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A Study on Supply Chain Management and Freight Village Collaboration Model in Agricultural Trade Clustering Formation

Abstract

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When we looked at the strategies of countries that are ahead of competition, recently, clustering notion is seen as the main component of their strategies. Especially, since the year of 2000, clustering studies that are seen as an important dynamic of development of countries, are attracting numerous studies in various sectors. Agriculture is also a very important sector for Turkey's future prospects. With this paper, our aim is to propose a model which is expected to contribute to the selected region's agricultural supply chain and logistics infrastructure. Vegetable production has been selected for this purpose. Previously developed cluster based Supply Chain Management and Logistics Village framework was utilised as main model is the starting point for the study. Under the light of these variables' interaction in vegetable sector, it is expected that the study will hopefully prevail the hidden antecedent clustering properties. As such that using these properties, new agricultural policies can be developed for better trade competition worldwide.

Keywords:

Clustering, Supply Chain Management, Agricultural Sector, Logistic Village

1. Introduction

The idea of regional competitiveness that can be provided with the acceptance of notion of networks has been accepted with the Porter's (1990) insight that since then, entered into the agenda of all nations. Author claims that, cluster concept represents a new way of thinking about the economy and emphasizes the importance of enhancing formal and informal ties across companies, governments and related institutions. This approach is gaining new dimensions will increasing importance, with new additions in terms of main purpose and mechanisms. Clusters are defined by the co-location of producers, suppliers, services providers,, educational and research institutions, financial institutions and other private and government institutions related through linkages of different types. Throughout the years the concept of cluster has gained various meanings in terms of content and mechanisms. A brief history of the cluster transformation is given in Table 1. Therefore, there is a considerable

diversity among clusters. They differ in terms of their stage of development, also, along the cluster life cycle.; some are networks of SMEs, some are organized around key anchor firms, and yet others has developed around universities. In the new economy, regions that do not specialize may be in danger of falling behind in competition. Because, clusters can be part of what makes a region prosperous but, they are not the only explanation for competitive advantages. The presence and depth of clusters in a regional economy is one aspect of the overall business environments that companies face in the location. In addition to that, factor conditions, the context for rivalry, and demand conditions are other aspects that have to be considered. Clusters are more likely to emerge, prosper, and survive where these conditions support high productivity and innovation. Although the cluster model is seen as a tool for promoting competitiveness, innovation and growth, there are concerns regarding difficulties in conceptualizing the definition of the cluster concept, theorization, empirics, benefits, advantages and its use in policymaking (Martin & Sunley, 2003).

Table 1. Grouping and Summarizing of Cluster Definitions

Approaches	Definitions	Authors
Geographical Approach	"Clusters are groups of companies and institutions co-located in a specific geographic region and linked by interdependencies in providing a related group of products and/or services [...]"	Ketels (2003a)
	The more general concept of 'cluster' suggests [...] a tendency for firms in similar types of business to locate close together."	Crouch and Farrell (2001)
	"Geographic concentration of competitive firms or establishments in the same industry that either have close buy-sell relationships with other industries in the region, use common technologies or share a specialized labour pool [...]"	Hill and Brennan (2000)
	"Clusters are geographic concentrations of interconnected companies and institutions in a particular field [...]"	Porter (1998)
	"A cluster means a large group of firms in related industries at a particular location."	Swann and Prevezer (1998)
	"A regional cluster is an industrial cluster in which member firms are in close proximity to each other."	Enright (1996)
	"Clusters are defined as groups of firms within one industry based in one geographical area."	Swann and Prevezer (1996)
	"Geographical concentrations of industries that gain performance advantages through co-location."	Doeringer and Terkla (1995)
Social Networks Approach	"In its broadest sense, a cluster is defined by systemic relationships among firms and organizations in a general region based on common needs for nearby goods and knowledge".	Rosenfeld (2005)
	"The popular term cluster is most closely related to local or regional dimension of networks [...]. Most definitions share the notion of clusters as localised networks of specialised organisations, whose production processes are closely linked through the exchange of goods, services and/ or knowledge."	van den Berg, Braun and van Winden (2001)
	Industry Cluster: may be defined very generally as a group of business enterprises and non-business organizations for whom membership within the group is an important element of each member firm's individual competitiveness."	Bergman and Feser (1999)
	"Clusters can be characterized as networks of producers of strongly interdependent firms (including specialized suppliers) linked each other in a value-adding production chain."	Roelandt and den Hertog (1999)
	"We define an innovative cluster as a large number of interconnected industrial and/ or service companies having a high degree of collaboration, typically through a supply chain, and operating under the same market conditions."	Simmie and Sennett (1999)
	"Clusters encompass an array of linked industries and other entities important to competition. [...] Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs. Finally, many clusters include governmental and other institutions [...]"	Porter (1998)
	An 'innovative milieu' is a "complex which is capable of initiating a synergetic process [...] an organization, a complex system made up of economic and technological interdependencies [...] a coherent whole in which a territorial production system, a technical culture, and protagonists are linked."	Maillat (1991)

As will be seen from the below Figure 1, regions with a higher share of employment in industries that belong the strong clusters are generally more prosperous. Between 30% and 40% of all employment is in industries that concentrate, or “cluster” regionally. Therefore, the data provides clear evidence that clusters are significantly related to prosperity and there is therefore a need to consider clusters as a central part of any economic strategy and growth.

