

## **Information Systems in Supply Chain: A Study of the Furniture Cluster in the State of Parana, Brazil**

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**Abstract.** This research analyzes the use of Information System (IS) by the furniture cluster located in the city of Umuarama, State of Parana, Brazil. The methodology used was a survey research made in 37 companies of this segment. These companies were interviewed about the use of IS as a competitive advantage in the cluster and in the distribution channel. The results showed that small enterprises use limited resources of IS in their internal processes and relationships with the distribution channels. The use of applications increases in midsize companies; however, they do not have systems to analyze their after sales. Large companies make intensive use of software in administrative processes, reaching more competitiveness than the other competitors.

**Keywords:** Cluster, Supply Chain, Information Systems, Distribution Channel, Furniture Sector.

### **1 Introduction**

The State of Parana is responsible for 707,802 employments with 45,252 companies, according to the company demographic research of 2013 [1]. There are three furniture industry clusters in the state of Parana: one at the North, another at the Northeast and other at the Southwest.

In the North region of the state of Parana, a cluster is located in the city of Arapongas with 400 companies, considered the second larger producer of furniture in Brazil, and the largest one in consumption and productivity, covering 163 manufacturers that generate 13,890 direct employments. This furniture cluster is responsible for 67.31% of the Gross Domestic Product (GDP) of the city of Arapongas [2].

In 2007 the Southeast region of the state of Parana grouped 35 companies covering logging and furniture industries, with 12 of them participating actively in the cluster [2].

The furniture sector established in the Northeast of the state of Parana is located in Umuarama, where this research was made. It is responsible for the movement of US\$ 119 million per year, generating approximately 13,000 direct employments. [2]

Due to the globalization, the organizations need to adapt to the new standards of competition, technological effects on the competitiveness, cultural influences, new economic environment, productive quality and different environmental aspects that interfere with the day-to-day operation of the companies [3], [4], [5] to remain in the national and international market. With this, the competitive advantages have gained significant value to the business management [3], [4], [6], motivating the companies in their search for Information Systems (IS) [5].

It is worth mention the cluster, by itself, as a competitive advantage, that represents a group of companies located in the same region that are connected to each other by complementary elements [3], [4], [7].

The research intended to map IS inside the supply chain of the furniture cluster in the city of Umuarama, in the state of Parana, Brazil, to verify the operation management in the relationship among the actors of the network, according to the following question: Is the furniture cluster in the city of Umuarama sufficiently equipped with IS to develop its activities?

The technology plays the most important role in the aspects of the development of the networks and clusters industries based on the information system management and information technology inside the business environment [8].

This research aims to analyze the usage of IS by the furniture cluster of the city of Umarama to study the IS tools used, establishing the relationship between the size of the company and the software resources used. For this we conducted a survey research covering 37 companies in the furniture segment.

The hypothesis is that these companies require a systematic support to best suit to the innovative resources of IS inside their processes. The development and implementation of IS and e-business strategies allow a variety of approaches of applications and strategic planning, and consequently, of support for managerial decision making.

## **2 Theoretical Background**

### **2.1 Production Clusters**

The Brazilian companies, mainly the small and medium companies (SME), between the decades of 1960 and 1970, started to act in a new market standard, due to a more connected economy [9].

After 1990 a new economic environment arose in Brazil due to an abrupt opening of the national economy that changed the governmental protectionist history, and the Brazilian companies had to face the international scenario, full of competitiveness, looking for innovation and new markets for expansion.

To survive in the market, the SME started to organize in clusters. There is a cluster in a city if all the local companies produce the same product with special characteristics of competitiveness. [10].

According to Porter [3] a cluster is defined as a geographical proximity group of interconnected companies and associated institutions in a particular field, linked by common and complementary elements. A cluster can also be understood as a group of companies individually specialized that complement each other in a way that the group represents a collective that works for competitiveness [4], [10]. For the SME it is vital to integrate a cluster as it provides a set of favorable conditions for mutual cooperation and a competitive environment in order to remain in the global market.

