Australia. They apply the five-factor framework of relational context for knowledge sharing. The framework distinguished between 5 types of distance between actors influencing their knowledge sharing practices: organisational, physical, institutional, knowledge, relationship. They also distinguish between the institutional modes of the clusters (top-down, bottom-up and hybrid) and life-cycle stages. The findings of the article indicate that physical proximity is not enough to stimulate knowledge exchange between cluster firms and that deliberate strategies are important in clusters regardless of their institutional mode. Furthermore, the authors find that with the growth and maturation of the clusters the challenge of maintaining actor connectivity becomes ever more important.
16	Eklinder-Frick J., Eriksson	Effects of social capital on processes in a regional strategic network	2012	Industrial Marketing Management	The article suggests that social capital as a key driver of cluster innovativeness can have two forms: bonding (deepening and strengthening the existing network connections) and bridging (establishing links with new, more distant actors). Contrary to the mainstream research, authors suggest that both of these forms of

№	Author	Article title	Year	Journal	Summary
	L.T., Hallén L.				social capital may have both positive and negative effects on cluster innovativeness. Furthermore, they suggest that pre-existing conditions, such as regional culture, can influence the effect of social capital on cluster innovativeness. Conducting a case study of a cluster in a region with a dependence-oriented culture they demonstrate that the outcomes of cluster innovativeness were shaped by the pre-existing forms of social capital.
17	Eklinder-Frick J., Eriksson L.T., Hallén L.	Multidimensional social capital as a boost or a bar to innovativeness	2014	Industrial Marketing Management	The article suggests that social capital as a key driver of cluster innovativeness and should be analysed along three dimensions to uncover potential impediments to innovation: actor-oriented, structural and socio-economic. Furthermore, authors suggest that pre-existing conditions, such as regional culture, can influence the effect of social capital on cluster innovativeness.
18	Forest J.	La production de connaissances a l'ère des pôles de compétitivité	2010	Innovations	The authors suggest that innovation is not only the result of knowledge exchange or dissemination, but also of knowledge creation. They identify three pre-requisites for knowledge creation in clusters: access to a variety of knowledge and human resources with expertise corresponding to their needs as well as the ability to identify problems.
19	Fromhold-Eisebith M., Eisebith G.	How to institutionalize innovative clusters? Comparing explicit top-down and implicit bottom-up approaches	2005	Research Policy	The article proposes to differentiate between explicit top-down and implicit bottom-up cluster initiatives. The former are driven and financed by the public sector actors and the latter by the private sector. The authors suggest that these institutional modes will have different effects on cluster innovativeness. The study finds that explicit top-down cluster initiatives may have more noticeable impacts in terms of the clusters material base while the implicit bottom-up approaches are stronger in creating immaterial resource base in terms of social capital, stronger motivation, resulting in innovation.
20	Gebhardt C.	The making of plasma medicine. Strategy driven clusters and the emerging roles of cluster management and government supervision	2013	Journal of Technology Transfer	The author discusses the development of a plasma medicine cluster funded through a federal government innovation support programme. She finds that a transformation from a loosely-connected scientific network to a strategy-driven cluster is necessary when a multitude of stakeholders is involved. She identified a range of success factors for such a transformation, notably: quality and

№	Author	Article title	Year	Journal	Summary
					relevance of information, feasibility and transparency of cluster strategy, general management know-how, expert knowledge in the relevant scientific fields, international visibility, access to R&D funding, identification of cluster members with cluster strategy, entrepreneurial culture, trust, delivering of project results, etc.
21	Gebhardt C., Pohlmann M.C.	Managing the organisation 2.0: Entrepreneurial spirit and general management competences as early indicators for cluster success and sustainable regional development: Findings from the German Entrepreneurial Regions Programme	2013	Journal of High Technology Management Research	The authors analyse the competencies needed of cluster managers in order to drive cluster innovativeness. They identify three existing profiles of cluster managers in German clusters participants of the Entrepreneurial Regions Programme: academics, regional networkers and entrepreneurs. The authors suggest that only the 'entrepreneur' cluster managers have the necessary competencies to drive the competitiveness and sustainable development of cluster and regions.
22	Giest S.	Network capacity-building in high-tech sectors: Opening the black box of cluster facilitation policy	2015	Public Administration	The article discussed the models of cluster facilitation in life-science clusters in three countries with innovation-driven economies (USA, Denmark/Sweden and Singapore). The author finds that different levels of government involvement in cluster facilitation result in different types and levels of engagement of the facilitators with cluster members. The author suggests that absorptive- and collaborative-capacity building activities are crucial for innovation and discusses the success of cluster facilitation with respect to the development of these types of capabilities in cluster members. The author finds that the government involvement may be an impediment in countries where the level of private actors to public bodies is low. However, cluster facilitators can only be successful if they are able to gain legitimacy and trust of the three major parties: industry, government and academia.
23	Gretzinger S., Royer S.	Relational resources in value adding webs: The case	2014	European Management Journal	The article examines the role of social capital in value creation in 3 Danish clusters. It finds that the governance structures providing a framework for interactions within the cluster and social capital-building need to balance formal

№	Author	Article title	Year	Journal	Summary
		of a Southern Danish firm cluster			and informal mechanisms to be successful. Over-reliance on informal governance mechanisms results in informal contacts which are not necessarily seen as business development opportunities. More formal and goal-oriented structure could facilitate the attraction of new members, the establishment of partnerships with other clusters and obtaining financial support from the government.
24	Günther J., Meissner D.	Clusters as Innovative Melting Pots?—the Meaning of Cluster Management for Knowledge Diffusion in Clusters	2017	Journal of the Knowledge Economy	The authors provide an overview of the importance of knowledge spill overs for cluster innovativeness and highlight the role of cluster managers in the promotion of knowledge sharing. They note that the contextual factors, the regional resources and actors' capabilities play a key role in the approaches to cluster management and innovation facilitation and call for further research in this respect.
25	Huang C., Wang Y.	Evolution of network relations, enterprise learning, and cluster innovation networks: the case of the Yuyao plastics industry cluster	2018	Technology Analysis and Strategic Management	The paper discusses the influence of relational embeddedness on cluster innovativeness. The study found that evolutionary dynamics of the cluster and the needs and capabilities of the cluster members at each stage of cluster development should be taken into account in the process of management of cluster innovation networks and promoting cluster learning.
26	Isaksen A.	Clusters, innovation and the local learning paradox	2007	International Journal of Entrepreneurship and Innovation Management	The article examines the mechanisms and institutions through which the learning and knowledge sharing occurs in Horten electronics cluster, which of these are locally rooted and which draw on national and global connections. The author highlights 6 implications of the study: (1) the importance of intra-company learning for cluster innovativeness, (2) the balance between formal governance (contracts) and informal trust-based relations in the cluster, (3) the growth of importance of the regional resources over time and their development, (4) the importance of the national innovation system actors for the local cluster development (which is particular for the case of Norway), (5) the importance of globalization and extra-regional links for cluster firms which allows to access markets and external knowledge, and (6) the importance of the context and

№	Author	Article title	Year	Journal	Summary
					historical developments for understanding of local learning and innovation patterns.
27	Jankowska B., Gotz M., Głowka C.	Intra-cluster cooperation enhancing SMEs' competitiveness - The role of cluster organisations in Poland	2017	Investigaciones Regionales	The authors discuss the benefits of intra-cluster collaboration for SMEs' innovativeness and efficiency. By conducting multiple case studies, the authors find that intra-cluster collaboration helps reduce the disadvantages related to the 'liability of smallness'. The authors find that cluster organisations can contribute to SMEs innovativeness by regularly conducting innovation audits to determine their capabilities and needs and designing support measures accordingly.
28	Kim N., Shim C.	Social capital, knowledge sharing and innovation of small- and medium-sized enterprises in a tourism cluster	2018	International Journal of Contemporary Hospitality Management	The article analyses the network relationships and social capital in a small firm tourism cluster in South Korea. The key findings on the article is the positive influence of cognitive social capital (shared visions and goals) on cluster knowledge sharing, innovation, and finally performance.
29	Klofsten M., Bienkowska D., Laur I., Sölvell I.	Success Factors in Cluster Initiative Management: Mapping Out the 'Big Five'	2015	Industry and Higher Education	The authors focus on cluster initiatives as mechanisms driving cluster innovativeness. They identify five success factors of cluster initiatives: idea, activities, organisation, critical mass, driving force and commitment. Idea refers to a common goal offering the members a sense of community. Activities refer to the business development, networking and funding activities of a CI and need to recognise the differences in needs and capabilities of cluster members. Critical mass relates to the number of members considered optimal for a cluster, exchanges between them, variety of resources they offer. Organisation refers to the tasks performed by CIs, where the key ones are the transformation of ideas for cluster activities into concrete activities and securing funding for these. Driving force and commitment refers to the presence and empowerment of enthusiasts and visionary cluster actors who may not necessarily be employees of a cluster organization but representatives of other cluster actors.
30	Lefebvre P.	Organising deliberate innovation in knowledge clusters: From accidental	2013	International Journal of	The article discusses the approaches to stimulating the emergence of collaborative R&D projects in clusters. The author conducts case studies to identify the most commonly used tactics: broad cluster networking, permanent

