

Multi-level analysis of value creation in supply chain management: evidence from New Zealand clusters

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Abstract

Supply chain management research frequently proceeds with little attention to the level of analysis being undertaken. Drawing from evidence from New Zealand clusters, the importance of analysis and understanding at different levels is demonstrated. In seeking to understand the role of clusters in value creation in supply chains, the capabilities present in the clusters are investigated. The analysis shows that individuals, firms, and the cluster levels are important in determining the capabilities that are leveraged by the cluster in generating value within the supply chain.

Keywords: Logistics, supply chain management, case study, multi-level analysis

1. Introduction

There has been a great deal written about the capabilities of firms - representing a collection of individuals with disparate abilities. When a firm clusters, or engages in a network, this new 'quasi firm' or 'quasi enterprise' [1] may also create, embody, and utilise supply chain management capabilities and draw on new capabilities relating to both competitive and cooperative management [2]. This article investigates how these capabilities may create value in the supply chain as it has been shown that supplier capabilities impact buyer performance [3] and small-to-medium-sized enterprises can leverage vertical and horizontal relationships to develop effective developments in the supply chain. The locus of the capability is important as it allows examination at the appropriate level. Previous research has shown that capabilities at specific levels influence developments at other levels [4]. When appropriate capabilities are examined it is necessary for an appropriate methodology and research design to be employed; examination of individuals may not capture firm-level capabilities, while seeking firm-level answers may result in missing network-level capabilities. Practically, for firms engaged in coordinated activities and operations, understanding the locus for the capabilities enables informed strategic decision making.

In order to explore and understand how the capabilities may create value over several levels of analysis several cases were explored. These cases were clusters of companies that coordinate their activities, located at the same level of the supply chain. Understanding the interactions and coordination activities within these clusters sheds light on where these capabilities can be held and the implications that this may have for the firms and the clusters.

2. Literature Review

The resources and capabilities perspective of competition perceives a firm to be a repository, or a bundle, of resources and capabilities and the differences in the possession of the resources or capabilities are used to explain heterogeneity in competitiveness [5-8]. Competitive advantage is conferred by holding capabilities that are difficult to imitate or acquire by competitors. When seeking advantage a firm must acquire or access the required capabilities, which may prompt collaborative efforts to combine complementary resources between firms when the returns justify the effort [9, 10]. The Resource Based View (RBV) of the firm contends that it is the possession of resources and capabilities that lead to a sustainable advantage as the possessor is imbued with 'organisational advantages' that enable organisation of activities in a manner that the open market cannot replicate [11], due to "the distinctive ways that things are accomplished within the enterprise" [11, p. 528]. Dierickx and Cool assert that building a capability or resource requires the presence of complementary resources or capabilities [12, p. 1508], indicating path dependency in the development that is difficult to imitate.

Cluster members seek to gain advantage through leveraging capabilities or resources within the cluster, yet outside of a particular firm, in alignment with Porter's suggestion [13]; such collaborative behaviour is a well-recognised behaviour of small firms [14]. These relationships and linkages with others in a cluster are critical, as "firms are embedded in networks of social, professional, and exchange relationships [. . .] such networks encompass a firm's set of relationships, both horizontal and vertical, with other organisations" [15, p. 203]. These relationships are an inimitable resource that can be exploited, along with a means of accessing other

resources [15]. McEvily and Zaheer [16, p. 1152] assert that “sources of competitive capabilities can be embedded externally in firms' network resources-their network of bridging ties and linkages to regional institutions.” Kogut claims that “networks constitute capabilities that augment the value of firms [. . .] It is through an understanding of networks as knowledge encoding coordination within and between specialized firms in specific cooperative and competitive structures that “missing” sources of value can be found” [17, p. 423]. Christopher and Towill claim that: “in today's challenging global markets, the route to sustainable advantage lies in being able to leverage the respective strengths and competences of network partners to achieve greater responsiveness to market needs” [18, p. 209].

2.1. Path Dependencies and Dynamic Capabilities

The notion that an entity is a bundle of knowledge with supporting processes [5, 19] is important in understanding competition. Within an industry different resources and approaches form an approach to competition, enhanced by “differing histories of strategic choice and performance and because managements appear to seek asymmetric competitive positions” [20, p. 132], indicating the importance of choices and the history associated with these choices.

Eisenhardt and Martin [21] define dynamic capabilities as “the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets collide, split, evolve, and die [21, p. 1107]. Organisational routines and capabilities can be developed and enhanced through accumulation of past experience and articulation of knowledge [22] and a capability “generally implies a set of resources and knowledge of their usage” [23, p. 219]. In this light “a dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness” [22, p. 340].