The research on competitive cluster, using the concepts of business networks, is becoming more popular in the literature, mainly addressing issues such as collective efficiency, task sharing and information [11]. Among the various characteristics of the clusters, the most important is the gain of collective efficiency, understood as competitive advantage derived from local external economies and the joint action among the actors that compose the clusters.

Other authors [3], [10] corroborate in the sense that these agglomerations are important to acquire new technologies, management processes, communication systems, control of production networks, specialization of products, increased of the competitive power and innovation.

### **2.2 Supply Chain Systems**

Before the great global economic expansion, the goods were not accessible to all people and had to be consumed immediately in the place they were found, because of the limited transportation and precarious storage processes.

Due to the improvements of the logistic systems, production and consumption began to separate geographically originating the Business Logistics concept, which is considered an essential resource, either fulfilling the necessities of the client, or as a competitive strategy for the company, being also defined as the Management of the Supply Chain [13], [14], [15].

The supply chain can be understood as an integrated process of business management related to products, finance and information flows. It brings together since producers to final consumers, suppliers of goods, services and information [14].

Another important concept about the supply chain is the distribution channel, which is divided in: a) physical supply channel, related to time and space variables between the company material sources and the processing plants, and b) physical distribution channel related to time and space between the company processing plants and the clients [13].

The supply chain structures are getting more elaborate due to the market complexity and the specific necessities demanded for each business. Then, the IS resources are becoming more essential to support the exchange of both, information and strategic knowledge, creating products with greater aggregate value to the final consumer.

### 2.3 Information Systems in the Supply Chain

Information System (IS) has become increasingly necessary to support information exchange practices and strategic expertise, creating value added products to the final consumer.

IS has become an essential element to the operation, management and strategic view for companies immersed in a competitive market that demand accurate data, real time information, agile responses and costs reduction, providing support to any business segment of any size.

In regard to the software, IS is introduced as a set of components interconnected that collect, process, store and disseminate information to support decision making processes within the organizations [5].

These systems act like an organized collection of people, hardware, software, network, communication and data resources that are collected, transformed and provide the information necessary for the organization [16]. IS has changed the way business is conducted [17], because globalization demanded agile decisions toward the competition for greater profits.

The usage of tools, such as Enterprise Resource Planning (ERP), or another integrated software, is able to manage vital business operations inside a company [17], [18] and also offers operational efficiency, consolidated information, standardized processes and operational costs reduction [5].

Software for offices automation, e-mail, e-business, e-commerce and social networks are applications that reduce distances, facilitating the communication, automating tasks, aggregating intelligence to the business, and contributing, as a consequence, to increase the productivity and the quality of the products/service. They are valuable resources to support the development of alliances, due to the Internet or Extranet, assisting the strategic company relationship among producers, suppliers, distributors and/or final consumers via Internet [8], [16].

Some difficulties in the supply chain, as the lack of parts, idle production capacity, exceeding inventory of final products, high transportation costs, are caused by imprecise information used by the organizations. The usage of the supply chain planning systems allows the visibility of information, permitting a fast and open share of information among the members of the supply chain. It also allows the synchronization of the orders, shipment and production to minimize inventory and speed up the demand of the clients, automating the information flow among the company and its network partners to decide consistently and improve the performance [5].

## 3 Methodology

This study is classified as an applied research using a descriptive approach, developed in the furniture cluster of the city of Umuarama, State of Parana, Brazil. We carried out a survey, which is commonly used to investigate events in the industrial engineering field, operation management [19] and business administration [20], with the objective of contributing to the knowledge in a specific area, collecting individual data or about the environment [19].

A cross section was made without considering the evolution of data over time, using numerical information to analyze the IS environment of this furniture cluster, and the use of technological tools, if used, to help the relationship between suppliers and customers.