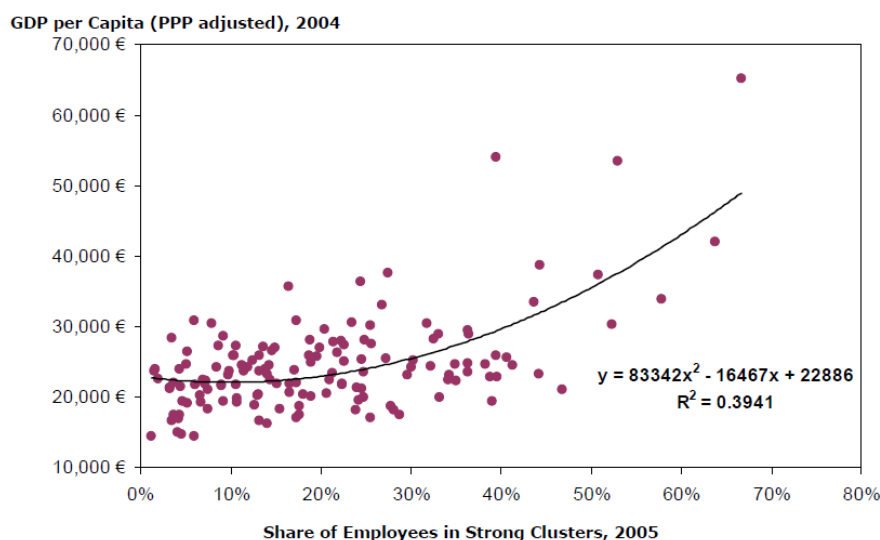


Figure 1. Cluster Strength and Prosperity (EU15) (The European Cluster Observatory, 2007)

Governments, institutions, universities and related organizations that recognized the power of clusters in economic development, started in dealing with the concept. Related studies, especially, gained a strong momentum with the entry of 2000's. In line with this goal, various studies have been started in Europe and in Turkey, almost, concurrently. With the publication of a Green Paper on future perspectives for the European Research Area (<http://ec.europa.eu/research/era>), the Commission has launched a complementary debate on the fragmentation of research activities in Europe. The vision outlined in the Green Paper suggests that, in order to strengthen its competitive position, Europe should pool its forces by developing regional specialisations and by allowing research driven clusters of global excellence. The Green Paper suggests that further concentration and specialisation of research efforts are needed in order for Europe to address the challenge of globalisation, and that this cannot be pursued effectively without a better integration of the science base with private R&D in new and existing clusters. Knowledge-based clusters of interlinked innovative enterprises and excellent research institutes could be among the main levers to foster EU competitiveness in the knowledge-based economy. Analysis shows that clusters are an important part of the European economic reality. Based on this analysis it can be assumed that roughly 38% of all European employees work in enterprises that are part of the cluster sector. In some regions, this share goes up to over 50% while in others it drops to 25%. About one fifth (21%) of these employees are employed in regions that are more than twice as specialised in a particular cluster category as the average region (www.clusterobservatory.eu.)

In order to map regional clusters in Europe, the analysis was conducted including 258 regions, and the cluster sector is divided into 38 cluster categories, creating about 10,000 areas in which a regional cluster might develop. To date, the “European Cluster Observatory” has identified more than 2000 regional clusters in Europe. Clusters have been evaluated on the basis of assigning one star for each of the following criteria:

- Employment size in a particular industry cluster within a region.

- Degree of specialisation within the region.
- Cluster focus of employment within a region.

On this basis, 155 regional clusters register three stars (8%), 524 regional clusters two stars (25%), and 1338 one star (67%). In identifying clusters, one of the widely used methods is LQ (Location Quotient). The localisation quotient is calculated as the industry's share of total employment. A localisation quotient equal to 1 means that the given region is not specialized in the given industry. (A localisation quotient equal to 1.5 means that the given industry is represented by a 50% bigger share of employment in the given region than the industry's share of employment on the level of all regions. This indicates that the region is specialized in the industry). This method is currently widely used in many countries worldwide, mainly because employment data can be easily collected. As shown in Figure 1, automotive sector is an example of a cluster category in which Europe shows clear regional specialisation. Automotive clusters, including cars, buses and truck assembly, engines and other components, are an area where Europe is among the strongest regions in the world economy. This success builds on a network of 39 regional clusters (out of a total of 259 regions) that meet two or three of the cut-off values and account for more than 50% of all European employment in the category. These regional clusters are interlinked by international strategies of manufacturers and suppliers, which can capitalise on the differentiation of local cluster conditions. This method of LQ has the advantage that it is not necessary to measure all different types of interactions, such as input-output relations, knowledge spill-overs, etc., quantify them and then compare their absolute weight relative to other factors that influence locations decisions, like wages and transportation costs.