Capabilities may be a synthesis of knowledge of how to coordinate members with a history of cooperation between them. Kogut [17, p. 422] claims that “to remove a firm from this network would be to deprive it of important capabilities that it could not immediately recreate, even if it could access equally capable suppliers.” However, it may be the knowledge of how to use a resource that is critical, not the possession of the resource [23]. A resource held elsewhere in the cluster can be fruitfully utilised by specific members. Smaller firms need capabilities to reconfigure and integrate when aligning capabilities, and they need a “vision of the future is created to give a picture of what the firm will look like in the years to come” [24, p. 116].

2.2 Supply Chain Management Capabilities

Specific capabilities may be required to coordinate activities in a cluster, such as relational partnering and alliance management [21, 25] and the management of relationships in supply chains [26]. Network capabilities also include network orchestration, network visioning, net mobilisation, and net management are critical capabilities that must be developed [23]. The capabilities required at one phase of network development are likely different to those at other phases. The preparation stage and the operational stage in networks present different causes of concern [27]. The existence of the right resources and capabilities to operate effectively in a cluster may depend on the ‘right person’ and network capabilities relating to specific individuals, and the ability to switch between different modes of operation in a network, may be critical in the future [28].

Members can obtain advantage by leveraging the capabilities of other members and the ability to effectively work within the cluster itself is an important capability. Working together effectively and the ability to coordinate activities may become a shared capability of the cluster. The investigation of supply chain management practices in the context of the cluster is a valuable study. RBV offers a perspective in the examination of a supply chain management as capabilities may enhance cluster competitiveness.

3. Method

This research sought to understand how clusters created value in supply chains. To answer this question there is little guidance available in the literature, forcing the research to employ an exploratory stance. In order to better understand the phenomena a case study approach was employed. This is recommended by Yin [29] as being suitable to answer how questions. It also has the advantage of being able to provide results with a limited sample size. Chetty [30] notes that case based research may be more effective in New Zealand due to the small sample size.

Throughout the project data were gathered from publicly published documents, company documents, and from interviews. This enabled participants, actively involved in the management and day-to-day activities involved in coordination over the multiple organisations, to explain the relationships and capabilities. The clusters involved

multiple small firms. Generally only one respondent from each firm was interviewed, a senior manager who was responsible for setting up the coordination activities and managing them. During the initial phases of the research a central governing committee or executive was approached for two clusters and the offer to participate was rebuffed both times. Soon after, personal relationships were used to identify members of potential clusters and to make initial introductions. Approaching member firms of a cluster, rather than the cluster core executive/committee, allowed many firms in a cluster to be approached without being ‘locked out’ of the cluster as a whole.

4. Cases

HortCom operates in a horticultural industry and ensures the exporter members have access to adequate shipping capacity at appropriate prices. Previously, half of the members had coordinated to present a larger volume to shipping lines while negotiating rates. With the changing business environment it became difficult to secure adequate capacity on shipping lines as the peak of the horticultural season falls during NZ’s peak export period (and contributes to it). The new cluster of twelve members secured volume guarantees in excess of those offered by the original, smaller cluster, enabling negotiation with a shipping line to bring in additional ships. Another challenge is the emergence of ‘dead freight’ charges, where the members will be billed for capacity whether or not they use it, acting as a penalty for failure to meet obligations.

The firms operate over several regions and produce multiple varieties. Some years different varieties will be ready for harvest well in advance of anticipated periods, or different regions may have a microclimate that encourages the fruit there to be read earlier or later. The members face uncertainty that impacts on their ability to ensure that fruit is available when forecasted for shipping. Coordination with customers ensures that the programme of volumes and times matches the customer requirements. The shipping line required the new cluster to undergo regular and intense sessions to create a ‘cluster flow plan’ representing the outcome for the group so that the shipping line could coordinate the appropriate capacity throughout their business. The shipping line was an outside force that, based on past experience with similar groups, provoked greater coordination in the cluster.

The capability to amicably coordinate activities is impaired by a long past history and feelings of ill-will between some members. During the first year an independent coordinator was employed to ensure that the cluster had adequate volumes of fruit ready to fill the slots offered by the shipping line. This was effective for two reasons: members were busy “running” their businesses during the season peak when the coordination was required and so had no time for other activities; and the coordinator needed to be trusted by all members to provide anonymity to requests. Members were concerned that a request for different shipping capacity would be met with scorn by the other members, who may reject an offer out of spite. Working through the coordinator provided anonymity and members were accepting that the coordinator might ask them to be ‘over’ or ‘under’ the original planned volume.

