Successful distribution center strategy without breakthrough technologies in retail grocery ⋆

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Abstract: The retail grocery store service level has been considered a key element to attract and keep customers. Several studies have investigated the vertical integration between companies and the supply chain management aiming at improving the level of service offered to the customer. Nevertheless, the internal logistic integration is still being investigated and the profit potential has yet to be developed mainly regarding retail grocery stores. Hence, this study aims at analyzing the internal distribution of two supermarkets, a regional retail grocery store chain, and a local supermarket. The results indicate that the smaller the company, the less controlled the operation is. The lack of performance indicators can hide losses. These findings indicate that further research is needed in order to understand better this kind of company and provide companies with simple and low cost management tools.

Keywords: Supermarkets, logistics, logistics data processing, retailing, food industry.

1. INTRODUCTION

Due to the intense global competition and technologic advances, logistics has played a fundamental role in entrepreneurial business management. Hence, the customer satisfaction is a key element in today's market and includes product availability, efficient and fast delivery, among other things. Thus, companies intend to find means of improving logistics performance and reducing its costs (Belfiore et al., 2006). The small contribution margins and perishable nature of many of their products make efficient supply chain management extremely important for food companies (Stank et al., 1999). Infrastructure and transportation problems in India also has made supermarkets keep products in stock for 45 days, compared to 14 days in Thailand and one to two days in Europe (Kumar, 2008).

An analysis of the cases studied shows a contrast. The regional retail grocery store chain keeps the products stored in the store for one day only, just the time for the next delivery, while the local supermarket (or local grocery store) keeps a thirty-day stock for most of the imperishable products. Due to such a contrasting reality in the same region, this study aims at comparing the internal distribution of a local supermarket, in the city of São Carlos(state of São Paulo), with a regional retail grocery store chain in the city.

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This article is divided into five sections. In the first section, a literature review is presented. The following three sections regard the research methods, main empirical findings, and empirical findings analysis, respectively, comparing the literature with the empirical results of this research. The final section deals with the conclusions.

2. LITERATURE REVIEW

A customer service program has to identify and prioritize all the requests in order to satisfy the customers' logistic demands as highly as or even more than the competitors. When establishing a customer service program, it is essential to define clear performance standards for each activity and measures for those established standards (Bowersox et al., 2006).

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Jones (2001) compared supermarket performances to those of automobile manufacturers. Nissan experiences approximately 150 failures per 1,000,000 parts. Assuming a typical supermarket basket of 40 items, each with a 99% availability, the customer has only 66% chance of receiving all the items ordered. Even worse, if you only have 66% chance of getting what you wanted in one order and you do not like the selection of alternatives, the probability of getting

Fig. 1. Basic performance activities of market distribution (source: Bowersox et al. (2006)).

exactly what you ordered over four weekly orders falls to 19%. Within three months, it falls close to zero. If Nissan's supplier performance was achieved by a grocery industry, basket fulfillment for one order would be 99.4%; over one month it would be 97.6%; and over three months, 93%. The author concluded that at this level you can start to build a continuing relationship with satisfied customers.

The performance comparison between the grocery store sector and automobile industry indicates the potential yet to be explored. Market distribution operations are related to processing and delivering purchasing orders to clients. The basic market distribution performance cycle, from a logistic point of view, connects the supply chain to the final customer as shown in figure 1.

Although the activities in figure 1 are known, they have been frequently studied (Collins et al., 2001; Kumar, 2008) in the logistic and retail fields since they influence directly the level of service provided to customers. The level of service is often measured based on the order cycle length, taxa de atendimento de linhas, the order fulfillment rate, or any combination among them (Bowersox et al., 2007).

An identification of the elements of customer service provides a basis for measuring it. The degree of importance attached to any of the elements associated with customer service varies from company to company depending on the customer needs (Collins et al., 2001). The elements of this study are associated to the internal distribution logistic of the basic market distribution performance activities, 1) Customer order 2) Order Transfering; 3) Order Processing; 4) Order Selection; 5) Order Shipment; 6) Order Delivery. In this specific case the client is the store.

Several components affect the time factor. These include order processing, order transferring, and order shipment. Effective management of these activities will ensure that order cycles are of reasonable length and consistent duration. Information technology, particularly EDI, can contribute significantly to improving the time dimension of customer service (Collins et al., 2001).