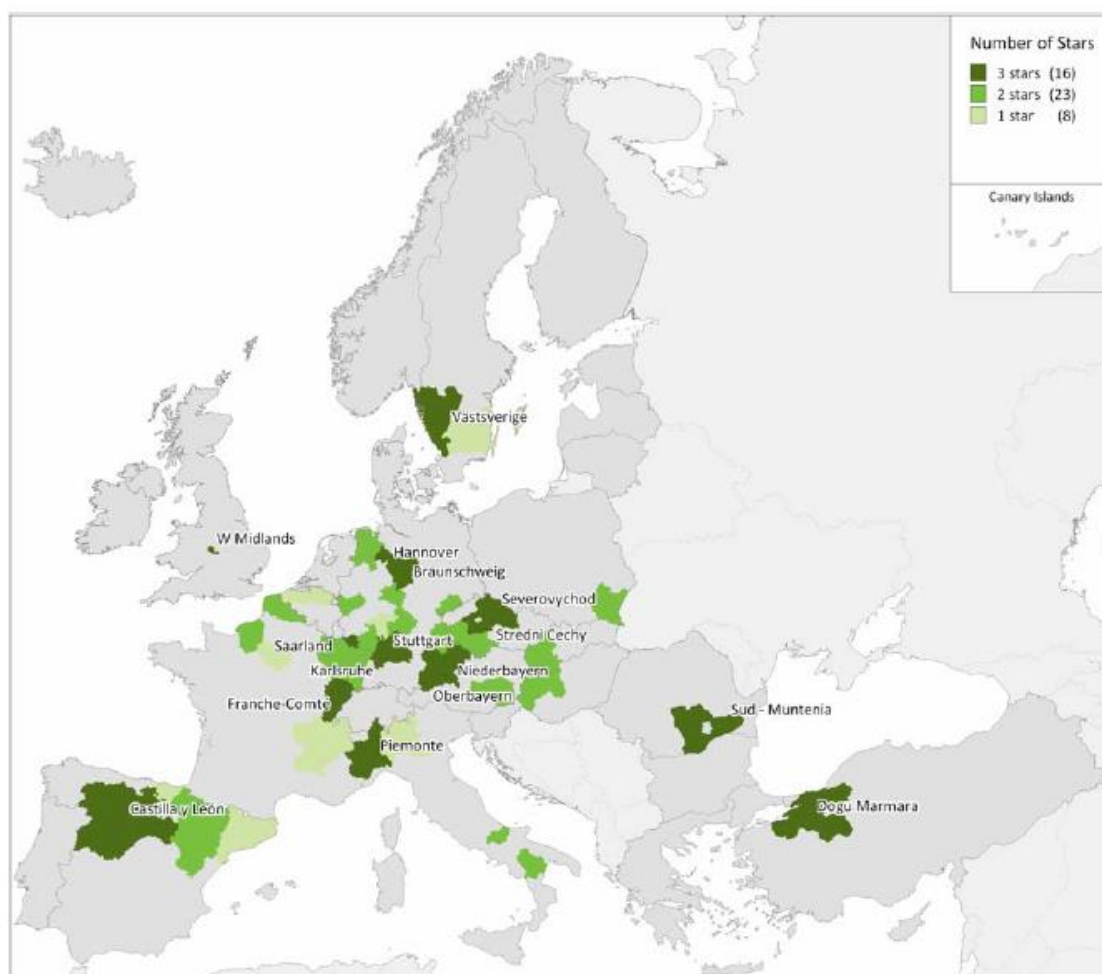


Figure 2. Leading European Automotive Clusters (European Cluster Observatory, 2007)

In Turkey, also, there are various studies that researched of various aspects of the clustering fuormation. Studies that focus on manufacturing clusters in Turkey reveal that firms are localized in four metropolitan areas (Istanbul, Izmir, Ankara and Adana) and that these four regions make up nearly 73% of the total manufacturing labour force (Eraydın, 2002). Following Eraydın (2002), the geographic dispersion of the industry centres in Turkey are identified under four major industry districts (İstanbul, İzmir, Ankara and Çukurova), emerging industrial localities around Ankara (Yozgat, Çankırı, Corum, Niğde, Nevşehir, Kırşehir) and regional industry centres as Kayseri, Gaziantep, Konya, Samsun and Eskişehir. Akgüngör (2006), using a meso-level application, a term adopted by the Organization for Economic Cooperation and Development (OECD), investigated the manufacturing sectors in Turkey, such that offers tools to identify key industries mostly using input/output-based methodologies. In exploring the cluster’s distribution across the regions and their relative importance, author used the criteria presented below:

- Share of cluster’s regional employment in region’s total employment,
- Location quotient: measure of the industry’s concentration in an area relative to the rest of the nation

Figure 2. shows the identified clusters in Turkey’s manufacturing industry, by using 1996’s data for number of establishments and employment with percentage change during the period of 1996-2000 period (Akgüngör, 2007). It is noteworthy that, analysis does not show any clustering of automobile sector, probably, due to the period of data utilized.