Now in the second year of coordination, the cluster has eschewed the use of an independent coordinator as the position was believed to add excessive costs to the coordination process. As the shipping line maintains direct contact with the members during the season peak, the shipping line has taken over the entire coordination role, reducing coordination costs.

NZBrand has operated for ten years and aims to enter and develop new markets for the members’ products. The four firms that comprise the cluster of exporters represent the bulk of NZ’s export volume for this product. The industry is relatively new and the founding members of the cluster have a much shared experience and history within the industry. There are many industry associations linking the different tiers of the supply chain, forcing congruence of standards and practices, and encouraging mingling of individuals. This strong structure “provided a springboard” that enabled the firms to work as NZBrand.

The four firms coordinate their flow plans to service four customers in Japan. Over the season the total revenue from the NZBrand operations is totalled and divided amongst the members on the basis of volume of supply. Likewise, the costs incurred are divided on proportionately based on supply over the period. Coordination of flow plans occurs through regular contact, via telephone and email (including spreadsheet attachments) between members. There is no central hub that coordinates the activities. Flow plans are compared, contrasted, and information about the supply (passed through the supply chain from growers, to exporters) and market (from importers in the destination country) is analysed and utilised. Decisions by NZBrand require unanimity and rapid consensus.

Each member talks with the others and to discover whether there is stock within the other members’ supply chains that they are able to use to satisfy their customer demand. Various markets have different requirements,

whether these are driven by governmental forces (relating to sprays used on the fruit) or market forces (the characteristics of fruit). Access to the supply chains of other members enables a firm to better meet their customer requirements, as the cluster provides a larger supply base. As members receive an average value for each unit of fruit supplied to Japan, no matter which customer receives it, there is no advantage or disadvantage to withholding supply from others.

Specific capabilities evolved inside firms over time and now there are significant differences between members. Jobs or tasks relating to the cluster objectives are performed by the most able member. For example, the member which also exports large volumes of a range of produce has developed strong networks and abilities to organise shipping and so they arrange the shipping for the cluster. The member most able to work with foreign exchange transactions gathers the revenue from Japan, manages the exchange, and handles disbursements. The firm with the strongest marketing team works closely with customers to develop marketing campaigns. This approach allows the cluster to leverage the capabilities of individual members.

Recently NZBrand believed a member manipulated their flow plan to advantageously place fruit elsewhere, an act that damaged NZBrand's ability to work in the Japanese market. The event raised realisation that communication and coordination capabilities needed improvement to enable them to deal with opportunism in the future.

Table 1: Capabilities evident at different levels in the clusters

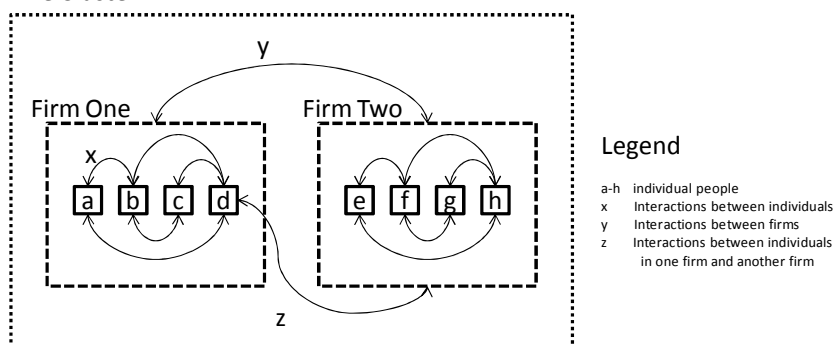
Factor	Cluster	
	NZBrand	HortCom
Competitive focus	Value and cost	Cost
Capabilities at the level of the individual	Experience and cool heads to deal with situations	Personality clash – creates difficulty in coordination of volume
Capabilities at the level of the firm	Sharing of value-creating capabilities between members	Capabilities not shared; held in silos
Capabilities at the level of the cluster	Capability to coordinate flows and activities to add value in market. Communication and aspirations ensure the capability shared by members is effective.	Coordination of volume resides in external party, either a coordinator or the shipping line.

