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CONFIGURATION OF LOGISTICS ACTIVITIES ACROSS LIFE- CYCLE OF THE FIRMS AND PERFORMANCE: PROPOSAL OF A CONCEPTUAL MODEL

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In the last years, broad changes have contributed to the enhancement of the importance of the logistics as a source of competitive advantage, not just for increasing the satisfaction of the clients, but also for improving the performance of the firms. Nevertheless, the response functions of the firms to the referred changes are different according to the life-cycle stage that they face. The present paper aims to present a conceptual model that explores the connection between the life-cycle firm's stages, and the standard profile of logistics activities, and the correspondent impact on performance.

Key words: Life Cycle, Logistics, Performance.

1. Introduction

In spite of the increasing importance of the firms' growth for the economy, the development of a theoretical understanding of the growth process is a subject that requires a lot of contention. It is the own change nature of a small firm for a big firm that turns difficult the development of a theory (Davidsson, 1989). Internal organisation among small firms and big firms is so substantially different that it turns little justifiable to develop a theory of firm's growth common (Penrose, 1959; Storey, 1994). Penrose (1959) makes reference to an aspect of this internal organisation when arguing that, as a firm expands new managers need to be integrated in the organisational structure of the firm. The capabilities and the new managers' experience increased those that are already in the firm will lead to a potential expansion for the diversification in new business areas.

More generally, O'Farrell and Hitchens (1988) demonstrate that thought schools where it would be waited that explained the aspects of firm's growth (industrial economics, neoclassical economics and strategy), in fact they don't make it. These authors affirm that still an appropriate explanatory structure was not developed to analyse the growth of the firms. Still a theory is sought that comes to explain the inference of the "phenomenon" simultaneously and to answer for the main underlying processes to the growth. The organisations have the capacity to adapt to environment through adjustments in the process of strategic decision-making.

However, in the approach of life cycle this adaptation capability to the environment changes along of the time. An organisation grows from simple structure, informal for a structure more formal, complex and differentiated (Greiner, 1972; Hanks *et al.*, 1993; Ferreira, 1997). The life-cycle models are, usually, used in studies about the organisational strategies and the strategic orientation (Gupta and Chin, 1994).

In the perspective of Heskett (1977) one of the main logistics' objective is to identify the positioning of the firms, in terms of their logistics competences for to win competitive advantages and differentiate from their competitors. The life-cycle models can help to perspective the firms' growth and consequently to identify the logistics practices more appropriate in certain development stage (Mintzberg, 1984).

In this context, we intend to present a conceptual structure in order to design a model that supports and makes possible to evaluate the way as the different logistics activities are developed throughout of the several stages of firm's life-cycle, and to evaluate the impact on the performance.

The present paper attends the following structure. In the section 2, several approaches of life-cycle and their contribution are evidenced for growth and development of the several logistics activities of firm. Measures of evaluation of logistics performance are established in the section 3. The section 4 presents the conceptual model of investigation proposed for this investigation which are reflected the relationships between logistics activities and performance along the firm's life-cycle. Last, the summary and final remarks are presented.

2. Approach of the Firm's Life-Cycle and the Logistics Activities

Several approaches have been proposed in the attempt of investigating the growth process. McMahon (1998) refers four main types of approaches:

- (1) Personality approaches that focus in the impact of the entrepreneur's personal characteristics;
- (2) Businesses administration approaches that emphasize the factors that affect the firm's performance in the market, particularly the financial performance;
- (3) Industry approaches focus more in the influence of the external factors than in the individual characteristics of the firm;
- (4) Organizational development approaches presented by the nominated life-cycle models or growth stages.

The life-cycle models have getting popularity, due to: (i) the capacity to predict the structural effects in the several stages of organizational development; (ii) the possibility to be tested and operationalised empirically (Miller and Friesen, 1984; Smith *et al.*,

1985; Dodge and Robbins, 1992; Hanks *et al.*, 1993; Ferreira, 1997) and (iii) the possibility of the researchers explore the way organizations behave in choice of generic strategies in the different stages of development (Gupta and Chin, 1994). The convergence of operationalisation of the methods will go, definitively, to improve the validity of organizational life-cycle as construction and to allow this to be applied in several contexts.

