How to Classify Networks: A Proposed Framework

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A characterization of supply networks is necessary and fundamental in showing the principal points of network organization that are able to be managed and which define superior performance. Although several studies have been conducted on supply chain management (SCM), academic studies provide valuable, but fragmented insight into factors linked with the characterization of supply networks. Few authors have presented models that allow effective management based on a company's position in the network.

The main objective of this work is to analyze and combine three models presented in the literature - Fisher (1997), Fine (1999) and Harland et all (2001) – and propose a more complete and dynamic framework that may help managers to understand their actual position in their network and the type of decisions they should consider if they whish to change or conquer new positions.

Keywords: Supply networks, supply network models, characterization of supply networks

1. Introduction

The dilemma of the scope of production that continues to instigate academics and companies is realizing which levels of production should be maintained internally and which should be outsourced, or in other words should be purchased from other companies. Several studies have been conducted about *make or buy* models (TUSHMAN e ROMANELLI, 1985; LONDSDALE, 1999; DISERIO E SAMPAIO, 2001), some focusing more on the transactional aspect (JONES, 2005), and others on the relationship between the levels of production and the competitive edge of the company, relating them to the *core competence* (PORTER,1996; FINE, 1999; LONSDALE, 1999).

However, another very important aspect for companies that appears not to have been properly explored in the academic literature is the model for the classification and management of the Supply Chain.

Some authors have already begun to delve into the subject of Supply Chain Management (SCM), (SNOW *et all*, 1992; HARLAND *et all*, 2001), but it seems that there is still no existing analytical taxonomic model for assisting administrators with decision making, at least not one more complete than the current models. The objective of this study is to propose an elaborate model developed from, principally, a combination of three other previous studies already recognized in the academic arena, the models being that of Harland et all (2001), Fisher (1997) and Fine (1999). The proposed model has been prepared from an inductive and deductive logic (FACHIN, 2001; LAKATOS e MARCONI, 2001), in order to reconcile the three previous models.

Harland *et all* presented in 2004 a methodological model used for the development of the conceptual model of 2001. The aim was to follow the steps of the authors, but not in such an extensive form. Initially guided by a literature review of existing models for the classification of networks, and constantly using an interpretative analysis (SEVERINO, 2002), the review culminated in the founding of the Harland et all model (2001). So, he continued to follow the previous studies of the author, and those researchers who cited the article in question as a basis for their research, until realizing the advances of the model. In addition, he began exploration of other reference points of SCM but which were not directly related to the model of Harland et all (2001).

The combination of this data resulted in the proposed model realized according to the inductive and deductive logic, as proposed by Lakatos and Marconi (2001) seeking not to limit the model, but on the contrary, to leave it generic, non applicable only to determined networks, but yes to all of them.

This study is composed of four parts, including this introduction. After the introduction, the revision of the conceptual theories and of the base thematic models will be presented. After the revision, the analysis that results in the proposition of the new conciliatory model is presented. The final item presents the conclusions and work limitations, as well as suggestions for future research.

2. Theoretical Revision

2.1. The Product/Chain Combinations

As for dynamic supply chain, Fisher (1997) suggests that the strategies should be consistent with the type of product produced. This author classifies the products in two types: the functional and the innovative. The functional products would be those that are relatively the same amongst themselves and that compete principally by price, and with a relatively stable demand and low margins. The innovative products would be fruits of research, relatively scarce and with demand less predictable, and products that can afford greater margins. For a company to attain excellence in the production of each type of product, they should align a production chain that combines with that product type.

For Fisher (1997) there exists two types of chains: the efficient chains, those that strive for minimization in the cost of production, in the waiting times and in the quantity of stock; and the responsive chains, those shaped in accordance with the market and that produce a different product regardless of the levels of efficiency and effectiveness.

For the author, there exists a wonderful alignment between the type of product of the company and the chain that it should administrate, the best combination being the innovative products with responsive chains and functional products with efficient chains. Other combinations are merely inefficient ways of production.

2.2. Network Classifications

Based on literature revisions and extensive empirical research, Harland et all (2001) proposes a taxonomic model for the supply networks based on the degree of influence of the

focal company and the dynamic of the process. There then would be four types of networks in this classification.

Companies with a dynamic network and low degree of influence will be those that need to motivate its partners and deal with the network once they cannot completely administrate it. In addition, they will seek a sharing of risks and benefits in order to reduce vulnerability to a turbulent market and a capturing of constant knowledge as a means of growth.

Companies with a high degree of influence and a dynamic supply network can better select their partners and actively make decisions once they have control of the network and its administration. The integrations are through human resources and the main innovations deriving from technological changes and the launching of new products.