№	Author	Article title	Year	Journal	Summary
		brokering to purposeful brokering processes		Technology Management	workgroups based on cluster's strategic themes and temporary groups based on emerging sub-themes. It has been found that the pre-existing R&D capacity and interests of participating cluster companies define the success of each of the tactics, although the last tactic (temporary working groups) has been found the most successful in the analysed clusters.
31	Leroux I., Muller P., Plottu B., Widehem C.	Innovation ouverte et évolution des business models dans les pôles de compétitivité: Le rôle des intermédiaires dans la création variétale végétale	2014	Revue d'Economie Industrielle	The article discusses the role of intermediaries in facilitating the transition of a cluster towards the open innovation model. The author suggests that intermediaries are successful if they understand the barriers to innovation faced by the cluster actors, if they can identify and bridge structural holes in the network and act as technological, institutional and political intermediaries. Moreover, legitimacy of an intermediary is an important factor determining the extent to which they will be able to play this role.
32	Matinheikki J., Pesonen T., Artto K., Peltokorpi A.	New value creation in business networks: The role of collective action in constructing system-level goals	2017	Industrial Marketing Management	The article suggests that the presence of a system-level goal in a network seen as a meta-organisation, is conducive to its collective innovativeness. The authors suggest that not only do system-level goals contribute to collective value creation, but these are also perceived as valuable by individual network members motivating them to commit more resources to collective actions. This, in turn, improves collective innovation outcomes. The authors also suggest that the system-level goal requires that multiple network members participate in the collective goal formation efforts.
33	Mendel K., Bardet M.	Which governance for SMEs' competitive clusters? [Quelle gouvernance pour les pôles de compétitivité constitués de PME]	2008	Revue Francaise de Gestion	The authors discuss the approaches to the governance of clusters dominated by SMEs. They suggest that leadership is an important factor and the presence of an entrepreneurial actor, who has legitimacy and trust of other cluster members can gather cluster members with diverging interests and be a driving force for cluster collaboration. Moreover, the authors suggest that KPIs of cluster innovativeness should be context-specific and take into account the lack of R&D capabilities of SMEs. They suggest that a broader understanding of innovation is necessary for SME clusters.

№	Author	Article title	Year	Journal	Summary
34	Messeni Petruzzelli A., Albino V., Carbonara N.	External knowledge sources and proximity	2009	Journal of Knowledge Management	The authors suggest that external knowledge constitutes one of the key drivers of cluster innovativeness and discuss three types of proximity as mechanisms for knowledge sourcing: geographical, cognitive and organisational. They suggest that organisational proximity (e.g. joint ventures, mergers and acquisitions etc) are used to access external knowledge sources that are geographically proximate, while cognitive proximity (e.g. common knowledge base of actors) is used to access more geographically distant knowledge sources.
35	Morgulis-Yakushev S., Sölvell Ö.	Enhancing dynamism in clusters: A model for evaluating cluster organizations' bridge-building activities across cluster gaps	2017	Competitiveness Review	The authors develop a conceptual model for the assessment of cluster organisations' bridge-building activities. Acknowledging the important differences which may exist between clusters based on their development stage, sector and long- and short-term goals, the authors suggest that bridging activities can be seen across 7 'gaps' , their importance for cluster performance will vary from case to case. Specifically, they differentiate between firm-to-firm, firm-to-research, firm-to-education, firm-to-capital, firm-to-public bodies, firm-to-other clusters, firm-to-global 'gaps'. They develop a model to evaluate cluster organisations' bridging efforts for each of these gaps based on their performance and the importance of each of these 'gaps' for cluster performance.
36	O'Dwyer M., O'Malley L., Murphy S., McNally R.C.	Insights into the creation of a successful mne innovation cluster	2015	Competitiveness Review	The article outlines the process of creation of an innovation-driven cluster in the pharma industry in Ireland. The key drivers for the actors have been the university and the industry after the realisation that the competitive advantage based on low-cost labour is being lost and the need for a new basis for competitive advantage has been voiced. The driving force for industry-university knowledge-sharing and learning has been the desire to contribute to the development of the knowledge economy in Ireland and retain the MNE activities which were increasingly threatened by low-cost production potential of China and India. The major finding of the article is that the innovative potential of the industry can be mobilised if a 'common denominator', or the motivation, is found for a group of companies, moreover, the realisation of the urgency of the problem is necessary in order to break the pre-existing institutions

№	Author	Article title	Year	Journal	Summary
					(in this case, fear of the competitor companies and the absence of communication whatsoever).
37	Parto S.	Innovation and economic activity: An institutional analysis of the role of clusters in industrializing economies	2008	Journal of Economic Issues	The author focuses on the influence of the institutional environment and the ability of cluster governance to stimulate cluster innovativeness in unsupportive environments. Distinguishing between different scales (national, regional, global) and types (formal and informal) of institutions, the authors describe the development of two clusters in South Africa and Egypt. They find that clusters indeed may play a role of catalysts for the formation of new institutional landscapes.
38	Renko M., Carsrud A., Brännbac k M., Jalkanen J.	Building market orientation in biotechnology SMEs: Balancing scientific advances	2005	International Journal of Biotechnolog y	The authors distinguish between two sources of innovativeness of biotechnology firms: science orientation (science/technology push) and market orientation (market pull). Conducting an action research project in a Finnish pharmaceutical cluster mainly composed of biotechnology SMEs, they discover insufficient market orientation in the cluster and develop a set of recommendations for the management. Specifically, making the most of the connections with universities, industry associations and opinion leaders as well as improving the awareness of the dual role of CEOs including both business development and gathering market intelligence.
39	Scott S., Hughes M., Kraus S.	Developing relationships in innovation clusters	2019	Entrepreneurs hip and Regional Development	The article analyses the influence of dyad relationships in a regional cluster as well as the external linkages on cluster innovativeness and development. The authors conduct a case study of a successful innovative cluster and, specifically, a university-industry partnership. They find that the readiness and willingness of the university to engage with industrial partners and the ability of both partners to 'speak the same language' and to find the ways to create win-win collaborations was one of the key factors. Furthermore, the internally authorised autonomy and support of the peripheral agents were crucial for the boundary-spanning actors which enabled these to both connects actors internally and externally. Appropriate multi-level formal governance mechanisms also played an important enabling role for the creation of collaborative projects.

№	Author	Article title	Year	Journal	Summary
40	Sellitto C., Burgess S.	A government-funded internet portal as a promoter of regional cluster relationships: A case study from the Australian wine industry	2005	Environment and Planning C: Government and Policy	The authors discuss the role of an online platform in driving cluster innovativeness. Describing a case study of Gippsland Wine Cluster, they found that the introductions of an online (government funded) portal helped bring together competing small businesses and contributed to the development of joint projects. Moreover, the portal contributed to resources sharing, trust building and the creation of untraded interdependencies.
41	Viljamaa K.	Technological and cultural challenges in local innovation support activities - Emerging knowledge interactions in charlotte's motor sport cluster	2007	European Planning Studies	The article discusses the development of the knowledge exchange between the motor sport industry and the academia. This development was shaped by the sectoral development as well as the regional cultural specifics. Notably, with the increase of technological sophistication the need for more applied research has increased as well and provided more opportunities for specialised education programmes at the university. At the same time, the closed 'old boys'-type network and the extreme secrecy inhibited the ability of the cluster to engage with the external knowledge institutions for their development.
42	Wannenmacher D., Antoine A.	Management of innovative collaborative projects: Moments of tension and the Peer-Mediation Process - A case-study approach	2016	Knowledge Management Research and Practice	The authors analyse interactions and knowledge flows in a French cluster to uncover barriers to these. They find that due to the large variety of actors involved in the cluster project, conflicts inevitably arise further to misunderstandings, and divergence of actors' goals and motivations. However, they see conflicts as a necessary and even positive element in knowledge generation and, thus, innovation, if these are mediated. Thus, the role of peer mediators is highlighted in the collaborative innovation projects.
43	Wei J., Zhou M., Greeven M., Qu H.	Economic governance, dual networks and innovative learning in five Chinese industrial clusters	2016	Asia Pacific Journal of Management	The study of 5 manufacturing clusters in China focused on 4 types of governance mechanisms: local regulations, community norms, associational autonomy and economic hierarchy and their influence on the extra-local linkages of the cluster firms. The study built on the premise that the extra-local linkages of a cluster are more conducive to exploratory than to exploitative learning, and thus are more conducive to radical, than incremental innovation. The authors found that the strengthening of the local regulations, associational autonomy and economic hierarchy and the weakening of community norms leads to the increase in the