In reviewing literature on the firms' life-cycle it was not found a definition of stage in an explicit or adequate way. Nevertheless, several descriptions of stages were explored, in the attempt of obtaining one definition. Several investigators (Quinn and Cameron, 1983; Miller and Friesen, 1984; Smith *et al.*, 1985; Adizes, 1991) refer explicitly, in their models, to life-cycle stages, while others use terms, such as growth stages (Galbraith, 1982; Kazanjian, 1984, 1988; Scott and Bruce, 1987) or development stages (Galbraith, 1982; Churchill and Lewis, 1983; Quinn and Cameron, 1983).

However, it seems consensual among investigators of the area that the changes in an organization follow a predicable pattern, that it is characterized by different development stages. These stages are defined as: (i) a sequence of events that describe the changes along the time (Dodge *et al.*, 1994); (ii) a hierarchical progression that it is not easily reversible (Greiner, 1972); (iii) a set of structures and organizational activities (Quinn and Cameron, 1983).

Although several references to the definition of life-cycle stage being defended and proposed by several investigators, the definition stays, still, unclear and generic (Hanks *et al.*, 1993; Ferreira, 1997). In the present study, the life-cycle stage is defined only as a configuration of variables related with the context and the organizational structure. Definition this also supported by Galbraith (1982), that used the configuration term to characterize the transition from one stage to another.

In the present study, the life-cycle model adopted is the recognized model for Hanks *et al.* (2003) and Ferreira (2003). This model results of a synthesis of the reviewing literature about life-cycle and support the following development stages: (i) Star-up; (ii) Growth; (iii) Maturity; (iv) Diversification; and (v) Decline.

Several researchers have been trying to correlate the concept of organizational life-cycle to the firm's structure (Scott and Bruce, 1987; Hanks *et al.*, 1993), to the strategy (Chandler, 1962; Hofer and Schendel, 1978; Miles *et al.*, 1993), to the environment (Miller and Friesen, 1984; McDougall and Robinson, 1988; Miles *et al.*, 1993), and to the logistics (Heskett, 1977).

According to Heskett (1977), the correlation between strategy and logistics appears because one of the main objectives of the logistics is to identify the way firms can allocate their logistics competences in order to win competitive advantages. For this author, logistics should be seen as an essential part of the strategy once through logistics the firms become differentiated from their competitors and to guarantee the success of their performances, in market each more dynamic and more global.

Gupta and Chin (1994) suggest a model of organizational development which establishes a dichotomy between organizational life-cycle and others management areas in order to understand the process of organizational adaptation. The organizational effectiveness, the strategic orientation, the structure and the organizational politics have been analysed to highlight the life-cycle models. Also, the way as logistics activities are developed can be analysed according to life-cycle theory. According to Heskett (1977) the changes at the internal and external environment to the organisations influence the life-cycle, impelling the transition from one stage to other. This can originate threats for the existent logistics practices or to create opportunities for growth and diversification, because most of the time the transitions from one stage for another emerge from intrinsic pressures (Mintzberg, 1984).

One of the suggested variables for Miller and Friesen (1984) to explain the differences from stage for another one it is the strategy. Thus, if the stage transition for another one is influenced by strategies and, the logistics constitutes a powerful instrument, in strategic terms, this indicates that logistics can be a key factor for the possibility of organisations transit from one stage to another. If the logistics be seen as an integrated system, mainly to the level of the physical and informational flows, can help the organizations so much to maintain in certain stage as to pass to the next stage.

However, considering that logistics has larger impact in the organisations that present a larger complexity, this will help the organisations that meet in the growth, maturity and diversification stages, where the processes are each increasing more complex, due to the evolution and growth of the same ones.

Taking into consideration that lack of planning and organisation is one of the problems of the growth stage (Galbraith, 1982; Churchill and Lewis, 1983; Kazanjian, 1984; Scott and Bruce, 1987) to develop more efficient systems for the survival of the firms. In this sense, adoption of efficient logistics practices, at the level of storage and handling of materials, it will constitute a source of competitive advantage that it will help the organizations to transit from growth stage to maturity stage.