We sent an email to each manufacturer explaining the survey; the next day we sent the questionnaire by e-mail, and two days after we got in touch with them by email to check whether they received the questionnaire, if there was any doubt and asking to arrange a meeting to collect personally the questionnaires.

This research was conducted in two stages: a) the application of instruments for data collection, and b) the insertion of them in an Excel spreadsheet to map the IS environment inside the cluster.

We used a structured survey for the data collection, containing closed questions using a Likert scale analysis, including three choices: “do not use it”, “use it partially”, and “use it totally” [21].

The survey consisted of questions embracing the applications used within the companies, such as: office tools, integrated management systems, non-integrated automating task systems, purchase control systems, inventory control systems, production control systems and after sale systems, as well as communication channels to suppliers and clients, and the use of social networks for connection to the clients.

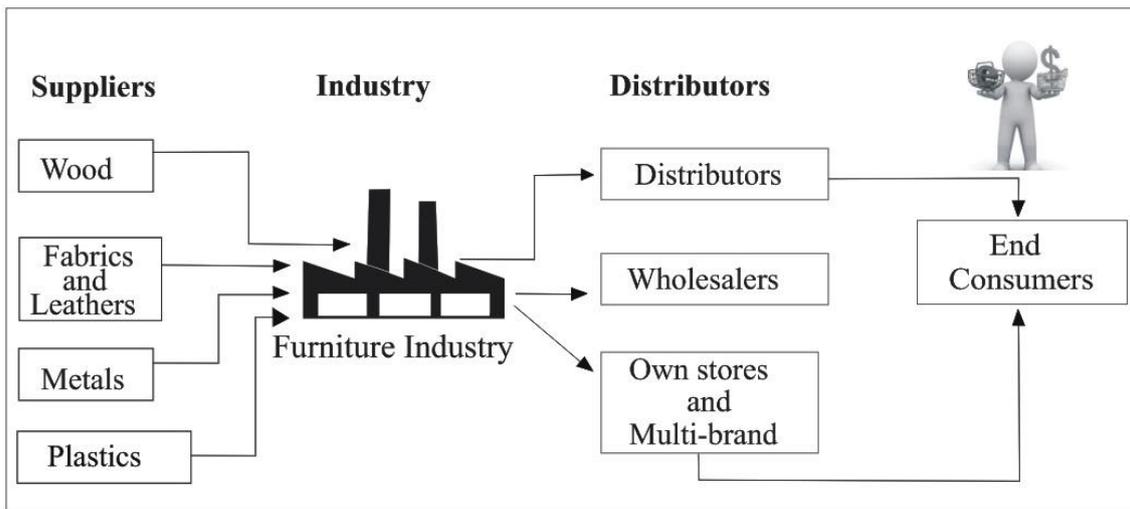
We used the Microsoft Excel software to analyze the data set, computing the average and generating graphics; and we also used descriptive statistics to determine some relevant information of the survey in the furniture cluster industry in the city of Umuarama.

We sent 37 questionnaires to small, medium and large companies and received 31 responses, representing 81% response rate, what validates the study.