A supply chain management strategy, which attempts to address the inefficiencies that have led to excessive inventory and unnecessary costs at all levels within the grocery industry supply chain, is the Efficient Consumer Response (ECR). This ECR initiative is concerned with transforming the grocery supply chain from a "push system" to a "pull system" - where trading partners form new alliance relationships and the replenishment of store products is initiated by the point of sale data (Harris et al., 1999). The key purpose for launching ECR is to create a seamless chain where the key driver is the continuous flow of information and the dedicated focus is on the final consumer (Zairi, 1998).

Overall market size also affects the ability and necessity of an effective ECR system. In New Zeland, for example, the size of the market allows for a less complicated system. The efficiencies enjoyed in a successful ECR program can be achieved through effective category management (Sankaran, 1998 apud Kumar, 2008).

Another relevant aspect when aiming for efficiency is using performance measurement. Measuring performance is essential for any kind of organization since it enables proper evaluation of services and logistic operation costs in a supply chain (Griffis et al., 2007).

Performance measurements will affect the logistic success if the logistic system is adequately understood and applied, and its results are presented (Fawcett and Clinton, 1996). Companies and administrators should be prepared to identify and select new or different measures based on organizational priorities (Griffis et al., 2007).

The challenge to administrators of this new entrepreneurial concept is to develop proper performance measurements and indicators, so decision-making can contribute to improve organizational competitively.

Lebas (1995) argues that different measures should be introduced for different users. For information users, such as managers and analysts, the purpose is learning and self-evaluation; for partners, the measures are intended to activities coordination and continuous improvement; for supervisors and high ranked managers, local metrics measures should be integrated to generate wider and aggregated ones to monitor the assigned activities. This performance measurement characteristic analysis and its correlation with different users and purposes are equally important when dealing with logistic performance.

A system to evaluate the logistic performance should provide primarily a functional perspective. Besides the basic functional performance, the improved methods to evaluate customer services have warranted attention in many corporations. The logistic performance measures implemented can be classified as follows; (1) customer service; (2) costs; (3) quality; (4) productivity; (5) assets management (Bowersox et al., 2006).

The use of logistic performance measures has recently been the object of study, such as the model proposed by Aastrup et al. (2008) which structures and links different types of ECR measures; a number of EDI standard messages is hardly an aim in itself but a means towards an end such as reduced administrative costs and more reliable order procedures. The common aim is to reduce costs along the distribution channel, preserving unchanged, and when possible increasing, the customer service level. The improvement, which implies the complete re-engineering of the chain, involves all the activities of the logistics process which more directly contributes to the total distribution costs and to the creation of the customer service level (Caputo and Mininno, 1998).

3. RESEARCH METHOD

The applied research design was a multiple case study in a qualitative approach. Such design emphasizes the perspective of people involved with research issues, the description

of context where the studied phenomena happens and the time line of events (Yin, 2003; Bryman, 1989). One remarkable characteristic of qualitative approach, as well as the case study method, is the flexibility in carrying out the investigation based on observation, interviews and document analysis (Bryman1989). However, the choice of a multiple case study was due to difficulties of studying deeply an insightful case applying a longitudinal method. There are benefits of carrying out more than one case study, such as greater number of results and choice of companies with different level centralization. The selected companies for carrying out the case studies are a important regional retail grocery store chain and a local supermarket, located in the State of Sao Paulo, Brazil. One large while the other is a medium-sized company. In the following sections, the studied companies will be named *Company A* and *Company B* to follow the companies' privacy policies.

4. MAIN EMPIRICAL FINDINGS

4.1 Company A

Company A is an entirely private capital company which started its operations 44 years ago and nowadays employs around 2,200 people in its 29-store network. The interviewee, a staff member, was the manager of the distribution center 1 (DC1), who is responsible for the distribution of the dry and frozen line items.

Table 1. *Company A* features

Feature	as is in *Company A*
Number of stores	29
Number of employees	2,200
DC actuation range	150 km - 29 stores in 15 cities
Fleet of trucks	Divided in DC1 and DC2
DC1 (dry, fresh and frozen lines)	Owned fleet of 26 trucks
DC2 (Fruits and Vegetables)	Owned fleet of 12 trucks
Items centralized into the DC	95%
Number of items per store	10,000 to 12,000 items

Company A products reception is centralized in two distribution centers, herein referred to DC1 and DC1, as illustrated in figure 2. DC1 is responsible for the reception, storage, and redistribution of dry, fresh, and frozen items. DC2 is responsible for fruit and vegetable (FV) items. Only DC1 activities were detailed. The products reception in DC1 happens at night, so it does not interfere with the store distribution activities. All orders received up to 12 am are delivered the next morning. Orders received in the afternoon are separated the next morning and delivered to the sores on the next afternoon. The standard DC1 operation delivers 45 shipments per day, from Monday to Friday, so that the reposition of any item is accomplished in no more than 24 hours.