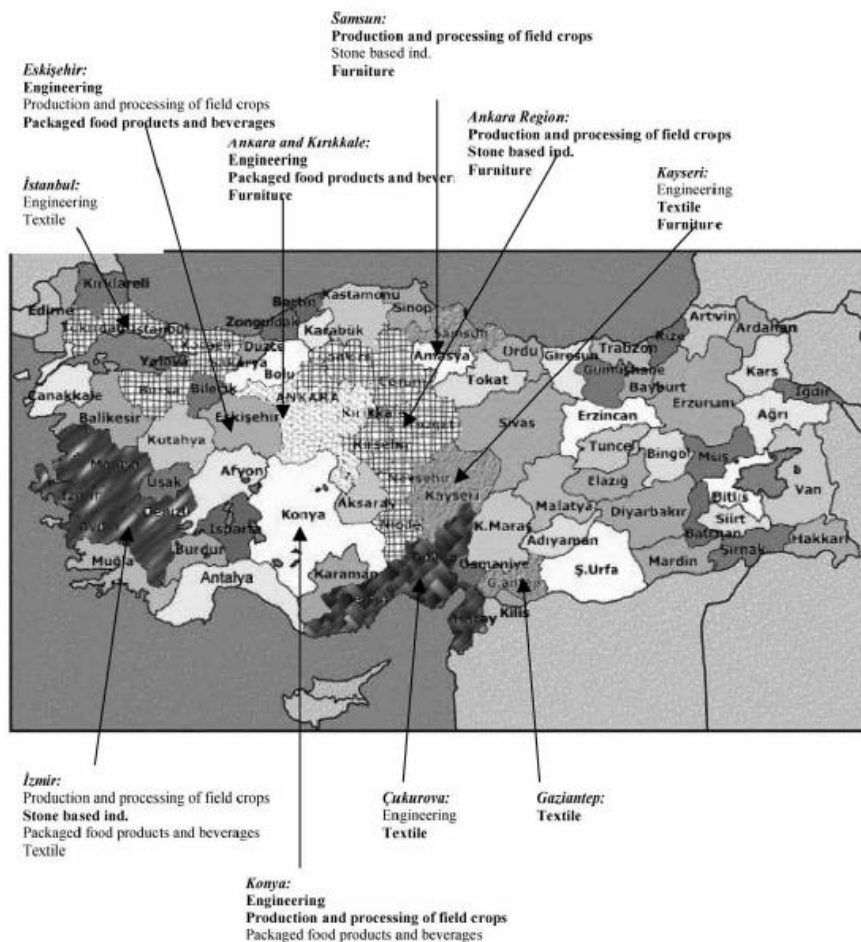


Figure 3. Turkish Manufacturing Industry Cluster Map (Akgüngör, 2007 (Data:State Institute of Statistics, 1996-2000))

This study that will be addressed in this paper, intends to build up upon what we already know with respect to industry clusters in Turkey, by adding new contributions. There are three empirical contributions of the paper in addition to what is known from the previous studies;

- Agricultural sector, to best of our literature knowledge has not been studied as a Agro-industry cluster. Therefore, this constitutes an attempt to shed light to a potential North West İzmir Region (Menemen-Foça-Aliaga and Muradiye which is a western part of Manisa) as a integral area which contributes to the economic ompetitiviness of the area and country.
- The second contribution of the paper is that, the identification and measurement of “relationship and maturity level” which is essential for hidden social networks that facilititate informations and knowledge transfer which is a pre-condition of a successful and competitive cluster. So, willingness and ability to create social networks that allow for information and knowledge transfer across firms and institutions, in relation to the formal business relationship will be shown.
- Finally, the relative linkages among the Agricultural clustering formation will be searched in terms of a mix of cluster based “Supply Chain Development” and “Logistics Village ” existence . Such a rich combination of perspectives in researching of a potential agricultural cluster, is a candidate to portray a baseline for the sector and contribute to the literature.

Why Horizontal Collaboration is important in a Cluster Based research studies?

