

A Proposed Model of Virtual Clustering of Organizations and Its Relationship to Supply Chain Competitiveness

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Abstract

Supply Chain Collaboration is cross enterprise and can be vertical and/or horizontal. Vertical supply chain collaboration involves collaboration and coordination with customers and suppliers whilst horizontal collaboration involves collaboration with competitors, government institutions and other important stakeholders. It is generally accepted that supply chain collaboration leads to competitive advantage. Whilst a lot of literature has been published that shows the importance of both horizontal and vertical supply chain collaboration in enhancing competitive advantage, very few studies have focused on the factors that influence successful virtual collaboration and the achievement of competitive advantage due to supply chain virtual collaboration. This paper proposes a conceptual model that attempts to close this gap utilizing the concept of virtual clustering.

Keywords

Organizational clustering, Virtual Clustering, Supply Chain Collaboration, Competitive Advantage

Introduction

Clustering

The general idea of clustering appears to have been first introduced in the literature in the 19th century around 1920 by Alfred Marshall through studying the economic importance of what he termed 'industrial districts', and then later the same idea was refined around the early 1990's by Michael Porter, who renamed the phenomenon as 'clusters' (Bell 2005; Lublinski, 2003; Wennberg and Lindqvist, 2010; Feltzensten et al, 2012 and Kulakova, 2014). Marshall (1920) noted that an industry concentrated in certain localities created certain advantages for firms located close to one another. The arguments raised in Alfred Marshall's work was that there were many advantages for organizations following the same skilled trade to organize closely to one another. One of the advantages of this industrial agglomeration as discussed by Marshall was that the mysteries of the trade became no mysteries anymore since these mysteries appeared to be in the air with everyone in the locality easily getting access to them. Notwithstanding the

work done by Marshall, the term ‘cluster’ was coined by Michael Porter in the book titled the Competitive Advantage of Nations published in 1990. When discussing ‘the dynamics of national advantage’, Porter (1990, pp. 131) defined clusters as ‘industries related by links of various kinds. Porter defined these links to be either vertical through buyer-supplier relationships or horizontal through common customers, technology, channels and so forth. From then on, following from the work of Porter (1990), a group of interconnected organizations, suppliers and service providers of any kind, located within a common geographical area and all linked by some commonalities and complementarities to their businesses came to be known as organizational clusters (Quaye and Mensah, 2017).

Following the above argument, the main objective of this research is to understand the importance of virtual clustering in creating local advantages for companies that share virtual proximities. This is because while there has been extensive research into the role of geographic co-location in conferring competitive advantage on firms so located, there seems to have been little research in understanding if virtual proximity can play the same role traditionally played by geographic proximity in firms within a cluster. This is important because technology has made production to become a special collaboration as opposed to the traditional physical handshaking involving colocation within the same geographic space.

The focus of this paper is on the first part of this research which seeks to develop a structural model of such virtual relationships. The scope of this paper is limited to the identification of the main factors of this structural model and the nature of the interaction between these factors, hypothesized by the directional arrows between the factors of the model. The second part of this research is the operationalization of this structural model and the test of the hypotheses proposed in the first part presented in this paper. The second part of this research will be outside the scope of this current paper.

Virtual Clustering

Whilst there has been a lot of discussion among academics and practitioners on organizational clustering, the need for geographical proximity of the firms and organizations involved have been challenged by some scholars (Giussepina and Giustina, 2002; Adebajo et al 2006; Adebajo 2010). In an article on ‘how do firms in clusters create knowledge’ Malmberg and Power (2005) argue that the physical proximity concept in the creation of competitive advantage in clustered firms may need to be revisited. Their argument was based on their study which reviewed literature that investigated organizations creation of knowledge and the importance of local partners. In general, what they found out is that organizations relied in a large part on far afield partners in the value chain for their innovative capability. Though it cannot be refuted that interactions between partners, collaborators and competitors is vital for innovative capability and competitive advantage, the question that arose was how do widely dispersed organizations achieve the vital productive interaction. Hence the model which will be presented in this paper argues that virtual proximity impacts on organization’s collaborative capability and innovative capability which in turn impacts on organization’s competitive advantage leading ultimately to supply chain collaboration in all aspects.