№	Author	Article title	Year	Journal	Summary
					number of extra-local connections and is more conducive to exploratory learning.
44	Yström A., Aspenberg H.	Open for innovation? Practices supporting collaboration in Swedish regional clusters	2017	International Journal of Innovation Management	The article analyses the ways collaboration is facilitated in organised clusters (cluster initiatives). Collaboration is seen as the key driver of innovation. The latter is seen broadly, and the studied clusters operate in a variety of sectors, from low- to high-tech. The authors find that two cluster management practices supporting collaboration can be distinguished: orchestrating and narrating. These are not mutually exclusive, but complementary. Orchestrating activities imply enabling members to collaborate through forging relationships, facilitating projects and offering a forum for sharing knowledge. Narrating activities involve story-telling and agenda-setting. One of the key findings of the paper is that narrating activities, often overlooked, are crucial for creating a shared image, goals and motivations, thus enabling collaboration.
45	Zettinig P., Vincze Z.	How clusters evolve	2012	Competitiveness Review	Viewing innovation as a major source of sustainable cluster development, authors discuss the process of cluster evolution form this standpoint. They suggest that long-term innovation-driven cluster development depends on the processes of exploitation of existing opportunities and knowledge and the exploration of new ones. The most important process, however, is the balancing of exploitation and exploration activities and is a requirement for the long-term survival of a cluster and a necessary condition for its success.
46	Zhong Q., Tang T.	Impact of Government Intervention on Industrial Cluster Innovation Network in Developing Countries	2018	Emerging Markets Finance and Trade	The authors discuss the effects of government intervention on innovation in clusters. They find that the effect differs at different stages of cluster evolution. At emergence (formation) and development (stabilisation) stages the interventions of the government should be moderate with a view to keep a short distance and close contact between cooperating parties, stimulating knowledge flow and technology transfer. At the maturity phase the government interventions should be minimal and should focus on encouraging enterprise innovation and reducing the risks of the whole network.

Annex 4 – Literature coding matrix

Framework dimension	Framework elements	Codes
Contexts	Cluster's contextual settings	$C_{1...n}$
Business model elements	Actors and their roles	BM_1
	Resources and capabilities	BM_2
	Value flows	BM_3
	Governance	BM_4
	Value propositions	BM_5
	Value-creating activities	BM_6
Generative mechanisms	Key success factors of cluster innovativeness	$GM_{1...n}$
Outcomes	Cluster innovative outcome	$O_{1...n}$

Annex 5 – Case study protocol

Research project overview

The empirical research conducted in the framework of this thesis is based on the case study method. It aims at elaborating on the theoretical knowledge in the field of clusters by extending the framework of business model and meta-organisations to the context of clusters.

An additional goal for the empirical research is to provide value to participant clusters to ensure their willingness to participate in the research. This is to be achieved by drafting reports evaluating the cluster business model design and its orientation towards fostering innovation in cluster members. This evaluation is to be based on the 'innovation-centric cluster business model' framework.

The section below describes in brief the theoretical frameworks in which the empirical research is grounded.

Cluster business model design framework

The concept of a "cluster business model" can be described as a set of *value co-creating activities* of cluster actors for generation of value propositions and *capturing the value* generated. Thus, six cluster business model elements have been identified: actors and their roles, resources and capabilities, value flows, governance, value propositions and value-creating activities. Working together, the key actors distribute roles according to the power relations in the cluster, they make available to each other a pool of resources and capabilities making the cluster a unique system which is larger than the sum of its parts. By exchanging value – both tangible and intangible – they create and shape the unique external and internal value propositions targeted, respectively, at external stakeholders – such as national and regional governments – and the internal ones, i.e. the cluster members. Figure 1 describes the cluster business model framework.

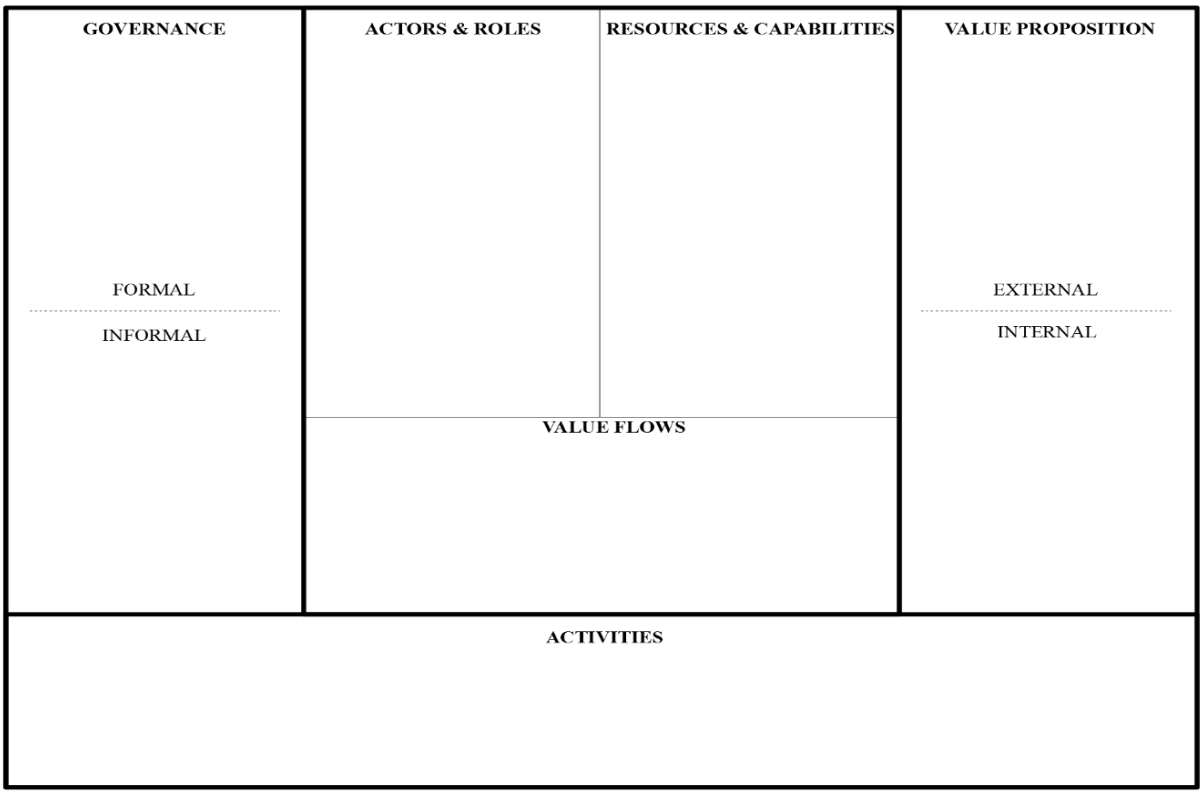

Figure 1: Cluster business model

In order to apply the business model framework in practice, the following four activities have been identified through a literature review:

1. Analysis of the cluster goals and KPIs and their re-shaping where appropriate.
2. Conducting an analysis of the external (institutional setting, innovation system, industry and culture) and internal (life-cycle stage) contextual elements of a cluster.
3. Analysis of the current cluster business model. This implies mapping and analysing the elements, interrelationships and underlying processes of an existing business model.
4. Identification of the potential areas for improvement with respect to cluster business model elements. Refinement of the cluster business model based on the "deconstruction" exercise by implementing a set of interventions shaping each of the elements of the cluster business model in order to achieve the cluster's performance goals.

Figure 2 visualises the business model and the method for its application in practice.