According to Adizes (1991) organizations in the maturity stage have already a stable position and also some safety in the market, provoking in these organisations one passive situation. This way, it is attended the loss of some creativity, innovation capability and implementation of changes, what it can take to the failure of the organizations. In this context, the logistics can give an important contribute, for example, in the simplification of the flows of information and circulation of the goods and/or services, as well as in the introduction of innovative and more creative processes. Besides, efficient policies of production, marketing and sales always support the efficient use of the logistics practices (Bowersox and Closs, 1996).

In this sense, it's impossible for firms to sell large quantities of their products/services and put them in the right place and at the right time if they don't have a good system of transport, warehousing, inventory control, order processing and information management

(logistics activities). The way logistics activities, in general, and the warehousing and handling activities, in particular, are performed, may contribute to extend the maturity stage of the organizational life cycle. In this context, Heskett (1977) refers that the increase dimension and complexity of businesses processes in the maturity stage, conjugated with the technological advances, could lead to uncommon logistics reactions in order to attain differentiated advantages in the market, widen this stage maturity.

In the diversification stage, characterized by a large diversification and expansion of the product/market, the logistics function has also an important role in making organizations more flexible. More, in this stage there is an enhancement on sophisticated control and planning systems.

In general terms, logistics activities are all those activities that firms appeal to support their production systems, that is, are activities related with purchase, handling, warehousing and delivery of materials and final products through the supply chain (Ratliff and Nulty, 1996).

A diversity of logistics activities could be find on literature, such as: production scheduling (Cilliers and Nagel, 1994; Langley and Holcomb, 1992); routing (Porter, 1985; Eibl *et al.*, 1994); (3) shipment consolidation (Dapiran *et al.*, 1996; Lieb, 1992); tariff negotiation (Dapiran *et al.*, 1996; Lieb, 1992); (5) packing (Cilliers and Nagel, 1994; Robles, 2000; Langley and Holcomb, 1992); (6) handling (Cilliers and Nagel, 1994; Dapiran *et al.*, 1996); (7) picking (Cos and Navascués, 2001); (8) orders processing (Cilliers and Nagel, 1994; Halley and Guilhon, 1997; Razzaque and Sheng, 1998); (9) customer service (Lambert and Stock, 1999; Lambert *et al.*, 1998); (10) transport (Cilliers and Nagel, 1994; Halley and Guilhon, 1997; Razzaque and Sheng, 1998; Laarhoven *et al.*, 2000) and; (11) logistics information systems (Dapiran *et al.*, 1996).

Given to immense difficulty in study all these activities in simultaneous, we opted by focus just about the logistics activities related with the warehousing and handling activities because are these activities that seems to have more impact on the firm's performance (Azevedo, 2004). So the logistics activities, object of this paper, are: (1) inventory control; (2) warehousing; (3) picking; (4) packaging; and (5) handling.

(1) *Inventory control*: this activity consists in controlling the level of existences in warehouse, having in mind, the reduction of the costs associated and the elimination of all possible sources of wastes (Burman, 1995). In order to reach these objectives, there are several models that may be adopted by firms, namely: the Economic Order Quantity (EOQ) (Tersine, 1988), the Material Requirements Planning (MRP); the Distribution Requirements Planning (DRP) (Tersine, 1988; Perry, 1988) and, the Continuous Replenishment System (LaLonde and Masters, 1994; Bowersox and Closs, 1996).

- (2) *Warehousing*: As regards warehouses they are seen by managers as a necessary evil and being so, they are neglected by firms. However, actually, the situation tends to invert. In fact, we assist on an increasing recognition of the true impact that a good warehouse management could have on the firms, in particular on aspects such as: a better usage of space, less handling of products, easier access to products, easier inventory replacement and, easier inventory controls (Sykes, 1994).
- (3) *Picking*: this activity consists in the preparation of the orders from items in stock (Peterson, 1997). The main tasks developed in this activity are: identification, selection, taking out and aggregation of items in quantities required by customers (Coyle et al., 1996; Cos and Navascués, 2001); position and recognition of stocks; and also the getting instructions (Hatton, 1997).
- (4) *Packaging*: *Packaging*: the packing aims to protect the physical conditions of products (Bowersox, 1978; Jonhson and Wood, 1993; Lambert and Stock, 1999), the decrease of outputs size to facilitate the development of handling activity (Lambert and Stock, 1999), and to interface two parts (Rod, 1990).
- (5) *Handling*: is an activity developed inside warehouses with the application of a set of handling equipment which aims: (i) to control the flows and storage of raw-materials, parts and final products that go to warehouses and that move between the several warehouses that belong to the same enterprise (Bowersox, 1978); (ii) to eliminate handlings that are unnecessary; (iii) to minimize the distances of moving inside warehouses; (iv) to guarantee an uniform flow without broken; (v) to minimize losses because of wastefulness; (vi) to avoid breakings (Tersine, 1985); (vii) to decrease the operational expenditures and; (viii) to decrease works' accident (Lambert and Stock, 1999).