Supply Chain Collaboration

Several concepts like have been used to explain the need for interconnectedness of organizations in a supply chain. All these terms are also synonymous with organizational clustering phenomenon. Just like organizational clustering, supply chain collaboration can range from very shallow transactionally focused to highly integrated close relationships (Leeuw and Fransoo, 2009). Although the many benefits of this close supply chain collaboration have been identified (Leeuw and Fransoo, 2009), there is very little literature that has fully explored how organizations can achieve the close supply chain collaboration. It is still not clear within the supply chain literature what the critical factors that are needed to ensure this close supply chain collaboration are. In the clustering literature, geographical proximity has been argued by many authors as the most important variable that ensures the collaboration of the organizations within the cluster. Recently, some authors within the organizational clustering literature have however begun to challenge the importance of geographical proximity on driving successful collaborations.

In the supply chain literature, very few critical collaboration factors have been discussed. People continue to discuss supply chain collaboration and organizational clustering as if they are two different concepts, with geographical proximity being recognized as a critical factor for organizational clustering while it is not discussed within the close supply chain collaboration literature. Leeuw and Fransoo (2009) discuss briefly the importance of the distribution of power among the partners involved in a collaboration. Their argument being that there is a need for a power difference between the supply chain members in order to promote integration between the partners. In their conclusion, they concluded that a power difference, with the customer having more power than the supplier within the supply chain made it easier for the customer to drive close supply chain collaboration with the supplier. In another study performed by Narayandas and Rangan (2004) it was realised that although power difference may be important, it is not always important particularly if you look at the various phases that supply chain organizations go through in the formation of a collaboration relationship. Several concepts like the need for a psychological contract at the beginning of a relationship were discussed as some of the most important factors that ensured a close supply chain collaboration. Other important variables which were seen as equally important if not more important include the issue of interpersonal trust between the personnel managing the relationship in both sides of the organizations in a collaboration relationship and the personal proximity of the two personnel indicated by personal and professional relationships. Emanating from trust, Narayandas and Rangan (2004) argued that for the relationship to be maintained successfully by the two organizations, there was always a need for the display of interorganizational commitment demonstrated by the level of investment in the relationship by the collaborating organizations. It is then clear from these two studies that power alone might not be really sufficient in maintaining successful interorganizational collaboration relationships at a close level. Ramesh et al (2010) also discussed several factors as potential barriers to close supply chain collaboration and these included lack of trust, lack of commitment, lack of supply chain vision, disparity in technological capability, inadequate information sharing, unwillingness to share risk and inconsistent and inadequate performance metrics.

From the reviewed literature, it is quite clear that there is no commonly agreed model that can help organizations that are willing to enter into close supply chain collaborations to follow. Hence, this study proposes a model based on virtual clustering that could potentially be used to

indicate the critical factors and the factor structure that can drive close supply chain collaboration.

Virtual Clustering Model

There are at least four theoretical models to clustering (Geenhuizen and Reyes-Gonzalez, 2007). These include the Porter's Diamond Model, Triple Helix Model, Birch Model and Florida's model. The cluster literature is replete with discussions on Porter's Diamond model and the Triple Helix model. The Birch model and Florida's model are not widely discussed in the clustering literature. The main difference between the Triple Helix model and Porter's Diamond model are the approaches to clustering that they take. Porter's model takes a bottom up approach to clustering, whereas the Triple Helix model takes the top down approach. Apart from that difference, the two models share a similar view that there is the need for collaboration among the cluster members in order for the cluster to successfully deliver the competitive advantage or benefits that firms in the cluster may expect from clustering.