Nevertheless, some operation features are noteworthy due to the way they occur. The activities of the internal ordering cycle are shown in figure 3. Some of them are in automation process. Currently, 20 stores of *Company A* process orders electronically, whereas 9 still do it manually using paper notebooks. Products are grouped into categories; each one is reported in a notebook, totalizing 100 volumes. Notebook processing follows a predefined schedule which ranges from daily (stores request every day) to weekly frequency. Notebooks with orders need to be given to the truck driver by the time the former shipment is being received in order to assure that the requested items are delivered to the store the next day. The products sort is slow because each picker needs to leaf through the notebook so as to identify what is being ordered. A manually written list is also prepared with the items that of the stock replenishing. The 20 stores which implemented electronic ordering, in turn, can deliver the order no later than 12pm. In these cases, an information system computes the product volume and lists the items that should form a roll container following order in which the items are disposed in the supermarket. Groceries in the warehouse are organized following the same order they are organized in the store so that a roll container loaded in the warehouse can have its path optimized when it is being unloaded for product replacement in the store gondolas. Having produced the list of items per roll container, the system also generates a list of items that are to be delivered to the pickers. Departure and return time of the picker is registered so that it is possible to estimate the list separation time, which may vary according to the product category and it is usually around 8 and 10 minutes on average. The loaded roll containers are brought to the conference area. After all items are separated, the area is closed and the items of each roll container are inventoried with the aid of a bar code collector which holds information about the items allowing discrepancies to be corrected. This checking confronts to list that the pickers return when the item separation is completed. With this comparison, it is possible to measure the picker error rate. The area is then released and all roll containers are put in the truck which is also released. The network knows the average trip time between the DC1 and the stores. Every shipment has an expected departure time and an arrival time with a tolerance of 15 minutes. The unloading of the roll containers from the truck to the store warehouse takes 30 minutes. The return items include devolutions, empty disassembled roll containers, and coolers used to transport frozen items from the DC1 to the stores. The use of the roll containers for the distribution of items in the gondolas is allowed after the truck is released to return to the DC.

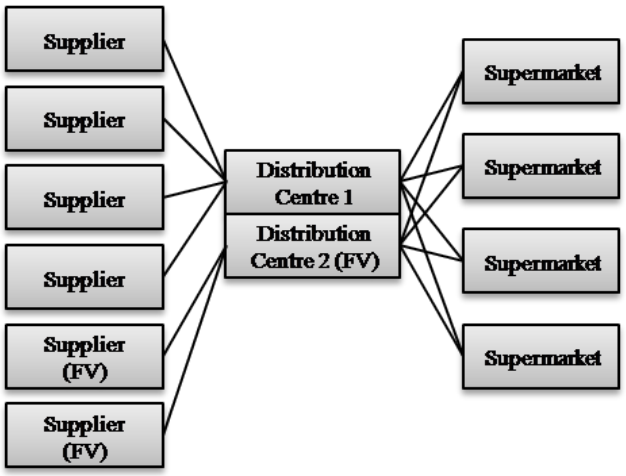

Fig. 2. *Company A* centralization model.