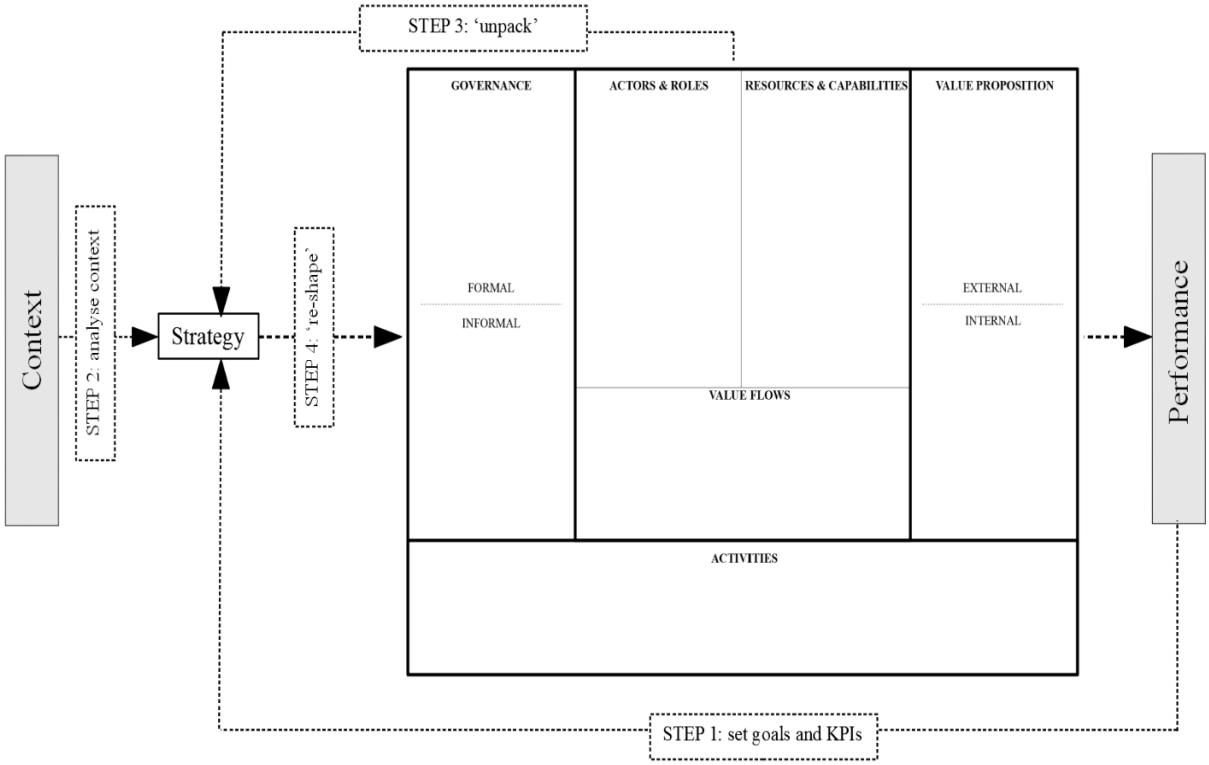

Figure 2: Cluster business model

Innovation-centric cluster business model design

In the framework of this doctoral research a literature review was carried out to identify the interventions for an innovation-centric design of a cluster business model. While this empirical work does not aim to test these propositions, these are to be used in order to provide more value to the participants of the empirical studies. Specifically, the following set of innovation-stimulating interventions based on the literature review is to be used to evaluate the innovation-centric design of the participant clusters' business models and to provide recommendations for their improvement:

I_1: Ensuring the participation of various competent cluster actors in cluster management

I_2: Identifying actors playing the roles of facilitators, sponsors and/or stakeholders and visionaries

I_3: Ensuring that cluster facilitators have a high level of network competence, legitimacy and understanding of actors needs

I_4: Strengthening the cluster facilitation role in the coordinated market economies

I_5: Ensuring a balanced representation of stakeholders, both internal and external

I_6: Ensuring the support of sponsors and/or stakeholders at early cluster life-cycle stages

I_7: Ensuring that the goals and values promoted by visionaries support the innovation and knowledge-creation orientations

I_8: Strengthening and supporting the visionaries at the early cluster life-cycle stages

I_9: Ensuring the balanced development of both tangible and intangible resources

I_{10}: Leveraging the enablers and alleviating the impediments of the pre-existing social capital

I_{11}: Ensuring the development of capabilities for knowledge generation, sharing and utilisation

I_{12}: Ensuring the development of both technology and market orientation in high-tech clusters and focusing on market orientation in low-tech fields

I_{13}: Ensuring the moderate similarity of actors' resources and capabilities

I_{14}: Ensuring the awareness of the cluster members of the variety and value of the available resources and capabilities in the cluster

I_{15}: Ensuring that cluster actors are willing to engage in firm-to-firm interactions and share both tangible and intangible resources

I_{16}: Focusing on maintaining firm-to-firm connectivity and knowledge flows in mature clusters and those relying on the 'synthetic' knowledge base

I_{17}: Ensuring firm-to-(fundamental) research connectivity for clusters operating in sectors drawing on 'analytic' knowledge bases

I_{18}: Ensuring firm-to-(applied) research connectivity for clusters operating in sectors drawing on 'synthetic' knowledge bases

I_{19}: Ensuring and strengthening firm-to-research and firm-to-education connections at the formation and 'transformation' cluster life-cycle stages

I_{20}: Distinguishing between low- and high-value-added foreign direct investments and focusing on the latter

I_{21}: Establishing external links with cognitively, organisationally, or institutionally proximate actors

I_{22}: Establishing external connections with the major sources of innovation in the sector

I_{23}: Establishing external connections allowing to compensate for the lack of regional or national resource endowment

I_{24}: Establishing virtual platforms facilitating knowledge flows

I_{25}: Balancing ties allowing the exploitation of the available opportunities and the exploration of new ones

I_{26}: Balancing formal and informal governance mechanisms

I_{27}: Ensuring the governance mechanisms provide a 'safe environment' for clusters operating in unsupportive contexts

I_{28}: Ensuring the connectedness and transparent communication between public and private sector cluster actors

I_{29}: Ensuring the participation and commitment of different cluster actors in its governance

I_{30}: Establishing adaptive and 'porous' governance arrangements facilitating the absorption of new knowledge

I_{31}: Establishing multi-level governance arrangements

I_{32}: Clearly defining a viable external value proposition based on a real market need

I_{33}: Aligning the external goals with the motivations, capabilities and goals of individual members

I_{34}: Identifying with broader national or regional development priorities

I_{35}: Engaging in five innovation-related activities: the orchestration of knowledge capabilities, ongoing strategizing, developing public policy, theorising innovation and resource generation

I_{36}: Focusing on the 'generative' activities in high-technology clusters

I_{37}: Orchestrating knowledge capabilities with respect to the knowledge bases and innovation modes of cluster actors

I_{38}: Focusing on public policy development activities in medium-technology clusters

I_{39}: Focusing on 'theorising innovation' activities for agenda-setting and brand-building at the formation and 'transformation' stages of cluster development

Clusters as deliberate actors

The meta-organisational perspective on clusters adopted in this research project raises important questions about their intentionality and 'actorhood'. Indeed, seeing clusters as 'organisations of organisations' implies that these can deliberately act, just as individual organisations. Recent research in the field of organisation studies suggests that organisations may display different levels of 'organisationality' depending on the extent to which the attributes of formal organisations are present. This empirical research aims at expanding this research into the levels of 'organisationality' and analysing whether clusters' 'actorhood' is mediated by the extent to which the attributes of formal organisations are present in these.

Moreover, viewing clusters as intentional actors capable of interaction with their environments, suggests that these can adopt deliberate strategies in response to environmental pressures. Thus, clusters can be seen as change agents or institutional entrepreneurs in unsupportive institutional settings. Transition economies represent such an 'unsupportive' environment due to the lack of formal institutions governing the relations between the actors of the innovation process or by presenting them with conflicting institutional logics. This research thus aims at extending the current understanding of clusters' 'actorhood' by examining their strategic responses to institutional pressures.

Research aims

This empirical study aims at (a) extending the meta-organisational theory to the cluster context by exploring clusters' agency and (b) extending the busines model framework to the cluster context.

The first aim of this research is to extend the application of the meta-organisational theory to clusters, and, specifically, to explore the capability of clusters to deliberately act upon their environments. To do so, two research questions have been formulated to guide the case studies:

- How does the level of cluster 'organisationality' mediate its ability to act upon its environment?
- How do clusters engage in institutional entrepreneurship in transition economies to alleviate institutional barriers to innovation?

The second aim of this empirical research is to extend the business model framework to the cluster concept by evaluating the extent to which the framework developed through a literature review reflects the processes of value creation in a cluster. Specifically, it aims at evaluating whether the developed 'artefacts' (constructs, models and methods) meet the pre-defined design requirements. The following additional questions have been thus formulated to be integrated in the case studies:

- Are the constructs and the model able to reflect the full spectrum of attributes and their relationships describing the value creation in the cluster context?
- Is the method applicable to clusters in different contextual settings at the same time allowing to account for differences stemming from these?

Thus, the case studies aim at extending the existing theories in three ways:

- Extending the application of the current research into the levels of 'organisationality' to the cluster context;
- Extending the application of the neo-institutional theories (specifically those on institutional work, institutional entrepreneurship and institutional strategies) to the cluster context.
- Extending the business model research to the cluster context.

Research design

Due to the focus of the case studies on the extension of the existing theories, and the lack of current research which would allow to adopt a deductive approach and test hypotheses, an inductive stance is to be taken. Specifically, in this research project a qualitative theory-elaborating multiple-case study method is to be applied. Clusters are to be the primary subject of the empirical research.

Although some researchers, adopting a more positivist perspective, focus on a specific number of cases which is needed to ensure the internal validity of a study (e.g. Eisenhardt 1989), this research adheres to a critical realist view proposed by Easton (1995) who advocates not for the breadth of research, but for its depth. Specifically, this means that the aim will not be the statistical generalisation, but analytical one. In other words, this research aims to be generalisable to theoretical propositions, and not to entire populations (Easton 1995). This approach will ensure the generalisability of the research findings and the potential of their practical application in various settings, i.e. it will ensure the external validity of the study (Yin 2008).