Horizontal Collaboration: Before going into the application, it is imperative to give som information in terms of Horizontal Collaboration’s (HC) importance in Clustering studies. There is a significant room for the companies to exploit efficiency gaps, but the question is how to do it. Many key policy makers and industrial players in logistics community have recognised that the key strategy for for overcoming this situation is to stimulate the collaboration between industry players in the distribution of goods, which has been called “horizontal collaboration”. Whereas vertical collaboration has been widely exploited and analysed, the literature on horizontal collaboration in logistics is still in its infancy (Cruijssen et al. 2007).However, this kind of collaborative practice is gaining momentum within the transportation sector (Cuijssen et al. 2006). Cooperating with partners from other supply chains with common networks and complementary needs and operations can increase companies’ capacities to respond to certain operational concerns, such as fluctaiting demand (Mason et al. 2007), and boost distribution efficiency by decreasing costs, improving service, and protecting market position.

Based on local dynamics, the aim of this article is to set up a model that enables horizontal collaboration by overcoming the barriers to collaboration and building up the foundations for sustainable and profitable cooperatiom in agricultural value chain distribution. Collaboration requires establishing the right conditions in the collaborative network of similar industry network which we will defina as “Cluster”, for continuously exploring logistical flows and operations in order to allow the realization of cooperative value generating relations. Collaboration in supply chains has been defined as ocuuring when “two or more independent companies work jointly to plan and execute supply chain operations with greater success than acting in isolation” (Simatupang and Sridharan 2002). It can occur in many ways and is commonly divided into two main categories (as shown in Fig 4.): vertical, when collaborating with customers, internally (across functions), service providers and with suppliers; and (2) horizontal, between different supply chains when cooperating with competitors and with non-competitors (Barrat 2004).

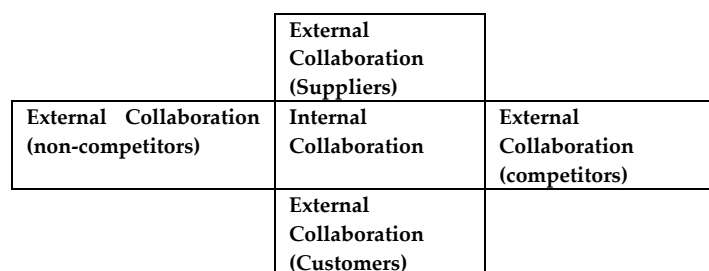


Figure 4. Forms of vertical and horizontal collaboration (adopted from Barrat 2004)

In this sense, when looking for opportunities beyond the company’s value chain, transport has been considered a versatile asset for supply chain improvement, and horizontal collaboration has proved to be an important element in distribution optimization since it exploits better the conceptualization of supply chain as supply network (Mason et al. 2007). One of the main conclusions is that horizontal collaboration is not easy to implement due to the apprehension shown by non-cooperating companies, which “tend to underestimate the opportunities and overestimate the impediments” of horizontal collaboration (Cruijssen et al. 2010). The purpose of a Horizontal Collaboration is to enable dynamics for continuous improvement of the supply chains of involved companies in a collaboration. The benefits of a horizontal collaboration are considerable, but they are only reachable and sustainable in the long run if the companies in the collaborative partnership are willing to work on developing a continuous relational learning environment. This means exploring together the potential improvements of both supply chains, assimilating each one internally within their organizations, making the changes they have to make in order to enable the collaboration, and exploring these changes through joint management and execution of the collaborative practices. These dynamics will be the way to continuously strengthen the relationship and make the cooperative more efficient by developing the necessary elements together, and they will generate outcomes or relational rents out of the opportunities or drivers. Therefore, it would continuously help companies to become more mature, stronger, and more profitable as a whole. Following Table 2. and 3. outline main drivers and barriers in a Horizontal Collaborative practices.

Table 2. Ranking of drivers for horizontal collaboration (Maria Jesus Saenz et al. 2015)

Motivation	Assesment
Cost reduction	4.6
Allowing easier response to demand fluctuation	4.4
Improvement of the service level	4.2
Improvement of the vehicle fill utilization	4.2
Lower carbon emissions	3.2
Access new markets	3.0

Table 3. Ranking of barriers for horizontal collaboration (Maria Jesus Saenz et al. 2015)

Barriers	Assesment
Organizational culture	4.2
Lack of trust	4.0
Difficulty finding collaborators	3.6
Lack of common practices	3.6
Competitors acquiring information	3.2
Difficulty agreeing to HC termes	3.2
Difficulty distributing the benefits in a balanced manner	2.4

Clusters: Clusters are the among the best formations of Horizontal Collaboration among the firms that deal with the same business activities in the same geography. As shown in the below figure, these firms are located at the center of the network. The other layers are integral part of the clusterin formation that help create synergetic value production through close collaboration.