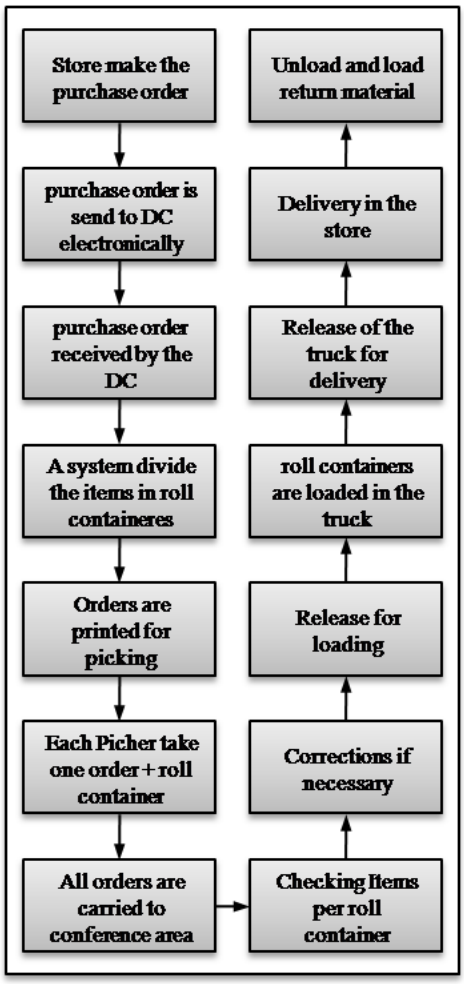

Fig. 3. *Company A* internal order cycle store-DC activities

4.2 Company B

Company B is an entirely private capital company which started its operations 68 years ago and nowadays employs 176 people in its 2 stores. The interviewee, a staff member, was the Store Manager, who is responsible for the management of the two stores.

Table 2. *Company B* features

Feature	as is in *Company A*
Number of stores	2
Number of employees	176
DC actuation range	two stores in the same city
Fleet of trucks	Owned fleet
Items centralized into the DC	not answered question%
Number of items per store	Around 15,000 items

Company B has a central warehouse where it receives and stocks dry line products. The products reception takes place in the afternoon, at 4pm. The perishable items including refrigerated, frozen, and fresh fruit and vegetables are delivered directly to the store.

Inventory policies are related to the approach of reducing intermediaries between the industry and the retailer. In order to reduce the number of wholesale items and searching for reduced costs/prices, the supermarket buys products monthly and it keeps them in stock. Another factor that influences the stock volume is the delivery delay. The lengthy delivery periods make the supermarket to keep a high volume stock in order to avoid non-availability of products. The relationship with the suppliers is transactional.

The items that are in the warehouse are transferred to the stores twice a day. Every day at about 5 pm the items in the gondola are checked using a bar code scanner connected to the central warehouse keeping detailed information about the store inventory. After verifying the store stock, the order is transferred to the warehouse. This order is processed the next morning, around 10 am. The same process is done at the end of the morning when a new order is placed and is processed in the afternoon. The transport of the goods from the warehouse to the stores is done using their own fleet of trucks. Nevertheless, the transport cost is not controlled, but the interviewee acknowledges they should have this control.

Like in *Company A*, *Company B* goods are separated, in this case it is done manually without the help of roll containers. A forklift truck or a pallet truck is used to handle goods in stock. Smaller items are carried manually. The transference invoice is used as the goods separation checklist. When the goods are delivered to the store, the truck is unloaded manually or pallet trucks are used and the goods are put directly in the gondolas.

Due to the stores proximity to the warehouse, if replenishing of some goods is needed but it was not properly reported, the goods can still be delivered to the stores fast using their own smaller trucks. The interviewee considers that the decentralized purchases, from store to store, reduce the lack of items, but this fact is so far a pure supposition.

Due to the presence of regional and big retailers, the interviewee stated that the sales, market stability, tradition as a retailer are successful, mainly being located in the countryside of the state, which is a major factor to achieve customer fidelity. In addition, *Company B* focuses on product quality to establish a reliable relationship between the supermarket and customers.

5. EMPIRICAL FINDINGS ANALYSIS

It is worth mentioning that in both cases good internal logistics performance was identified, even having few IT resources available. In *Company A*, the separation of goods was considered a critical factor to reduce costs and/or waste. A delay in separating the items to be delivered to the stores can result in extra hours of work for truck drivers and for supermarket staff in charge of receiving goods, besides causing a delay in replenishing goods in the gondolas.

Company A has been investing in IT for a year, for the automation of tasks as it is done in big supermarket chains. So far, from their twenty-nine stores, twenty already use electronic order processing. As demais lojas devem receber a tecnologia dentro de um ano. The next step is automating orders in DC stores making it easier to interfere manually when needed, for example during clearances, when the demand is different.