Design requirements

The nature of the research questions places certain requirements as to the design of the case studies. Specifically, it should take into account the dual aim of the empirical research: exploring clusters' agency (through their organisationality and their application of and extending the business model framework to the cluster context. To ensure the ability of the case studies to provide answers to the research questions, the following requirements have been formulated:

1. To analyse the mediating effect of a cluster's 'organisationality' level on its ability to act upon its context, it is necessary to ensure the variability in clusters' levels of 'organisationality'. Specifically, it is necessary to select clusters displaying different combinations of the following attributes of formal organisations: membership, hierarchy, rules, monitoring and sanctions.
2. To analyse the institutional strategies adopted by clusters in contexts presenting barriers to innovation, it is necessary to select clusters in settings displaying a range of institutional pressures and contradictions.
3. To ensure that different facets of value creation in cluster context are covered, representatives of different cluster communities are to be involved in the research project (i.e. academia, private sector and public sector where applicable).
4. As the level of actor involvement, priorities, responsibilities and relations between cluster actors may vary significantly between the top-down and bottom-up driven clusters, case studies are to be performed in clusters displaying different levels of public vs. private sector actors involvement (i.e. top-down or bottom-up institutional modes).
5. The dominant sectors of activity shape the priorities of the clusters, the types of actors that are involved and the relations which are crucial for value creation. Thus, to ensure that the business model concept can be applicable to different configurations of clusters depending on their sector of activity, the variability in the latter is to be ensured for the case studies.
6. To ensure the applicability in different contexts and the ability to account for contextual specifics, clusters located in different environments are to be selected. Specifically, variability is to be ensured with respect to national and regional contexts.

Cluster selection criteria

The general and operational criteria for the selection of the subjects of the case studies have been formulated (see Table 1 for an overview).

The operational criteria are set based on the discussion above in order to meet the case study requirements. The general criteria for cluster selection are established following the framework developed by Miles *et al.* (2014), and are based on such elements as relevance of the cases to the conceptual framework and research questions, potential for enhancing the generalisability of findings, potential for production of believable explanations, and feasibility (in terms of time, finance, access).

Table 1: General and operational criteria for cluster selection

	Operationalisation	**Desired characteristics**
General criteria		
Relevance	Capacity of the case to provide fruitful ground for the study of the theoretical concepts	High capacity for the testing of the theoretical framework, relevance of the innovation-centric design for the cluster community, presence of cluster management practices and collective decision-making mechanisms
Potential for knowledge production	Availability of documents and willingness of cluster managers and members to participate in the research project	High willingness of the representatives of different cluster communities (specialised cluster organisations, cluster businesses, academia and government where applicable) to participate in the study
Feasibility	Geographical proximity and ease of physical access	Relatively geographically proximate and easily accessible cases will be considered in priority provided that they also meet other general and operational criteria.
Operational criteria		
Organisationality levels	Presence of the attributes of formal organisations: hierarchy, membership, rules, monitoring and sanctions	Clusters displaying different combinations of the five attributes of formal organisations
Contextual variability	Differences in contextual settings across the following dimensions: - National - Regional - Sectoral - Institutional modes	Clusters based in a developed country (Australia) and a transition economy (Russia) Clusters located in natural-resource rich and natural-resource poor environments Clusters operating in industries with varying levels of importance of science and R&D for innovation Clusters with varying levels of involvement of the government
Elements of cluster value creation	Ability of the case study clusters to provide information regarding all the elements of value creation: actors and roles, resources and capabilities, value flows, value propositions and governance.	Ability of the representatives of different cluster communities to participate in the interviews (academia, business, public officials if applicable) in order to account for all aspects of value creation

Cluster selection procedure

In order to select clusters corresponding to these general and operational criteria, the following 3-step procedure has been designed:

Step 1: Analyse the data on all 'organised' clusters in both countries. This may involve either accessing openly available data or requesting access to cluster databases by contacting relevant cluster-related bodies, such as TCI (The Competitiveness Institute). This step is to result in an initial selection of clusters based on their potential ability to meet the general and operational criteria.

Step 2: Refine the initial selection of clusters by seeking additional information from the local industry experts, consultants and academics in the cluster field. This step is to complement the information obtained from the database analysis and is to result in a short list of candidate clusters for field tests and case studies.

Step 3: Make initial contact with cluster representatives in order to come up with a final list of clusters that are to participate in the field tests and case studies.

Field procedures description

- Each interviewee is to be contacted individually by e-mail or phone to arrange a face-to-face meeting where possible.
- Before each interview, the interviewees are to be informed about the scope and the aims of the study as well as the procedures in place to guarantee the privacy of the collected data.
- The permission to record the interviews is to be asked for before the start of the interview.
- Hard copies of the documents provided by interviewees will be copied (where possible) and/or their key points will be summarised in the electronic case study database.

Data collection and analysis protocol

In order to ensure construct validity of the study, multiple sources of data will be used for the research such as interviews, observations and documentation, which will allow for the methodological triangulation (Stake 1995; Yin 2008). Table 3 describes the primary and secondary data sources for the field tests and case studies.

Table 2: Data sources for the case studies

Empirical study	**Primary data source**	**Secondary data source**	**Comment**
Case studies on cluster business model	Interviews, documents	Observations	The interviews and documents (such as strategic plans and other strategy-related documentation) will provide the key inputs for the case studies while observations will serve as an additional date source
Case studies on cluster 'organisationality'	Interviews, observations	Documents	The interviews will serve as the main sources of data, as well as the observations gathered during the workshops, internal meetings and strategy sessions attended by the researcher. Additionally, documentation will allow to complement this data and triangulate the findings
Case studies on cluster institutional strategies	Interviews, documents	Observations	To gather a deeper insight into the broader institutional settings, both interviews and documents will be considered primary data sources. The latter are to include policy documents, industry reports and regional development reports allowing to understand the institutional settings. Observations gathered at various events will constitute a complementary source of data.

Interviewees are to be identified using the 'snowball' method. The interviewees are to represent the following key groups of cluster actors: cluster management (1-2 representatives); representatives of businesses (1-2 top-management level representatives of different categories of businesses where possible: large companies; SMEs and start-ups); research institutions or universities (1-2 representatives directly involved with cluster), support service providers/consultants where possible (2 representatives of different types of service providers). To ensure construct validity of the study, the transcripts of the interviews are to be submitted for review to the interviewees (Gibbert, Ruigrok, and Wicki 2008).

The data is to be recorded by audio-recording or note-taking depending on the context and the preferences of the interviewees. The interviews are to be carried out face-to-face or by telephone/internet. The recorded interviews are to be transcribed.

Within-case and cross-case analyses are to be performed based on a case-oriented approach, whereby each case is to be examined first individually and then compared to other cases to draw general conclusions (M. Miles, Huberman, and Sdana 2014). Data analysis is to be performed using NVivo software.

Given that the theory-elaborating approach is adopted for the case studies, the 'provisional coding' approach (M. Miles, Huberman, and Sdana 2014) is to be applied. This implies coding based on a set of pre-established codes and expanding the list of codes if new concepts emerge.

Case study database

In order to establish and maintain a clear chain of evidence and thus ensure construct validity of the study (Yin 2008), an electronic case study database is to be established and is to contain the following information:

- general case information (name of the cluster, address, date of establishment, number of members, field(s) of activity);
- original interview recordings (where available);
- copies of original documents (where available);
- interview transcripts and observation notes;
- circumstances under which the evidence was collected (time and place of the interviews, names and positions of the interviewees).

The complete data on the interviewees is to be stored in the database, however, privacy is to be ensured as for the personal details of the interviewees as well as the copies of the documents.

Coding matrices

Three matrices have been developed to guide the interviews conducted in the framework of the case studies:

- an observations coding matrix – based on the approach proposed by (M. Miles, Huberman, and Sdana 2014; Lamb 2016) - will follow the 'analytical memoing' procedure to systematise and analyse the memos produced during the research process and complementing the interviews.
- a categorisation matrix – based on the approach proposed by Elo and Kyngäs (2008). The matrix establishes a relationship between the developed theoretical propositions regarding cluster business model elements, interview topics and their codes ($I_1 \ldots I_n$).
- an interview matrix – based on the approach proposed by N. King (2004). The matrix establishes the link between the theoretical framework, interview elements and the categorisation matrix codes. For each of the interview elements a set of interview topics is proposed ($I_1T_1 \ldots I_nT_n$).

The following sections describe each of these elements of our data collection protocol in further detail.

Observations coding matrix

Observations made during the interviews will be written down in the form of a research diary after each interview and then categorised and coded following the "analytical memoing" procedure (M. Miles, Huberman, and Sdana 2014; Lamb 2016). The codes to be used are presented in Table 4.