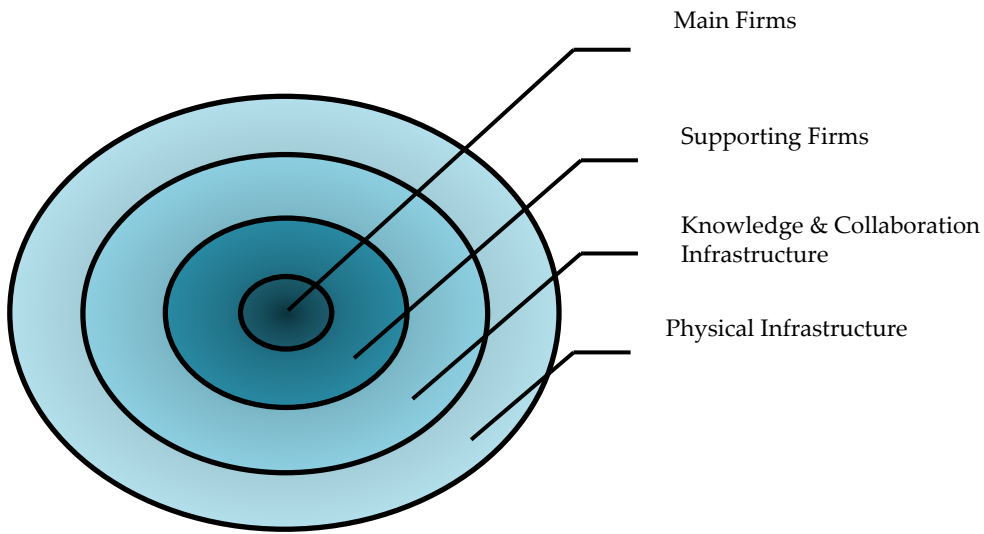


Figure 5. Layers of a Cluster (Guide for Applied Cluster Development, T.C. Ministry of Industry and Trade 2011)

Such a cluster based approach as shown in Figure 5, enables us, at least, to recognise the existence and the details of the possible cluster forms. As a result of this, by understanding the state of clusters within an economy, it makes it much easier to diagnose the economic inefficiencies and prioritize various countermeasures for competitiveness and growth. Similarly, main focus can be given to unique challenges that may be sector-specific and can address real sources of the improvement areas to leverage additional benefits of positive spill over. We can say that, at least, above approach can be seen as a sound conceptual framework that outlines key components that can be used to initiate cluster based analyses and dialogues, and offers new opportunities for developing models in order to promote competitiveness. Excellence in productivity for firms can be acquired by working together on related subjects, not by living alone, in isolation. And for this reason, industrial clusters are having real answers. They can increase productivity and operational efficiency through linkages, spill over, and synergies across firms and associated institutions and through efficient access to public goods and via better coordinating.

2. Research Framework and Proposed Model

Three main components that were chosen as the main research approaching areas of the study, as explained in previous section are;

- Tire cluster supply chain development
- Logistic village development for clustering service.

During the study, we will investigate the effects of these two main improvement areas to the partners' behaviour in terms of their business decisions that will give us valuable clues for an the ideal formation of regional clustering in terms of qualitative aspects. Original model was developed by the author during his doctorate study and applied to the Tire Business Location in Kocaeli. Table 4. shows the case study application results of the proposed cluster supply chain and logistics service model to the tire firms located in Kocaeli region. Main purpose, as explained in the former sections, was to determine to what extent the antecedent signs of clustering type of cooperation were existing. In addition to quantitative analysis, focus group and survey related qualitative followed. While quantitative results showed strong sign of being a cluster type of network relation in the region, model applied results showed that the infrasturcture of the environment were suitable from some

points in order to start the collaboration in much stronger directions. Agility, logistics competence, customs were the most effective parameters that “tire environment” paid attention for “customer happiness, product enhancement and service enhancement” as value-add elements. These elements were above the expected level according to analyses. This means that, there is a strong base for start up of much organised collaborative activities among the partners. Similar way, in the original model, a third construct was added to see the net effect of the other services that were not possible to detect with the previous two constructs. Cluster based additional value development construct asserted that “warehousing & distribution” activity was among the most effective ones in the environment that conveys the message that should be exploited further by related partners its, since its direct contribution has been shown in terms of “customer happiness and product enhancement” outputs. If future collaborative planning can be built upon these impactful elements, all of the tire firms and their suppliers can benefit from the close cooperation. These opportunities are mentioned by the focus group participants as; usage of intermodal transportation of Köseköy train and Derince Port transportation, common warehouse usage as some global tire brands already make, procurement of raw materials from the same source with lower prices using scale factor and more. Model based qualitative results, at least promise that, supply chain and logistics related some elements have more appreciation that directly supports the cooperative actions to start. Yet, it has to be mentioned as an important condition that firms’ cultural backgrounds should not be a barrier for their future opportunities of sharing supply chain practices.