Some regional network characteristics need to be taken into account while analyzing the market share in the cities where they are present. One one hand, the network takes advantage of recognizably important technologies for external logistic integration such as ECR. On the other hand, the network seeks to offer a better purchasing experience, what is expressed by the company slogan "more than a supermarket, a place to feel good". Moreover, convenience elements can be observed: easy access localization, home delivery and bakery services among others, what reveals the focus on value, confirming the expected for the grocery retail market **?**. This directly contrasts with *Company B*'s focus on product quality and affordable prices, and its usage of even less sophisticated management tools.

6. CONCLUSION

This research work investigated the warehouse-to-store supply strategy of two supermarket networks which operate in the interior of the most industrialized region of Brazil, both counting on centralized distribution centers. In one of them, demand and supply management principles ground the distributed activities for its nearly thirty stores but, without the suitable technology support need for its effective implementation, it is configure what can be informally called a "artisanal ECR system". The efficient consumer response fundamentals are conceptually present, underlying the attitudes of the staff personnel, resulting in commitment despite the impracticability of performance measurements from the operational data which still circulate as paper spreadsheets. The usage of available information system technology if still incipient in the other studied company, whose tacit knowledge utilization characterizes a transparent relationship and management approach. That is how those supermarket networks have survived along the years.

It was observed that the extent of operation control is proportional of the enterprise size, as foreseen by the literature). Usually, the lack of performance measurements can hide a high level of losses. Even so, the smallest of the two companies has been operating for 68 years and is a major competitor of the much larger networks which have installed in the city. How come can the incipient usage of logistic management technology still exist in medium- and large-size grocery retail networks, even in highly industrialized regions? How can those companies hold a significant market share and even expand their business while competing with major players? Why do they not invest in information technology to improve their performance and efficiency when they are aware of the resulting losses reduction and gains increase?

A reasonable conclusion from those observations are that further investigations are need to be carried out in order to better understand the needs inherent to the reality of the food industry industrial, and to develop low-cost and simple management tools for this segment.

REFERENCES

Aastrup, J., Kotzab, H., Grant, D., Teller, C., and Bjerre, M. (2008). A model for structuring efficient consumer response measures. *International Journal of Retail & Distribution Management*, 36.

Belfiore, P., do Valle Costa, O., and Fávero, L. (2006). Problema de estoque e roteirização: revisão bibliográfica. *Revista Produção*, 16, 442–454.

Bowersox, D., Closs, D., and Cooper, M. (2007). *Supply Chain Logistics Management*. McGraw-Hill/Irwin.

Bowersox, D., Closs, D., Cooper, M., Nakagawa, C., and Nakagawa, G. (2006). *Gestão logística de cadeias de suprimentos*. Bookman.

Bryman, A. (1989). *Research methods and organization studies*. Unwin Hyman, London.

Caputo, M. and Mininno, V. (1998). Configurations for logistics co-ordination: A survey of Italian grocery firms. *International Journal of Physical Distribution & Logistics Management*, 28(5), 349–376.

Collins, A., Henchion, M., and O'Reilly, P. (2001). Logistics customer service: performance of Irish food exporters. *International Journal of Retail & Distribution Management*, 29(1), 6–15.

Fawcett, S.E. and Clinton, S.R. (1996). Enhancing logistics performance to improve the competitiveness of manufacturing organizations. *Production and Inventory Management Journal*, 40–46.

Griffis, S.E., Goldsby, T.J., Cooper, M., and Closs, D.J. (2007). Aligning logistics performance measures to the information needs of the firm. *Journal of Business Logistics*, 28(2), 35–56.

Harris, J., Swatman, P., and Kurnia, S. (1999). Efficient consumer response (ECR): a survey of the Australian grocery industry. *Supply Chain Management: An International Journal*, 4(1), 35–42.

Jones, D. (2001). Thinking outside the box. *ECR Journal*, 1(1), 81–9.

Kumar, S. (2008). A study of the supermarket industry and its growing logistics capabilities. *International Journal of Retail and Distribution Management*, 36(3), 192.

Lebas, M.J. (1995). Performance measurement and performance management. *International Journal of Production Economics*, 41, 23 – 35.

Stank, T., Crum, M., and Arango, M. (1999). Benefits of Interfirm Coordination in Food Industry Supply Chains. *Journal of Business Logistics*, 20(2), 21–42.

Yin, R. (2003). *Case Study Research: Design and Methods*. Sage Publications Inc.

Zairi, M. (1998). Best practice in supply chain management: the experience of the retail sector. *European Journal of Innovation Management*, 1(2), 59–66.