Following from the Triple Helix model of clustering, this study has developed a model that can be used to investigate the critical factors that can be used in close supply chain collaboration or what may be termed virtual clustering. Several authors have discussed the possibility of clusters which do not involve geographical proximity of the firms involved (Giussepina and Giustina, 2002; Adebajo et al 2006; Adebajo 2010). No study to date has however explored how organizations can cluster without actually being in geographic proximity with one another. In an article on 'how do firms in clusters create knowledge' Malmberg and Power (2005) argue that the physical proximity concept in the creation of competitive advantage in clustered firms may need to be revisited. Their argument is based on their study which reviewed literature that investigated organizations creation of knowledge and the importance of local partners. In general, what they found out is that organizations relied in a large part on far afield partners in the value chain for their innovative capability. Though it cannot be refuted that interactions between partners, collaborators and competitors is vital for innovative capability, the question that arose was how do widely dispersed organizations achieve this vital interaction. Knobens and Oerlemans (2006) carried out a study that looked at the different dimensions of proximity that are relevant in inter-organizational collaboration which can be used to advance understanding of how else organizations can cluster without the need for geographical proximity. It is through these various proximity variables that this study has specified a model which can be used to investigate how a virtual cluster can drive close supply chain collaboration and the impact of it on firms' competitive advantage. Following the Triple Helix cluster theory, the proposed model using the inter-firm collaboration, university-industry collaboration and government-industry collaboration will investigate how organizations can achieve close supply chain collaboration even in the absence of geographical proximity. These different inter-organizational collaborations can be modelled along the lines of vertical and horizontal supply chain collaboration relationships. The specified model shown in Figure 1 (a) and (b) will be used to hypothesize that virtual proximity conceptualized in two ways (organizational and technological proximity) will have a positive and significant impact on cluster organization's collaborative capability and innovation capability which will ultimately have a positive impact on competitive advantage of the firms in collaboration with each other. Figure 1 (a) shows only the direct effects of this model, without any geographic proximity moderation effects.