Table 3: Analytical memo coding

Observation/visual data memos	**Codes**
Degree of support of the design artefacts • low • medium • strong • neutral • contradictory	 LOWSP MEDSP STRSP NTRSP CONTRSP
Emergent notions (patterns, categories, themes, concepts, and assertions)	EMNOT
Different interpretation of an interviewee's reply	DIFINT

Related theories	RLTDTH
Connections with other concepts	CNTCON
Correspondence between numerous data elements	CORES
Elaboration on or clarification of observed or communicated facts	CLARF

Categorisation matrix

The aim of the categorisation matrix (Table 5) is to establish a relationship between the business model elements, interventions for their innovation-centric design, interview topics and their codes. The matrix is separated into seven sub-sections: six focusing on the cluster business model elements and one – on the contextual settings. Some of the interventions for innovation-centric cluster design are context-specific and may not be applicable to all studied clusters. These are marked in the categorisation matrix.

Table 4: Categorisation matrix

Business model elements and design propositions	**Interview topic**	**Code**	**Sub-code**
Actors		**BM_1**	
Ensuring the participation of various competent cluster actors in cluster management	Actor participation		I_1
Identifying actors playing the roles of facilitators, sponsors and/or stakeholders and visionaries	Cluster role distribution		I_2
Ensuring that cluster facilitators have a high level of network competence, legitimacy and understanding of actors needs	Cluster facilitators competencies		I_3
Strengthening the cluster facilitation role in the coordinated market economies	Cluster facilitation intensity		I_4
Ensuring a balanced representation of stakeholders, both internal and external	Stakeholder representation		I_5
CONTEXT SPECIFIC: Ensuring the support of sponsors and/or stakeholders at early cluster life-cycle stages	Sponsor/stakeholder support		I_6 (CONT)
Ensuring that the goals and values promoted by visionaries support the innovation and knowledge-creation orientations	Visionaries' values		I_7
CONTEXT SPECIFIC: Strengthening and supporting the visionaries at the early cluster life-cycle stages	Visionaries' support		I_8 (CONT)
Resources and capabilities		**BM_2**	
Ensuring the balanced development of both tangible and intangible resources	Tangible and intangible resource development		I_9
Leveraging the enablers and alleviating the impediments of the pre-existing social capital	Pre-existing social capital		I_{10}
Ensuring the development of capabilities for knowledge generation, sharing and utilisation	Knowledge capability development		I_{11}

Ensuring the development of both technology and market orientation in high-tech clusters and focusing on market orientation in low-tech fields	Technology- and market-orientation		I_{12}
Ensuring the moderate similarity of actors' resources and capabilities	Similarity of resources and capabilities		I_{13}
Ensuring the awareness of the cluster members of the variety and value of the available resources and capabilities in the cluster	Resources and capabilities awareness		I_{14}
Value flows		**BM_3**	
Ensuring that cluster actors are willing to engage in firm-to-firm interactions and share both tangible and intangible resources	Firm-to-firm interaction		I_{15}
CONTEXT SPECIFIC: Focusing on maintaining firm-to-firm connectivity and knowledge flows in mature clusters and those relying on the 'synthetic' knowledge base	Firm-to-firm connectivity focus		I_{16} (CONT)
CONTEXT SPECIFIC: Ensuring firm-to-(fundamental) research connectivity for clusters operating in sectors drawing on 'analytic' knowledge bases	Firm-to-fundamental research connectivity		I_{17} (CONT)
CONTEXT SPECIFIC: Ensuring firm-to-(applied) research connectivity for clusters operating in sectors drawing on 'synthetic' knowledge bases	Firm-to-(applied) research connectivity		I_{18} (CONT)
CONTEXT SPECIFIC: Ensuring and strengthening firm-to-research and firm-to-education connections at the formation and 'transformation' cluster life-cycle stages	Firm-to-research and firm-to-education connectivity		I_{19} (CONT)
Distinguishing between low- and high-value-added foreign direct investments and focusing on the latter	FDI value added		I_{20}
Establishing external links with cognitively, organisationally or institutionally proximate actors	External links with proximate actors		I_{21}
Establishing external connections with the major sources of innovation in the sector	External links with innovation sources		I_{22}
Establishing external connections allowing to compensate for the lack of regional or national resource endowment	External 'compensatory' links		I_{23}
Establishing virtual platforms facilitating knowledge flows	Virtual platforms		I_{24}
Balancing ties allowing the exploitation of the available opportunities and the exploration of new ones	Exploration and exploitation ties		I_{25}
Governance		**BM_4**	
Balancing formal and informal governance mechanisms	Formal and informal governance		I_{26}

CONTEXT SPECIFIC: Ensuring the governance mechanisms provide a 'safe environment' for clusters operating in unsupportive contexts	Governance for a 'safe environment'		I_{27} (CONT)
Ensuring the connectedness and transparent communication between public and private sector cluster actors	Public-private interactions		I_{28}
Ensuring the participation and commitment of different cluster actors in its governance	Governance participation		I_{29}
Establishing adaptive and 'porous' governance arrangements facilitating the absorption of new knowledge	Governance for knowledge absorption		I_{30}
Establishing multi-level governance arrangements	Multi-level governance		I_{31}
Value propositions		**BM_5**	
Clearly defining a viable external value proposition based on a real market need	External value proposition		I_{32}
Aligning the external goals with the motivations, capabilities and goals of individual members	External-internal goal alignment		I_{33}
Identifying with broader national or regional development priorities	National/regional priority alignment		I_{34}
Value-creating activities		**BM_6**	
Engaging in five innovation-related activities: the orchestration of knowledge capabilities, ongoing strategizing, developing public policy, theorising innovation and resource generation	Innovation-related activities		I_{35}
CONTEXT SPECIFIC: Focusing on the 'generative' activities in high-technology clusters	Generative activities		I_{36} (CONT)
Orchestrating knowledge capabilities with respect to the knowledge bases and innovation modes of cluster actors	Alignment of activities with actors' needs		I_{37}
CONTEXT SPECIFIC: Focusing on public policy development activities in medium-technology clusters	Public policy development in med-tech fields		I_{38} (CONT)
CONTEXT SPECIFIC: Prioritising 'theorising innovation' activities for agenda-setting and brand-building at the formation and 'transformation' stages of cluster development	'Theorising innovation' activities at formation and transformation stages		I_{39} (CONT)
Contexts		**$C_{1...n}$**	
National institutional specifics hampering or facilitating innovative activities of cluster members	National characteristics		C_{EX1}
Regional institutional specifics hampering or facilitating innovative activities of cluster members	Regional characteristics		C_{EX2}
Industrial or sectoral specifics, e.g. predominant knowledge base	Industry/sector characteristics		C_{EX3}
The predominance of public versus private actors in steering the cluster (top-down vs. bottom up)	Institutional mode		C_{EN1}

Interview matrix and guide

The interview process is to be divided into two parts: an unstructured and a semi-structured interview.

The unstructured interview aims at extending the meta-organisational theory to the cluster context and exploring clusters' 'actorhood'. The choice of the interview type is guided by the theory-elaborating stance and the lack of extant research which makes it impossible to formulate detailed interview questions in advance. Several interview questions were developed to allow for an elaboration on the contextual pressures and clusters' strategies for coping with these. These interview questions and prompts were designed in a way to provide the most flexibility thus allowing the researcher to explore new emerging topics in the process of interviews which could not have been identified otherwise.

The semi-structured interview part aims at analysing:

(a) if the conceptual framework of the cluster business model covers all the aspects of value creation in a cluster,
(b) whether the method for business modelling in the cluster context allows to uncover these aspects and allows to account for different contextual specifics, and
(c) whether the current cluster business model design is conducive to cluster innovativeness.

The interview matrix has been developed based on these aims and the identified interview themes. The format of the matrix has been developed so as to guide the researcher through the business model 'unpacking' exercise thus at the same time testing the relevance of the business model elements and the appropriateness of the business modelling method.

The semi-structured interview guide also included interview prompts. These are not supposed to provide a schedule of questions to be asked word-for-word, but rather a list of topics to be covered during the interviews (N. King 2004). Such an approach was considered the most appropriate as it allows, on the one hand, to follow the cluster business model framework but, on the other hand, it provides flexibility for the exploration of the topics not covered by the framework. This allows to test whether new topics relevant for value-creation in clusters emerge during the interview process but are not covered by the framework.