Companies with a low degree of influence and whom belong to a routine supply chain are characterized by the actions of motivation and incentives of sharing risks and benefits with their partners, with integration of equipment and processing of information, thus an integration more limited than the "dynamic" type. Companies in this group deal with the network rather than manage it. Improvements are operational and not with the product.

The last group of companies is characterized by the routine network and the large influence of the focal company within the network. Through the management of the network they not only select the partners and integrate equipment, but also make decisions with information disseminated by the network. They are responsible for improvements in the processes once they are focused on operational excellence and can achieve greater competitiveness through its partners.

2.3. Evolutional Velocity of Companies

The decision to develop a network based only on what the company is essentially competent (core competence) in achieving is one of the most fundamental decisions that a company can make. The less important, or trivial activities can be outsourced as other tasks for other companies to perform. These, in turn will be able to earn more with a production in scale and reach even better costs due to the fact that they will be more efficient and with lesser costs because of their specialization and having more volume. This is explained by Fine (1999), through their searches. The company, however, must maintain the memory of production, knowing how to specify your wishes and control the performance of the company for which it has outsourced its operation.

In addition to this collaboration from Fine, he also notes that there seems to be some logic in the cyclical movement of integration and vertical organization of companies, with a constant pressure always moving the company opposite from the actual direction. The pressure from competitors who have found a special niche of the dimensional complexity of the organization and the inflexibility of large organizations are responsible for the pressures for outsourcing, or disintegration; while the technical advances and the market power of suppliers and profitability of the patented systems are responsible for the pressures of integration.

These pressures, however, are only sharply felt in some moments or phases of the life of the company. The dynamic of the market where the company is present is what determines these moments. Fine refers to this movement as evolutionary velocity. The evolutionary velocity is the average time in which companies feel these pressures for change dictated by the market. This time would be relatively short for technological companies and relatively large for commodities, for example.

2.4. The External Influences

When purposely simplifying the environment of a company to accomodate its resources and the market of which it belongs, there can be noted eight principal external factors that influence and therefore permit the companies to differentiate the way that they deal with these factors.

On the side of operation resources, there are: transaction costs, scale economies, potential of learning and deficiency in resources. In turn, on the side of the market there are: market position, market risk, market structure and behavior of the competition. (SLACK e LEWIS, 2003) The study of these external influences presented itself through the expressions of the authors in Table 1, sometimes with the same author referring to himself in both influences.

Table 1: Basis for the Analysis of External Influences

External Influences	Authors (Year)
Operational Resources	Slack, Chambers e Johnston (2002), Slack e Lewis (2003), Chopra e Meindl (2004), Pindyck e Rubinfeld (2005), Jones (2005)
Market Requirements	Lamming(1993), Lonsdale (1999), Inkpen (2001), Hitt, Ireland e Hoskisson (2005), Kotler e Keller(2006)

Source: Prepared by the Authors.

3. Proposed Model for a Dynamic Taxonomy

While analyzing the considered models, one should perceive that the Harland et all (2001) fills a gap that existed in SCM of a *framework* for the classification of networks. However, the literature revision indicates that the considered model did not evolutionize and still presents some limitations. One of the points of criticism about the model would be its punctuality of time, permitting a fixed and momentary analysis of the network in question, to the contrary of the actual market dynamics and the constant changes (to the ones that are vulnerable, mainly, the global companies).

One way to try and bring more dynamics to the model is the conjunction of itself with other analytical models of the market of networks already observed Fine (1999), about evolutionary velocity and double helix, and the Fisher model (1997) already respected in the academic arena, which allows a more dynamic analysis of networks.