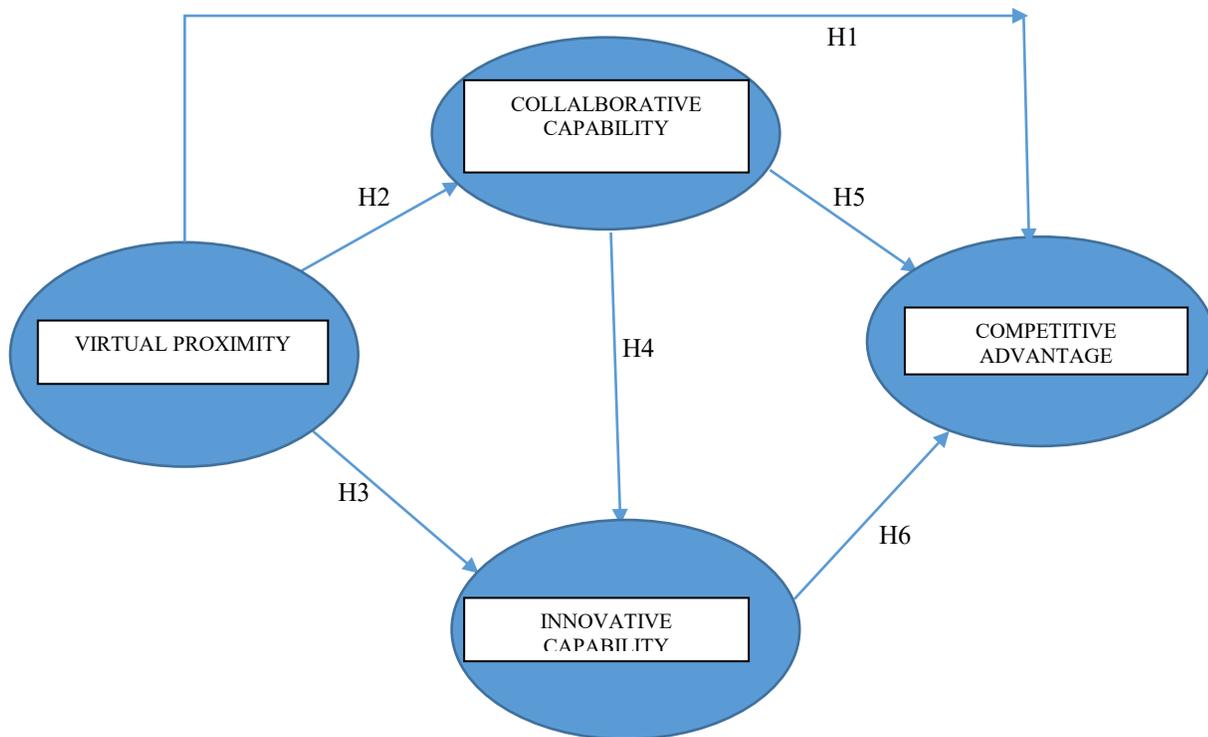


Figure 1 (a): Virtual Clustering Model

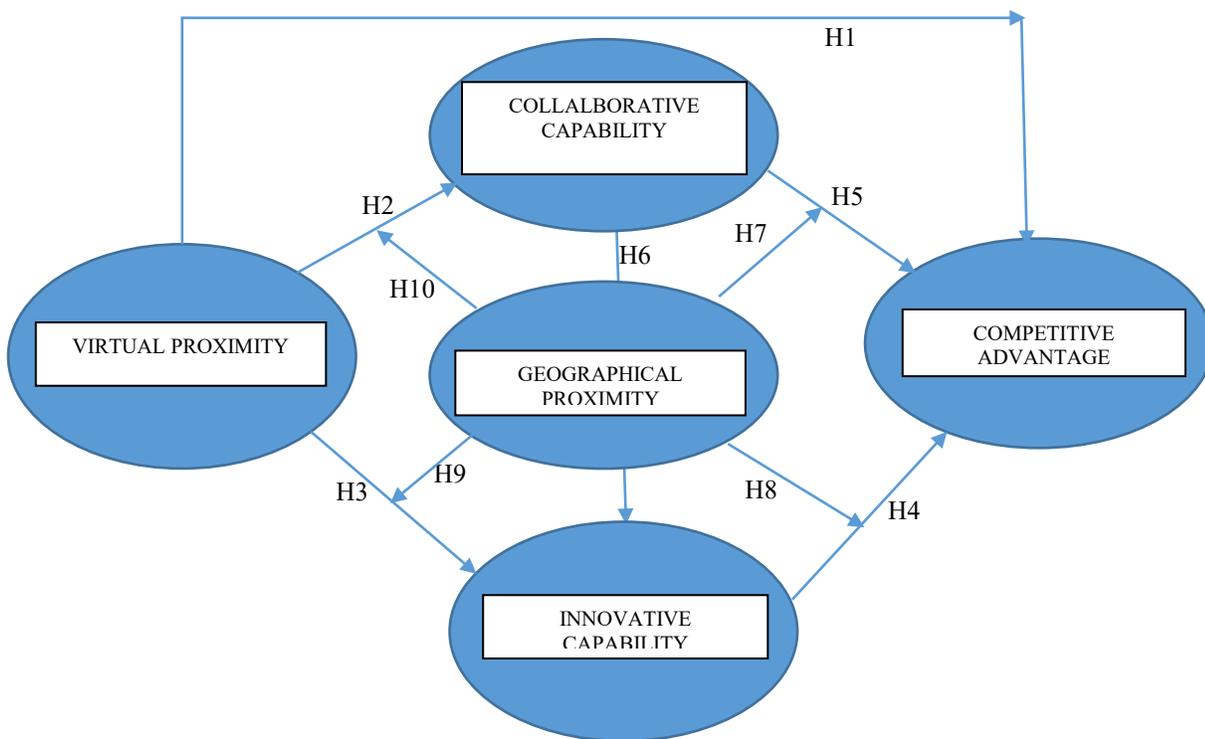


Figure 1 (b): Virtual Clustering Model

The model as shown in Figure 1 (a) and (b) is premised on two major factors: the virtual proximity factor and the collaborative capability factor. The virtual proximity factor is conceptualized under two variables, organizational proximity and technological proximity. These proximity factors are measured along several similarities between the collaborating organizations. Some of these similarities have also been recognised as barriers that hinder effective close supply chain collaboration (Ramesh et al, 2010). The main argument here is that the more similar organizations are in these different aspects the much easier it is for these organizations to form close supply chain collaborations. These aspects are: similarities in organizational types; similarities in organizational purpose; similarities in organizational functions; membership of the same corporate group; similarities in organizational planning and financial management; similarities in flexibility of forming relations with other organizations outside the collaboration; similarities in preference to stick to procedures over achieving results; similarities in the importance the organizations attach to protection of intellectual property; similarities in R&D experiences; having hierarchical dependency with one another; technological similarities and lastly similarities in production technology class.

The direct link from the Virtual Proximity factor to Competitive Advantage factor has been conceptualized as Hypothesis 1. This link intends to test the direct impact that the virtual proximity variables conceptualized as organizational and technological proximity (Knoben and Oerlemans, 2006) together have on competitive advantage of firms in a cluster irrespective of organizational geographical proximity. This hypothesis has been stated as:

Hypothesis 1: Virtual proximity has a positive and significant impact on clustered firms' competitive advantage.

The direct link from the Virtual Proximity factor to Collaborative Capability factor, is premised on the literature that argues that in order for clustered organizations to achieve significant competitive advantage, they need to collaborate significantly with one another and other cluster members (Singh and Power, 2014) as argued by both Porter's Diamond model and the Triple Helix Model. Within supply chain literature, collaboration has been defined as 'two or more members working together to create a competitive advantage through sharing information, making joint decisions, and sharing benefits which result from greater profitability of satisfying end customer needs than acting alone' (Singh and Power, 2014). Without this collaboration, proximity alone be it geographical or non-geographical will not lead to competitive advantage (Lei and Huang, 2014). Following this literature, this study hypothesizes that:

Hypothesis 2: Virtual proximity will have a positive and significant effect on organization's collaborative capability.