3. Performance Measures of Logistics Activities

As regards performance, there are several measures that could be used to assess firm's performance. Some of those measures, which could be found on literature, are: (i) customer satisfaction (TRILOG, 1999; Fawcett and Cooper, 1998); (ii) time (Keebler *et al.*, 1999; Chow, *et al.* 1994); (iii) flexibility (Lambert and Stock, 1999; Samaras, 2000; Pfohl and Hoop, 1995); (iv) costs (Fawcett and Cooper, 1998; Daugherty *et al.*, 1998; Boyson *et al.*, 1995; Dias, 1999; Carvalho, 1995); (v) quality (Mentzer *et al.*, 1999; Sohal *et al.*, 1999; Samaras, 2000); (vi) productivity (Lambert and Stock, 1999; Bowersox *et al.*, 1999; Carvalho *et al.*, 2001); and (vi) efficiency (Neven-workgroup, 1989; McGinnis and Kohn, 1993; Cooper *et al.*, 1993).

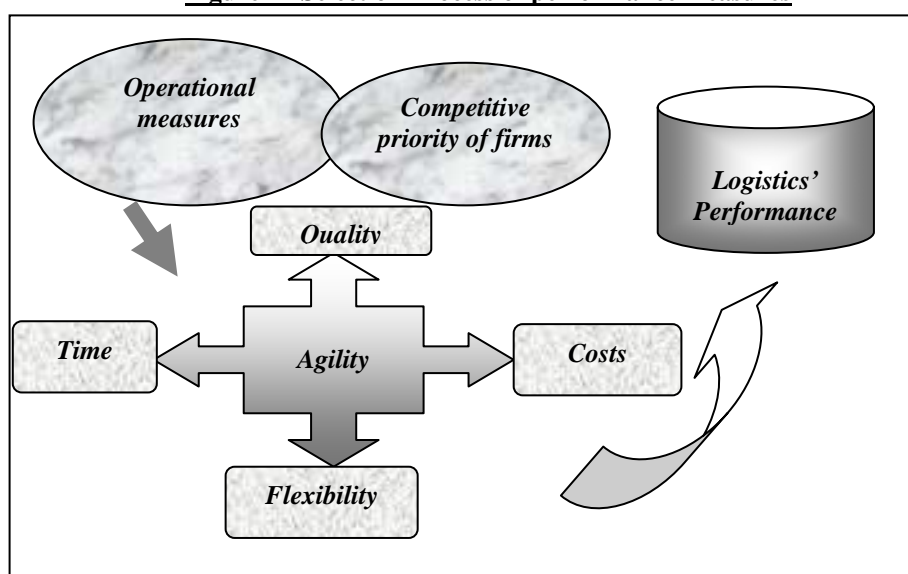
The choice of them could be done attending to many factors, for instance: the key success factors (Cavaco and Themido, 2000); the strategy followed by firms (Carvalho *et al.*, 2001; Kellen 1992); the logistics targets (Van Amstel and D'Hert, 1996; Bowersox and Closs, 1996; Neven-workgroup, 1989); the logistics priorities defined by firms (Fawcett and Smith, 1995) and; the competitive priorities of firms (Carvalho *et al.*, 2001).

According to Cowen *et al.* (1984) the strategy, the structure, the goals and methods followed by firms are different in each stage of the organizational life-cycle. The firms should be managed with specific competences, in order to fulfil, successfully, all the requirements of each growth stage.