Table 4. Kocaeli Region Tire Clustering Case Study Results (Cezayirlioglu, Tanyaş, Acar 2015)

Main Orientations	Most Effective Cluster Characteristics	Performance Outputs Effected
Cluster-based Supply Chain Development	Agility	Product Enhancement
		Service Enhancement
		Customer Happiness
Cluster-based Logistics Village Development	Logistics Competence	Customer Happiness
	Customs	Product Enhancement
Cluster-based Additional Value Development	Warehousing & Distribution	Customer Happiness
		Product Enhancement

Proposed Model: The elements displayed in the proposed model in Fig 6. are the aspects that should be addressed in order best create absorptive capacity to obtain relational rents out of the collaboration and to make it sustainable over the long run. Although collaboration can occur without everything settled, it is expected that, the more mature the relationship is, the higher will be the level of elements that can be deployed, which will make the collaboration more fruitful and sustainable by constantly creating absorptive and exploiting it to increase the relational rents. For overall maturity, the parties should not consider putting efforts into higher-level elements without having accomplished a certain level of joint performance on the lower-level elements as well. Since strengthening them will drive the collaboration towards more sustainable and profitable outcomes among potential partners.

In the study, for the applicability of the model to a clusterwise studies, a couple of conversions had to be realized for LPI usage which has been offered for a country’s Logistic performance evaluation. It was a necessity to see the model’s validity in various sectors. World Bank has been issuing periodical evaluations of relevant countries’ logistics performance values that were calculated as the average perceptions of nearly 3,000 sectoral chosen people for every two years. Considering that a firm’s internal logistics evaluation criteria should also be in line with the host country’s main logistics characteristics. So that, it was taken as an objective evaluation parameter for a firm and later for the same cluster formation’s logistics services appraisal. Surely, one can argue that every firm has its differing judging criterion depending on its company infrastructure. This argument has merits.

However, in a cluster type organization the end results effects all the firms involved in the consortium. Under these assumptions, we have to use more generic type of criterion that will give more comparable results for chosen sectors

SCOR Reference Model of ASCM is being used successfully throughout the world for the assessment of individual firms' Supply Chain Management's performance evaluations. Here, again similar acceptance of conversion conducted for SCOR construct as it was the case with LPI. In order to obtain comparable and objective results for cluster type of structures, SCOR was utilized as evaluation format for cluster based firms' mutually formed supply chain formations. Both assumptions may be in their infancy stage or may nor exist in reality. Obtained results will prevail this assumptions.

Table 5. LPI and SCOR Construct Elements Used For Individual Companies' Assessment

Logistics Performance Index (LPI) Elements	Supply Chain Management (SCOR) Elements
Customs	Reliability
Infrastructure	Costing
International Shipments	Agility
Logistics Competence	Sensibility
Tracking & Tracing	Asset Management
Timeliness	