The direct link from the Virtual Proximity factor to Innovative Capability factor is based on the research from empirical studies that generally claim proximity facilitates agent interactions which in turn results in innovations (Boschma, 2005(a) & 2005(b); Geldes et al, 2017). In Boschma (2005(a) and (b) theoretical critical assessments, an argument is made that geographical proximity may neither be a necessary nor a sufficient condition for learning to take place since there is a need to consider other virtual proximity variables like cognitive,

organizational, social and institutional proximity for the much-needed inter-organizational interactions for innovative capability. In a study by Geldes et al (2017), the findings of this study show that geographical proximity does not mediate the relation between non-spatial dimensions of proximity and inter-organizational cooperation for innovation. Following the literature on proximity and its role in innovative capability, this study hypothesizes that:

Hypothesis 3: Virtual proximity will have a positive and significant effect on organization's innovative capability.

The collaboration capability factor argues that it will be much easier to form close supply chain collaboration relationships if certain indicators are also there among the different partners. These indicators have been identified as: partners taking each other's organizations opinions seriously when making any decision that might affect the collaboration; each partner brainstorming with the other organization when developing solutions that are mission critical to the collaboration; personnel managing the collaboration clearly understanding their organization's roles and responsibilities within the collaboration; personnel managing the collaboration having a feeling that their meetings with the partner organization accomplish what is necessary for the collaboration to function well; the two organizations finding it easy to agree on the goals of the collaboration; the two organizations being able to properly coordinate the different tasks of the collaboration; personnel managing the collaboration not having a feeling that the other organization hinders their organization from meeting its own organizational mission due to the collaboration; the two organizations not having a feeling that their organization's independence is affected by having to work with the other organization; personnel managing the collaboration not having a feeling that they are pulled between trying to meet both their organization's and the other organization's collaboration expectations; the two organizations being in a position to combine and use each other's resources for the benefit of both parties collaboration needs; the two organizations being able to share information with one another; the two organizations being able to feel appreciated and respected by the other organization; the two organizations being able to work through their differences amicably and arrive at win-win situations; personnel managing the collaboration at one end feeling they can trust the personnel managing the collaboration at the other organization; the two organizations feeling they need each other to meet their obligations; and lastly, the two organizations feeling it's worthwhile to stay and work with the other organization for their own good.