With several kinds of performance measures proposed, what are the measures that firms should use? In order to answer this, Keebler *et al.* (1999) propose a set of measures considered as basic and essentials, apart from the kind of firm and the logistics strategy (low cost strategy, product innovation, customer service leader). These measures are: (i) the time; (ii) the cost; (iii) the quality and; (iv) others that were designed by of support. Following a similar position Christopher (1998) considers that the time, the cost and the quality are three key performance measures that should make part of any performance measurement system in the logistics field. This is because these kinds of measures contribute more than proportionally to the success or failure of firms on the market. They are in fact the expression of the following philosophy: “better, bigger, faster and cheaper”, that is to say, better customer service, with shorter lead times and with low costs. Being so, and attending to several researchers, we choose to use, in the selection of performance measures, the following factors: (i) employment of realistic measures, comprehensible and integrators measures; (ii) preponderance of operational measures, directly related with logistics; (iii) measures that appeal to all logistics process; (iv) the competitiveness priorities of the firms.

In this context, it was selected the new competitive priority named by agility. The agility is considered as one of the most important variable in logistics (Carvalho, 2001) and is translated by the cost, the quality, the time and the flexibility. These four performance measures are also proposed by Keebler *et al.* (1999), in a context of measuring the performance of the logistics processes. Besides, Christopher (1998) argues that the time, the cost and the quality are key measures of performance that must take part of any logistics’ performance measurement system. In order to analyse the logistics responsiveness of firms to the environment, four measures and the correspondent indicators should be used to evaluate the agility of the firms, in terms of the definition of their competitive priorities.

Figure 1 – Selection Process of performance measures



Source: Elaboration of the authors

Once chosen the performance measures, it is important to decide about the indicators associated with each measure. According to the reviewing literature, we propose the indicators presented below at Table 1.

Table 1 –Performance Measures and indicators proposed

<i>Measures</i>	<i>Performance indicators</i>	<i>Authors</i>
Cost	Cost of satisfying customer requirements	Keebler <i>et al.</i> (1999)
	Cost with continuous improvement philosophy	Lambert and Stock (1999)
	Cost with safety stocks	Lambert and Stock (1999)
	Cost with reverse logistics	Bloemen and Petrov (1994)
Quality	Customer satisfaction	Chow <i>et al.</i> (1994); Mentzer, Flint and Kent (1999); Keebler, <i>et al.</i> (1999)
	Quality of information available	Bowersox <i>et al.</i> (1999); Sohal <i>et al.</i> (1999); Fawcett and Cooper (1998); Garver e Mentzer (1999)
	Stockout level	Sohal <i>et al.</i> (1999); Garver and Mentzer (1999)
	Percentage of orders fulfilled	Bowersox and Closs (1996)
	Percentage of orders without quality problems	Sohal <i>et al.</i> (1999)
	Correct billing	Dias (1999); Fawcett and Cooper, (1998)
Flexibility	Number of changes accepted by order	Neven-Workgroup (1989)
	Responsiveness to customer requirements	Pfohl and Hoop (1995); Fawcett and Smith (1995)
	Logistic system responsiveness to special orders	LaLonde and Masters (1994)
	Logistic system responsiveness to the instability of environment	Beamon (1999)
Time	Delivery Lead time	Fawcett and Cooper (1998); Boyson <i>et al.</i> , (1995); Pfohl, (1997); Bowersox, <i>et al.</i> (1999); Dias (1999); Carvalho <i>et al.</i> (2001)
	Order cycle-time	Keebler <i>et al.</i> (1999)

Source: Elaboration of the authors

4. The Design of the Conceptual Model

In this item we propose a conceptual model, where we identify the relationships between the several logistics activities of a firm, and their impact in terms of performance, in a firm's life cycle approach.

As previously preferred, the present paper is focused on the logistics activities that are related with storage and handling of materials. Thus, the logistics activities that are considered in the present proposal of conceptual model are: (i) The inventory control; (ii) the storage; (iii) the picking; (iv) the packing; and (v) the handling of materials. The adopted life cycle model is constituted by the following stages: (i) the Start-Up; (ii) the Growth; (iii) the Maturity; (iv) the Diversification; and (v) the Decline.