Unstructured interview matrix and guide

Contexts		**Unstructured interview prompts**
National characteristics (C_{EX1})	$C_{EX1}T_1$: barriers and enablers presented by the national institutions	Could you speak about the barriers and enablers of cluster innovativeness presented by the external environment? What about the challenges presented by the industrial context? What have been the strategic responses the cluster has taken to overcome these barriers? The influence of specific contextual factors: culture, corruption, legal frameworks, financial system, taxation, competition laws, immigration, education, ease of doing business, public sector commitment; industry dynamism, volatility, predictability of evolutionary trajectory, knowledge-intensiveness What in your opinion are the key elements conducive to cluster innovativeness?
	$C_{EX1}T_2$: Influence of specific factors: culture, corruption, legal frameworks, financial system, taxation, competition laws, immigration, education, ease of doing business, public sector commitment	
	$C_{EX1}T_3$: cluster's strategic responses to these barriers	
Regional characteristics (C_{EX2})	$C_{EX2}T_1$: barriers and enablers presented by the regional institutions	
	$C_{EX2}T_2$: Influence of regional factors: regional history, presence of natural resources, regional industrial specialisations, availability of skilled workforce, regional policies with respect to innovation promotion, clusters and economic development in general	
	$C_{EX2}T_3$: cluster's strategic responses to the regional barriers	
Industry characteristics (C_{EX3})	$C_{EX2}T_1$: barriers and enablers presented by the industrial context	
	$C_{EX2}T_2$: Specific characteristics: dynamism, volatility, predictability of evolutionary trajectory, knowledge-intensiveness	

Semi-structured interview matrix and guide

Governance (BM_4)	**Actors (BM_1)**	**Resources and capabilities (BM_2)**	**Value propositions (BM_5)**
Formal and informal governance (I_{26}) $I_{26}T_1$: Presence of unwritten rules and trust-based relations $I_{26}T_2$: Presence of formal governance mechanisms $I_{26}T_3$: Balance between these *Governance for a 'safe environment' ($I_{27(CONT)}$)- for clusters operating in 'unsupportive' contexts* $I_{27}T_1$: Mechanisms compensating for the lack of institutional frameworks *Public-private interactions (I_{28})* $I_{28}T_1$: Communication between the public authorities and the cluster governance bodies *Governance participation (I_{29})* $I_{29}T_1$: The ability of different cluster actors to participate in governance *Governance for knowledge absorption (I_{30})* $I_{30}T_1$: Variety of competencies, knowledge and expertise of board members *Multi-level governance (I_{31})* $I_{31}T_1$: Overarching governance board and master agreements $I_{31}T_2$: Project-specific governance mechanisms	Actor participation *(I_1)* I_1T_1: Types of participants I_1T_2: Level and type of engagement of various participants Actor role distribution *(I_2)* I_2T_1: The presence of actors playing the roles of facilitators, visionaries and sponsors/stakeholders I_2T_2: The clarity of role distribution Cluster facilitator competencies *(I_3)* I_3T_1: Types of actors performing the facilitation role I_3T_2: Legitimacy and credibility of facilitators I_3T_3: The reputation, skills and knowledge of cluster facilitators Cluster facilitation intensity *($I_{4(CONT)}$)- for clusters in coordinated market economies (if applicable)* I_4T_1: The importance of the facilitation role I_4T_2: The number and types of facilitation activities carried out *Stakeholder representation (I_5)* I_5T_1: The extent to which different stakeholders are represented in cluster strategy-making I_5T_2: The importance of sponsors/stakeholders for cluster existence I_5T_3: The involvement of major sponsors in cluster strategy-making I_5T_4: The extent of government involvement	Tangible and intangible resources *(I_9)* I_9T_1: The availability of local finance venture capital) and talent I_9T_2: Simultaneous development of tangible and intangible resources *Pre-existing social capital (I_{10})* $I_{10}T_1$: Innovation enablers of the pre-existing social capital $I_{10}T_2$: Innovation impediments of the pre-existing social capital *Knowledge capability development (I_{11})* $I_{11}T_1$: Capabilities for knowledge generation, utilisation and development $I_{11}T_2$: Absorptive capacity $I_{11}T_3$: Collaborative capacity *Technology and market orientation (I_{12})* $I_{12}T_1$: R&D capabilities $I_{12}T_2$: Access to knowledge and expertise corresponding to actors' needs $I_{12}T_3$: Ability to identify market problems, research and understand markets *Similarity of resources and capabilities (I_{13})* $I_{13}T_1$: Variety of resources and capabilities of cluster actors $I_{13}T_2$: The relatedness of their resources and capabilities *Resources and capabilities awareness (I_{14})* $I_{14}T_1$: Mechanisms for information circulation on resources and capabilities	*External value proposition (I_{32})* $I_{32}T_1$: Identifying with a real market need *External-internal goal alignment (I_{33})* $I_{33}T_1$: The ability of cluster actors to identify with external value propositions *National/regional alignment (I_{34})* $I_{34}T_1$: The correspondence of cluster system level goals to regional development priorities $I_{34}T_2$: The correspondence of cluster system level goals to national development priorities *Sectoral alignment (I_{34})* $I_{34}T_1$: Prioritising short- or long-term goals depending on the sectoral specifics

	Sponsor/stakeholder support *($I_{6\,(CONT)}$) – for clusters at early life-cycle stages (if applicable)* I_6T_1: Presence of sponsors I_6T_2: Sponsors'/stakeholders' support of the cluster's strategic directions Visionaries' values (*I_7*) I_7T_1: The alignment between cluster and visionary values Visionaries' support (*$I_{8\,(CONT)}$*)*- for clusters at the early life-cycle stages (if applicable)* I_8T_1: Approaches to empowering cluster visionary actors		
	Value flows (BM_3) *Firm-to-firm interaction (I_{15})* $I_{15}T_1$: The willingness of the firms to interact $I_{15}T_2$: The willingness to invest own resources for collective goals *Firm-to-firm connectivity focus ($I_{16(CONT)}$) – for mature clusters and 'synthetic' knowledge bases* $I_{16}T_1$: The intensity of interactions between firms *Firm-to-fundamental research connectivity ($I_{17(CONT)}$) – for clusters in sectors with 'analytic' knowledge bases* $I_{17}T_1$: The intensity of interactions between firms and fundamental research organisations *Firm-to-applied research connectivity ($I_{18(CONT)}$) - for clusters in sectors with 'synthetic' knowledge bases* $I_{18}T_1$: The intensity of interactions between firms and applied research organisations *Firm-to-research and firm-to-education connectivity ($I_{19(CONT)}$)- for clusters at the formation and 'transformation' cluster life-cycle stages* $I_{19}T_1$: The intensity of interactions between firms, research and education organisations *FDI value added (I_{20})* $I_{20}T_1$: The ability and willingness of foreign actors to bring in tangible resources $I_{20}T_2$: The ability and willingness of foreign actors to bring in intangible resources *External links with proximate actors (I_{21})* $I_{21}T_1$: Cognitive proximity of external partners		

	$I_{21}T_2$: Organisational proximity of external partners $I_{21}T_3$: Institutional proximity of external partners *External links with innovation sources (I_{22})* $I_{22}T_1$: Identification and connections with the major innovation players in the sector *External 'compensatory' links (I_{23})* $I_{23}T_1$: Identification and connections with the external sources or resources and capabilities missing inside the cluster *Virtual knowledge platforms (I_{24})* $I_{23}T_1$: The use of virtual platforms for knowledge sharing and collaboration *Exploitation and exploration ties (I_{25})* $I_{25}T_1$: The presence of weak (exploration) ties $I_{25}T_2$: The presence of strong (exploitation) ties $I_{25}T_3$: The balance between these	
Value-creating activities (BM_6) *Innovation-related activities (I_{35})* $I_{35}T_1$: Orchestration of knowledge capabilities (development of cluster actors' absorptive capabilities, sector specific knowledge, etc.) $I_{35}T_2$: Ongoing strategizing (regular revision and re-shaping of cluster strategy in response to the external and internal changes) $I_{35}T_3$: Developing public policy (lobbying activities) $I_{35}T_4$: Theorising innovation (engaging in storytelling, brand-building, cluster promotion) $I_{35}T_5$: Resource generation (building up the pool of resources needed for innovation) *Generative activities ($I_{36\,(CONT)}$) – for clusters in high-tech sectors (if applicable)* $I_{36}T_1$: Prioritising of resource generation in high-tech sectors *Alignment of activities with actors' needs (I_{37})* $I_{38}T_1$: understanding of differentiated cluster needs $I_{38}T_2$: development of activities adapted to these *Public policy development ($I_{38\,(CONT)}$) – for clusters in mid-tech fields (if applicable)* $I_{39}T_1$: Prioritising lobbying *'Theorising innovation' activities ($I_{39\,(CONT)}$) – for clusters at formation and transformation stages (if applicable)* $I_{39}T_1$: Prioritising brand-building and storytelling activities		

Semi-structured interview prompts

Actors

- What is the process of becoming a cluster member? What are the admission criteria? Are these specified in a formal document and freely available? Who is responsible for setting the admission criteria, screening new members and making the decision regarding their admission?
- Are there any events or activities organised by cluster members without the involvement of the formal cluster management organisation? Could you give some examples?
- How common is it for cluster members to take initiative in organizing events?
- What is the composition of the cluster in terms of firm size? Predominantly large/SMEs? What type of companies do you think are the most important for cluster innovativeness and success? (in terms of size, business models, age, growth trends?)
- What in your opinion is the optimal composition of a cluster in terms of firm size distribution?
- How important would you say are high-growth potential firms for the cluster innovativeness?
- In your opinion, are there any small firms with a high potential for growth in the cluster? What are these?
- In general, how supportive is the cluster environment for the growth and development of small firms?
- What are the research institutions collaborating with the cluster? What are the relationships between these and the cluster? How are they involved in cluster activities? Are there any events/workshops organised by the University for the cluster members?
- In general, how important do you think the university is for the cluster innovativeness?
- To what extent are the different categories of cluster actors (businesses, universities, support providers) involved in community building by acting as facilitators? What do they do to act as network-builders, connectors?
- Do you carry out regular stakeholder analysis to identify external stakeholders?
- Who are the key influencers and decision-makers both within the cluster and external to it?
- Do public-sector stakeholders have an important role for cluster strategy development? what are their agendas and motivations? What is the role of the government in cluster development/support/funding?
- What are the sources of cluster funding? What is their relative importance?