From this literature a direct link from the Collaborative Capability factor to Innovative Capability factor is created based on the research from several empirical studies like Geldes et al (2017), Codini (2015) Marrocu et al (2013). One of the major findings made in Geldes et al (2017) is that business cooperation is a positive determinant of business innovation and that business cooperation is affected positively by the cognitive-proximity relationships of the cooperating partners. The study also showed that geographical proximity does not in any way moderate the relationship between non-spatial dimensions of proximity and inter-organizational cooperation for innovation. In one of Marrocu et al (2013) conclusions, the authors write that 'the production pattern of innovation is shaped not only by spatial and technological proximities but also by the presence of co-operative and relational proximity which emerges through social and organizational networks'. Following literature in this area, it is hypothesized that:

Hypothesis 4: Collaboration capability will have a positive and significant effect on organization's innovative capability.

The direct link from the Collaborative Capability factor to Competitive Advantage factor is based on several empirical research studies likes Mappigau et al, (2017), Vanathi and Swamynathan, (2014), Giha and Leat, (2008). The existing research on this area appears very limited and with few studies studying the phenomenon from the supply chain literature. In a study done by Mappigau et al (2017), studying the root problems inherent within the collaboration of small holders of beef producers and traders it is concluded that lack of collaboration was negatively impacting the competitive advantage of the producers. Vanathi and Swamynathan (2014) study results also confirm that supply chain collaboration influences competitive advantage. In another study still within the supply chain literature done by Giha and Leat, (2008), although the study results were not conclusive, however some of the results do indicate that participation in a collaboration network had positive results for the studied farmers who participated in them. Following literature in this area, it is hypothesized that:

Hypothesis 5: Collaboration capability will have a positive and significant effect on organization's competitive advantage.

The direct link from the Innovative Capability factor to Competitive Advantage factor is based on several empirical research studies (Varma et al, 2018; Singh 2012) that argued that innovative capability affects positively organizational performance. Hence based on those studies it was hypothesized that:

Hypothesis 6: Innovative capability will have a positive and significant effect on organization's competitive advantage.

Lastly to test the effectiveness of geographical proximity, Figure 1 (b) includes in the model geographical proximity factor. This factor is modelled as a moderator variable of the direct links between effects noted between virtual proximity and collaborative capability, virtual proximity and innovative capability, collaborative capability and competitive advantage, and lastly innovative capability and competitive advantage. The argument being made is that geographical proximity will not have a significant moderation effect on all these direct links based on findings from several studies (Giussepina and Giustina, 2002; Malmberg and Power 2005; Boschma 2005(a) and (b); Adebajo et al 2006; Adebajo 2010; Geldes et al 2017). We argue the unimportance of geographical proximity in the presence of virtual proximity by proposing the following hypotheses.

Hypothesis 7: Geographical proximity moderates the effect of organization's collaborative capability on competitive advantage.

Hypothesis 8: Geographical proximity moderates the effect of organization's innovative capability on competitive advantage.

Hypothesis 9: Geographical proximity moderates the effect of organization's virtual proximity on innovative capability.

Hypothesis 10: Geographical proximity moderates the effect of organization's virtual proximity on collaborative capability.

Conclusion

Having reviewed both the organizational clustering literature and supply chain literature the model in Figure 1 seems to have a potential to move the current knowledge and understanding in virtual inter organisational collaboration forward. This is achieved by addressing both issues of what makes virtual organizational clustering and technologically driven supply chain collaboration relationships successful. Such collaborations involve both vertical supply chain (buyer-supplier and supplier-customer relationships) and horizontal supply chain (university-industry relationships and government-industry relationships). This research will also advance the debate on organizational clustering paradigm, which has traditionally focused only on geographic space, especially as technology shrinks the world into a small global space. This research will proceed into the next stage which will operationalize the model proposed in Figure 1 and test the necessary hypotheses in comparison with the traditional clustering concepts.

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