4.1. The Inventory Control

In the reviewing literature about logistics activities, the inventory control is associated with the following performance measures: (i) Costs; (ii) Quality; (iii) Time; and (iv) Flexibility.

In the vision of Burman (1995), the influence of this kind of activity on the level of costs, is due to the fact that the inventory control aims, fundamentally, to maintain a low level of existences, and to provide the elimination of all the possible sources of waste, in order to decrease the supported costs, and this way, reaching an higher efficiency. Furthermore, an optimal control of the existences provides to the firms the possibility to maintain a certain level of existences, and to react more easily to the market evolution. Besides that, it will be possible to surpass the time differential that exists between the producers and the consumers, and also to support the implementation of just in time programmes, which should embrace suppliers, sellers and customers (Lambert and Stock, 1999).

The logistics activities not only impact on the costs, the flexibility and the time, but also on the global quality of the logistics service, which, for its turn, may be influenced through the process of controlling, and more specifically, by the level of available existences (Closs and Thompson, 1992). For the authors, this is justifiable by the fact that logistics has the mission of delivering products and services to the customers, when, where and how they intend to access it. This is also related with the range of the referred mission, the level of available existences, and the consequent level of satisfaction of the customers. Thus, it can be suggested that the performance of the logistics activities, and the process of controlling existences, is, positively, related with the global level of performance of the firms, in terms of costs, flexibility, and time.

4.2. The warehousing

The warehousing, as a logistics activity, in the literature is, usually, associated with time, flexibility and costs. According to Kaplan (1983), this is related with time, since the maintenance of stocks in warehouse make possible to the firms have always available products, by diminishing the delivery lead-times. Additionally, it is related with flexibility, because the maintenance of stocks provides a larger operational flexibility, which may contribute for a quick response capability, to the clients' requirements (Bonney, 1994).

Nevertheless, in the perspective of Prince (1998), the way how the warehouses are managed may contribute for the reduction of operational costs and execution times in logistics. Thus, the use of Integrated Warehouse Management Systems in order to improve its performance is suggested.

4.3. The Handling of Materials

The way this logistics activity is developed, it appears to influence the performance, especially, in terms of costs, time and quality. Some authors (Tersine, 1985; Goldratt and Cox, 1993) consider the handling of materials as an activity that does not contribute, strongly, for the value added. This way, its impact should be minimized, through the optimization both of the layout of the warehouses, and the products flow. This allows the firms to reduce the number of operations and movements of materials, whereas the associated cost is also reduced.

According to Tersine (1985), the guidelines for developing this kind of logistics activities concern to the elimination of the dispensable operations, the minimization of the distances, and the establishment of a uniform flow of goods without jams. Giving the due importance to these guidelines, the firms will be able, on the one hand, to minimize the time dimension time of the logistics' performance and, on the other hand, to increase the quality of the supplied service, by assuring a smaller level of losses and wastes associated with the products, during the handling and the movement of the products. From the previous statements, it results that the performance of the logistics activity that embraces the handling and movement of products is, positively, related with the global performance of the firms, in terms of costs, time, and quality.

4.4. The Packing

The literature of reference stresses that the packing activity influences the measures of performance: quality and time. One of the main functions of this logistics activity is to provide the packaging of the products. The industrial packing presents, in physical terms, two essential functions, i.e., to facilitate and to minimize the time of execution of the activities of handling and movement of the products, and to protect the products against damages (Bowersox, 1978; Johnson and Wood, 1993).

According to Tracey (1998), this activity contributes to the increase of the quality of the logistics service, by providing the best conditions in the reception of the service, from the part of the customers. For its turn, this generates a feeling of satisfaction relative to the quality of the delivering service (Lancioni and Chandran, 1990). In this sense, we expect that the performance of the packing logistics activity is, positively, related with the firms' global performance, in terms of quality and time.