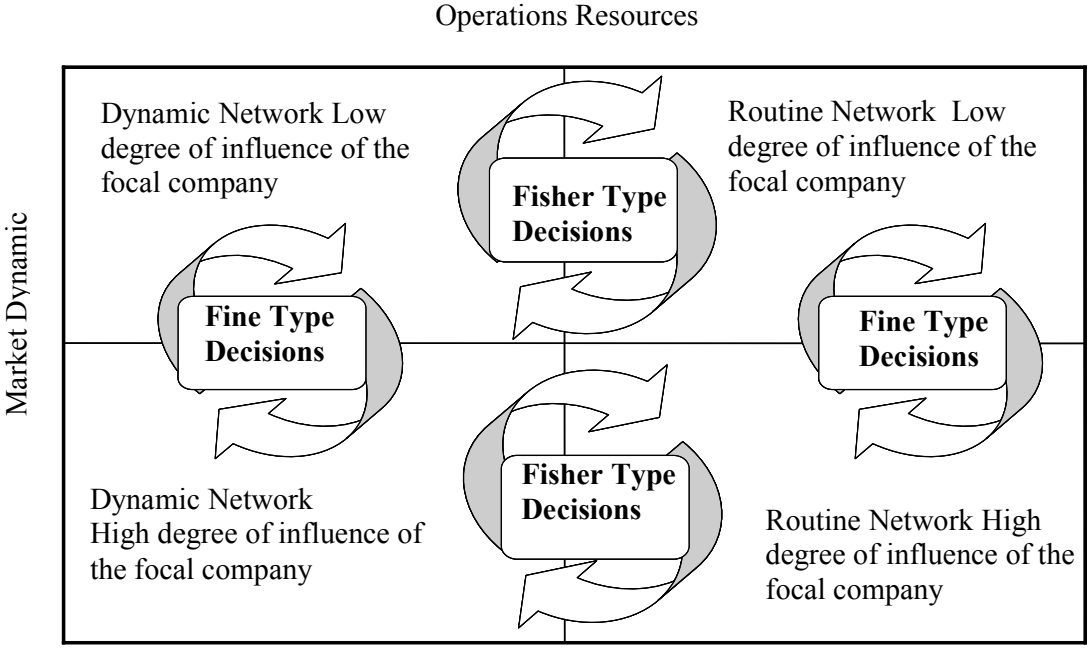
This conjunction of the models, however, is only noticeable through various points of convergence of the bibliographical revision. According to Fisher (1997), the question of efficient or responsive networks converges with the ideas of dynamic or routine networks, as according to the taxonomy of Harland et all (2001). Therefore, a company would fit into this new framework from knowing how to line up its strategical objectives with the taxonomy obtained through analysis. Just like a company that produces innovative products should not have an efficient chain, in principle, this same company should not have a network with its focus on the dynamic, but rather, on the routine.

The same congruence can be noted with Fine's (1999) double helix model. The author stresses that companies should, for their own survival, manage the network in order to produce only what is essential to them, and outsource the rest. The companies, in accordance with its own evolutionary velocity, need to know the most appropriate moments to vertically

organize and expand itself. This same type of decision seems to be present amongst the quadrants of Harland et all (2001). The authors, however, make the classification in accordance with the influence of the focal company on the network, not only limiting it to acquisitions, but also embracing the power of influence as a whole. This information and findings are seen summarized in the proposed model of Figure 1, which attempts to complete the model of Harland et all (2001).

One notices that in the drawing, divisions were realized between "Operational Resources" and "Market Dynamic," with "Dynamic/Routine Networks" landing in first place, and "Focal Companies with High/Low Degrees of Influence on the Network," as second. This division happened while seeking the utilization of a nomenclature that could embrace all of the added models, without injuring any of the logic. The considerations surrounding the "operational resources" and "market dynamic" variables were based, mainly, by the authors from Table 1. The four helixes that were added to the model, in turn, follow the classification "Fisher type decision," or "Fine type decision," once the movement of these helixes, permitting that the company changes quadrants, follows the logic of the quoted authors (FISHER, 1997; FINE, 1999).

Figure 1: Dynamic Model of Network Classification



Source: Elaborated by the authors

4. Final Considerations

The revision of literature in the area identified the existence of a recent model about the classification of networks, the model by Harland et all (2001). This model came to fill a gap in the literature of SCM, however has not yet been validated. The careful analysis of this model indicates some limitations that have possibly hindered its applications.

The present study seeks to contribute to the theoretical development of the theme, as well as its application for the practical business owner. After analyzing other models presented in the literature, we attempt to insert some dimensions that were not considered in

the model from Harland et all (2001) and that we understand are present in actual reality, like the dynamics imposed by the increasing competitiveness and globalization. In order to attend this conclusion, the present work sought to add other contributions of literature that possesses this dynamic character of the models of Fisher (1997) e Fine (1999).

The new added model was considered with the intention of making the classification of networks possible and to give insight to the project, as well as ways of administering it. In addition, the idea is that this model can stimulate and assist in the validation and evaluation of how the decisions of the Fisher (1997) type (Routine or Dynamic) and of the Fine (1999) (Horizontal or Vertical) type, apply themselves within the proposed matrix of Harland (2001). Once it knows its relative position in the model, a company will be able to prioritize its actions aiming for a strategic change within its quadrants or even at its maintenance and solidification and such, backing itself away from the helixes.

A suggestion for future studies would be the application of the proposed model, initially with the utilization of secondary data, and later, with the collection of primary data. An evolutionary study of companies throughout its entire existence, tracing the path they have covered could also contribute to the validation of the proposed model. Another possible point would be the analysis of how the tense moments, where a company was faced with the "helixes," that is, with a change of quadrants, affected its results.

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