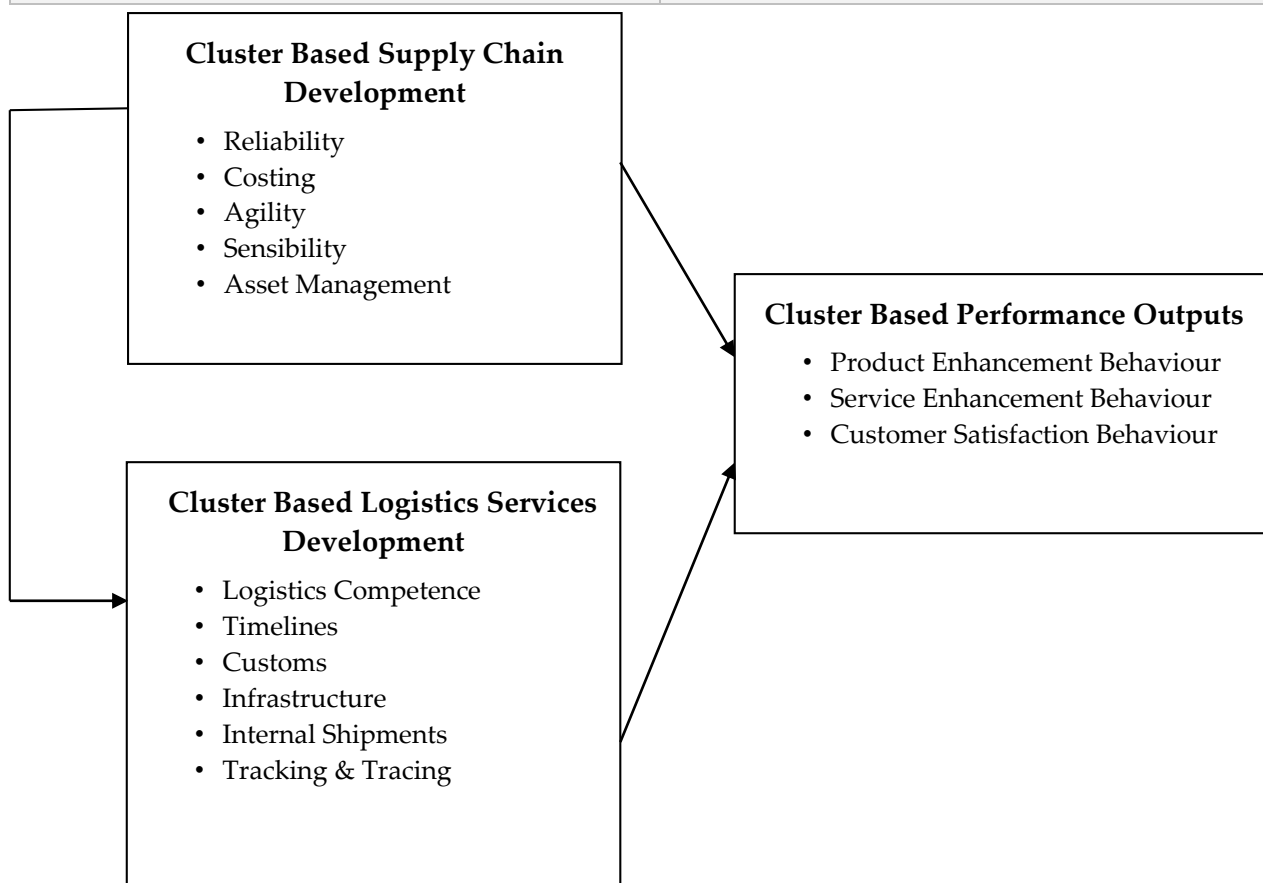


Figure 6. Proposed Antecent Framework Model for Clustering Based Logistics and Supply Chain Interactions (Adapted from Cezayirlioglu Ph.D. Thesis 2015)

In the analytical study of selected agricultural area's clustering formation, following independent variables' interaction will be investigated, in depth;

Supply chain development perspective: A supply chain is defined as a network of organizations performing various processes and activities to produce value in the forms of products and services for the end customers Christopher,1999. Various authors have focused on the different aspects of it. Bowersox and Closs (1996) and Giannoccoro and Batrandolfo (2002) have mentioned that SCM is being a process based mechanism, gives the opportunity to decrease the manufacturing by concentrating to customer services. Li et al.(2005,2006) identified strategic supplier partnership, customer relationship and information sharing as being the prime SCM practices. Different interests and opportunistic behavior of supply chain partners and informational asymmetries across supply chain affect the quality of information (Feldman and Müller, 2009). During the recent years, the focus has shifted from factory level management of supply chains to enterprise level management of supply chains (Gunasekeran et al. 2005). In the same article of author, differences between “traditional” and “networked” organizations are well discussed by emphasizing the importance of strategic alliances, global outsourcing, shorter product life cycles, partnership formation and collaboration, agility, responsiveness, flexibility, reverse logistics and extended enterprise integration (integration beyond enterprise resources planning (ERP), covering both internal and external integration). Therefore, supply chain relations of a cluster is even more complex phenomenon than individual firms’ supply chains. In this article, one of our main targets was to investigate these interrelationships that were effective in the competition of Agricultural sector in selected İzmir/Manisa location.

Freight village development perspective: Logistics (freight) villages are connection points of local and long distance transport as well as interface of the transport carriers. Today, logistics assumes a function of stabilizer and coordination in a constantly changing supply and distribution groups within the framework of Global Supply Chain Management. Therefore, globalization is a strong impulse for increased attention for logistics management. As a facilitator of global logistics activities, logistics villages were among the earlier solutions. The first initiatives of for the development of Logistics Centers in Europe, started in sixties and seventies, particularly in France, Italy and Spain. Logistics villages, with their differing partners, can be seen as synergy producing entities. Bentzen and at all. (2007) have given samples from logistics villages in Europe, with differing characteristics. Jorden et all. (2006), has developed assessment criterion depending upon the purpose, location, transport mixes etc. He has classified 19 different criterion in five dimensions. In Turkey, however, there are continuing efforts to establish logistics villages with similar functions as existing in Europe.

3. Comments on the Proposed Model

With this paper, three interpretative tools; a) Business clusters, b) Value chains, c) Logistics platforms have been combined in an agricultural model for horizontal collaborative studies. Surely, a case study application must follow the above model’s algorithm for the application which is the subject of a different study. This type of case study will also confirm the validity of concepts that developed from individual firm based “supply chain and logistics” models’ to “cluster type of formations of firms’ for a selected segment of agricultural sector. With this model, it is expected to better understand the factors that lead to success within the agricultural clusters. With a much better collaboration with involved partners, the joint use of scarce resources such as warehouses, agricultural equipment, transportation vehicles can be possible. Thus, additional values could be developed in local supply chains and logistics activities that constitute the core of a agricultural process competitiveness. Furthermore, these efforts will help the development of the region in terms of economical and social points. Therefore, main motive was to develop the frame of a agri-cluster infrastructure so that can achieve much better operational results from the available resources that exist in the same sector and in the same region.

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