Resources and capabilities

- What types of support infrastructure is available to cluster members? finance? Technical facilities? Business support?
- Do you have a database of cluster members, their needs, competencies? If so, how do you maintain it/keep it up-to-date? If not, why and would you consider establishing such a DB?
- How would you estimate the availability of skilled workforce in the cluster? Are there any initiatives to attract high-skilled employees to the cluster?
- What is the extent of employment of local university graduates by cluster firms? Are there any placement programmes in the cluster for university graduates/academics? What are these?
- What is the extent of highly qualified labour inflow into the cluster? What about the outflow?
- How would you estimate the proportions of regional/national/ international skilled workforce in the cluster?

- How is cluster management involved in the creation and maintenance of support infrastructure in the cluster? Do you pro-actively look for support service providers? Do you provide any support services yourself as cluster management organization?
- How do you communicate information on the available support to the cluster members?
- How would you assess the capacity of the cluster members in general to identify relevant information and to apply it in practice in order to innovate their products or services (absorptive capacity)?
- What are the reasons behind the geographic location of the cluster? Why historically it has been established in this location?
- Would you say the cluster still draws on the advantages brought by the geographic location? If so, what are the key local/regional resources or capabilities your cluster builds upon?
- How important would you say these are for the cluster competitiveness and innovativeness?
- What are the main technological fields in which cluster members operate?
- Do you think cluster members have complementary resources and capabilities? What makes you say so?
- In your opinion, what is the optimal balance between the relatedness and diversity of capabilities and skills of cluster members for cluster innovativeness?
- Who are the "typical" entrepreneurs establishing firms in the cluster? Are these related to the cluster in any way? How common is it for former employees of cluster firms or serial entrepreneurs to start up new business in the cluster?
- How common is it for the University spin-offs to be established in the cluster? Is the University involved in the process? If so, in what way? Could you give a rough estimate of the number of university spin-offs in the cluster?
- Have any other institutions or service providers been recently established in the cluster? What are these?
- To what extent would you say the cluster has been successful in attracting finance providers?

Value flows

- How would you estimate the level of competition among cluster members? How common is it for competing firms to cooperate? What type of collaborative projects do they engage into?
- Would you say new collaborations is easily established between cluster firms? What are the main barriers for collaboration between cluster members? And between large and small firms in particular? How flexible are the collaborative arrangements inside the cluster?
- How common is collaboration among large and small firms in the cluster? What type of collaborative innovation projects do they engage in?
- Do you monitor and measure the number of cluster actors involved in collaboration? If so, what is the number or % of such actors? If not, what would be your estimate?
- What type of collaboration is prevalent in the cluster: market-based (buyer-supplier) or knowledge sharing?
- What are the key barriers to knowledge sharing in the cluster? How could these be overcome?
- How would you assess the attitudes to knowledge sharing in the cluster?
- How would you assess the level of trust among cluster members? What would you say are the key factors enhancing trust among cluster members? What are the barriers ?
- Do you think opportunistic behaviour is currently a problem for the cluster? What could deter it?

- How frequent are university-industry collaborations? Who most commonly initiates the collaborative projects – academia or industry? What types of collaborative projects are these? Could you give any specific examples?
- What in your opinion are the key barriers faced by the academics in collaborating with the cluster firms? What are the barriers faced by the industry in collaborating with the academia?
- Are there any public-private partnerships between the government and cluster firms? If so, what types of projects are these? Some examples? What are the main barriers to academia-industry-government collaboration in the cluster? What could be done to overcome these?
- Does the cluster have connections with other clusters nationally/internationally? What type of contacts/collaborations do you have with these? Does the cluster management facilitate the establishment of links between the cluster members and external partners? If so, in what way?
- Would you say the University's international collaborations have brought value to the cluster in general? In what way? If not, do you think there is a need for the University to facilitate international collaborations? If so, how? If not, why?
- How easy has it been for the cluster to adapt to market and technology changes? What are the key enablers and barriers to such adaptation?
- What are the mechanisms for the peer-to-peer mentoring and knowledge sharing in the cluster?

Governance

- Who/ what body(-ies) is(are) formally leading the cluster?
- How should a cluster be led to be innovative?
- How many actors are involved on the board? What are the responsibilities of the board as a whole?
- Are there representatives of public and private sectors and academia? How are Board members appointed/elected? Do all the board members have the same powers and responsibilities? What are these?
- How and by whom is cluster strategy decided upon?
- In what way do stakeholders influence the strategy of the cluster? What are their needs and requirements? How are these communicated?
- Would you say external stakeholders have any impact on cluster innovativeness? Why?
- Do you feel that stakeholders have conflicting needs and demands? If so, how do you "navigate" among these? And how does it affect the cluster's competitiveness and innovativeness?
- Do you think opportunistic behaviour is currently a problem for the cluster?
- What do you think deters or could deter opportunistic behaviour in the cluster?
- In case a cluster member behaves in an opportunistic or unfair manner towards another member would the information about it circulate inside the cluster? If so - through what channels? If not, why, what are the barriers? Are there any formal mechanisms sanctioning unfair behaviour of cluster members?
- Can you think of any unwritten rules and conventions in the cluster? What are these? How are they communicated? How important would you say they are for cluster innovativeness? Could you elaborate on your answer?
- In case of collaborative projects among cluster members, what are the mechanisms most commonly used for distribution of benefits among cluster members? What are the common agreements signed by cluster members in collaborative projects?
- What kind of contracts/agreements do members sign when joining a cluster?
- To what extent and in what ways are cluster members involved in cluster governance/decision-making?

Value propositions

- What do you think are the most important values shared by the cluster members?
- Does the cluster have a common mission and vision statement? If so, what is it? If not, why?
- What are the goals of the cluster as a whole? Are cluster goals or KPIs reflected in any formal documents?
- Is cluster performance formally measured against these goals/KPIs? If so, what are the performance assessment procedures in place? If not, are there any other formal performance indicators and procedures for their measurement?
- Do you measure the collective innovative output of the cluster? If so, what are the performance indicators currently applied and why were these selected (e.g. patent activity? numbers of new products introduced? proportion of sales derived from imitative and innovative products? new products announcements?)? Could you provide some statistics? If no performance indicators - do you envisage to implement these?
- To what extent would you say that the cluster has a collective market orientation?
- What are the activities undertaken in the cluster to identify markets and to follow market trends? Does the cluster engage in "technology watch" activities? Does the cluster participate in commercial fairs or specialized conferences? Any other channels through which the cluster can receive the information about market trends?
- Who undertakes these activities? Are these undertaken on the cluster level or individual firm level?
- How is the information on market/technology trends disseminated within the cluster?
- What is the cluster's market position? How does it distinguish itself?
- Would you say the cluster image and brand are recognizable to relevant external audiences? How important do you think it is for a cluster to have a brand image?
- How would you describe the cluster's value offering? (i.e. what is unique about the products of the cluster? What differentiates it from its competitors?) Is the cluster's value offering defined in a formal manner? Has it been changing over time? If so, how? Has the variety of offerings increased?

Value-creating activities

- What type of skill-building activities or programmes are provided to cluster members?
- How do you design new training programmes or workshops? I.e. how do you identify the need? have you initiated any surveys of the companies? Direct expression of the need by members?
- Do the support and training programmes and workshops conducted for cluster members target any specific type of companies? If so, what type? If not – what type of companies do most commonly participate?
- Are any activities/initiatives implemented by the cluster management or community to leverage the role models and facilitate connectivity? What are these?

Cluster business model report guide

The ‘cluster business model’ reports are to be prepared by the researcher and provided to the participants of the empirical studies. The following model is to be followed when drafting a report in order to provide the most possible value to the participant clusters:

- Theoretical background describing the innovation-centric cluster business model design framework
- Cluster background information
- Cluster business model ‘unpacking’: describing the findings with respect to each of the business model elements
- Benchmarking the cluster ‘innovation success factors’ against the findings of the systematic literature review with respect to each of the business model elements [7]
- Business model re-shaping: providing recommendations for the improvement of the cluster innovation performance based on the findings of the systematic literature review.
- Bibliographic information.

[7] The findings of the systematic literature review were synthesized as propositions for innovation-centric cluster business model design and presented in Article 2. While this empirical research did not aim at testing these propositions, they were used by the researcher in order to provide more added value to the participants.