4.5. The Picking

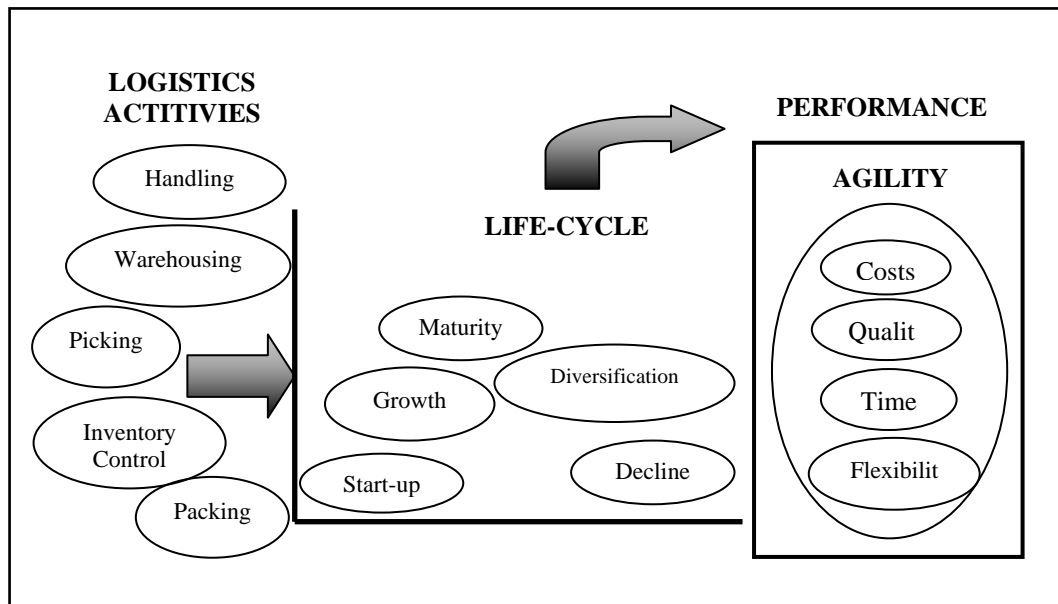
The picking activity seems to exercise some influence on the logistics' performance of the firms, in terms of time.

Coyle *et al.* (1996) state that the picking activity, when it is developed by making use of systems with automated equipments, it allows to decrease the lead time of the requests. In this sense, we expect that the picking logistics activity is, positively, related with the performance of firms, in terms of time.

4.6. The proposal of Conceptual Model

From the previously identified relationships, which embrace the several logistics activities and the correspondent measures of performance, the proposal of conceptual model corresponds to the one that is presented in the following Figure 1.

Figure 1 –The impact of logistics activities on the performance of the firms, according to the life cycle



Source: Elaboration of the authors

This study presents two important contributions for the literature. In the first place, by making use of the firm's life cycle approach, a methodology to test, empirically, the relationships between several logistics activities and the performance of the firms, is proposed. This approach is used, since it allows to understand better the growth problematic, and of its effect on the firms' activities.

The configurations of the logistics activities and of the development stages that were incorporated in the present proposal of conceptual model represent a key construction for future researches. The empiric application of this model, to different samples, can be systematically, explored and improved through the inclusion of relevant relationships.

In the second place, the design of the conceptual model constitutes itself a basis to delineate future studies. The model reveals and systematizes some relationships between the stages of the firms' life cycle, the logistics activities (the handling of materials, the packing, the storage, the picking, and the inventory control), and the firms' performance, in terms of costs, quality and flexibility. The formulation of a conceptual model that helps to validate, empirically, the relationships previously identified, represents an important contribution for knowledge even so a significant amount of work still remain to be done.

First, it's necessary to develop empirical studies in order to ratify or modify the relationships of the configurations of the organizational logistics activities, along the life cycle.

Second, several studies to identify the internal changes that occur in the firms, must be performed. These studies could provide additional information about the choice of the adequate variables to analyze the impact of the performance of the logistics activities, taking into consideration the stages that are faced by the firms, along their life cycle.

Third, in order to generalize the conceptual model now proposed, it is necessary to test it, empirically, and to apply it to the firms in different stages of the life cycle. How logistics activities are related with the strategic guidelines or the problems faced by the firms? This open problematic reveals the need for delineate a typology about the classification of performance measures, which should be intended as the basis for developing future studies about the way logistics activities are developed along different stages of the life cycle of the firms.

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