5. Discussion

A routine and procedure is more able to be held by individuals that are close to one another and share culture. It is held at one level but becomes apparent at a higher level as it is displayed by a series of actions. The actions that an individual creates are due to their particular talents and routines they engage in. An individual can display a capability which is a series of actions based on their talents and knowledge, displaying a capability at the individual level, or they may belong to a group of individuals, in a firm, can engage in a series of actions. In **Error! Reference source not found.** this is shown as interactions between individual people, labelled 'x'. These interactions are based on effective procedures between individuals. These interactions are exhibited at the firm level as a capability of the organisation. A series of actions, between firms, can be seen to be a capability exhibited by a network ('y' in **Error! Reference source not found.**). The actions are a sequence of activities between individuals within a firm and individuals in the different firms. The presence of individuals within the firms can impact on the ability of the network to exert a capability, indicating that a level (a firm-level) can be 'skipped over' during the exhibiting of capabilities. The actions of an individual in Firm A can interact with the

actions of a group of individuals in Firm B ('z' in **Error! Reference source not found.**).

The Cluster



Legend

- a-h individual people
- x Interactions between individuals
- y Interactions between firms
- z Interactions between individuals in one firm and another firm

Capabilities can be exhibited at the individual, firm, or network level and yet are rooted within specific entities. If the capability to coordinate activities of a network is rooted within a specific entity that was to depart then the capability is lost to the network. In the case

Figure 1. Capabilities as a series of interactions at different levels

of HortCom the capability to coordinate resided within an external entity (the coordinator or the shipping line); contrastingly, in NZBrand the capability to coordinate activities resides within the cluster and is embodied by the interactions between the firms and individuals within the firms.

The capability resides in a sequence of actions between these entities, whether individuals or groups of people, and can thus reside at different levels of analysis. The capability may be exhibited at a specific level of analysis, yet it is the actions of entities subsumed by the level where the capability is exhibited at that create the capability. In **Error! Reference source not found.** the interaction 'x' is a capability exhibited at the firm-level but is a routine formed by interactions between individuals. Contrastingly, interactions 'z', between an individual in Firm One and the entity Firm Two form a capability that is exhibited at the cluster level.

Within a firm there may be two individuals with complementary capabilities. The firm leverages these individuals by allocating appropriate work to each individual to maximise the benefit that the individual can bring to the firm. Similarly, within a cluster firms exhibit capabilities that can be leveraged by the cluster, by passing work to the most able member. Sharing volumes in a cluster brings economies of scale and reduced costs, requiring the capability to aggregate volumes from separate entities. In contrast, sharing capabilities allows creation of value within the supply chain that firms cannot achieve independently. Firm A and Firm B coordinate their activities and sell a product at a price comprised of the cost to produce and ship it. The difference between the sum of these costs and the price at which it can be sold is the profit that the firms may make. Sharing volumes may aid both parties. The firm that has greater capability relating to shipping may, however, benefit only by the gain in economies of scale from clustering (Firm A in Figure 2) while the firms with less capability in shipping stand to benefit more greatly.

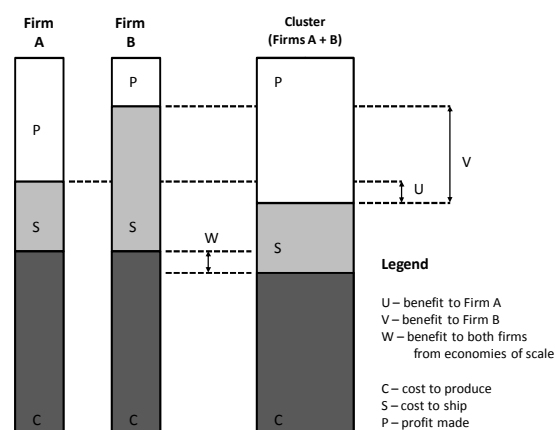


Figure 2. Benefits of working in a cluster, adapted from Figure 9.8 [31]

Firms exhibit capabilities that develop over time. Coordination of activities requires time to develop appropriate routines between firms and individuals. If the new capabilities in a network are required these might be developed between firms, or within particular firms. Most likely, they will be developed within a firm, where there are stronger ties between individuals, allowing simplified creation of the routines and procedures. If a firm is to develop a new capability they must be able to recoup the investment in the development. The firm that develops the capability requires benefit, as well as the firms that contribute the volumes required to make it work.

6. Conclusions

The question of how clusters create value in the supply chain has been addressed, focusing on the role of capabilities in clusters. During the course of the study the findings strongly suggest that capabilities may reside at different levels of analysis within the supply chain. This research is important as it complements existing understanding of capabilities and highlights the criticality of research design in supply chain management. Academics need to ensure that when investigating capabilities and supply chain management a multi-level analysis is undertaken, making it more likely that researchers uncover evidence of these routines.

Managers need to ensure that the appropriate individuals or firms in a network are retained and fully leveraged. The identification of the entities involved in a capability can ensure that appropriate measures are taken to retain the holders of the capability. This can provide significant strategic advantage through enabling reduction of costs in the supply chain and the enhancement of value.

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