#### 4 Results and Discussion

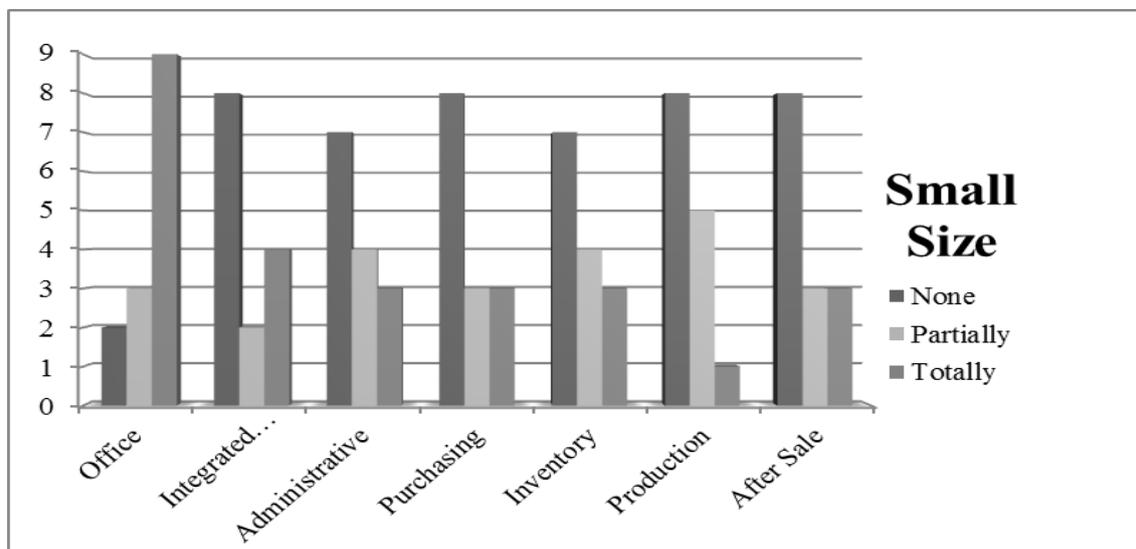
The companies located in the region of the city of Umuarama are classified as follows: 13% of large size, 39 % of medium size, and 48% of small size. These data were already expected [22], as 95.5% of the national companies in Brazil are classified as SME.

Suppliers, industries, distributors and consumers compound the supply chain of this furniture cluster, as shown in Figure 1.



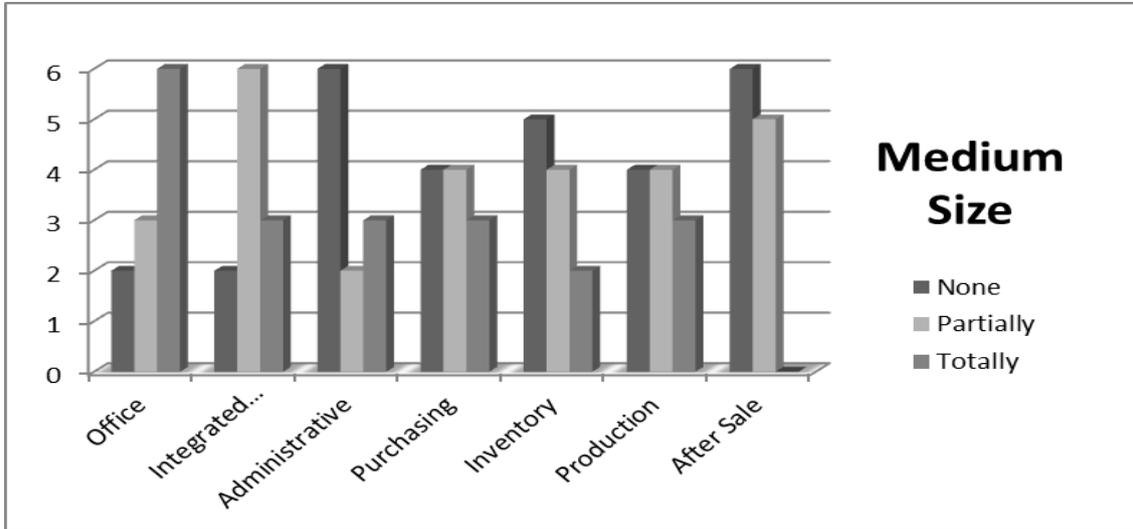
**Figure 1:** The supply chain of the furniture cluster in the state of Parana, Brazil (Source: Authors).

In this furniture cluster we found 3 (three) large companies and 7 (seven) medium companies that operate using distribution channels. Nevertheless, only 3 (three) small companies operate using a distribution channel due to the necessity of negotiating and the infrastructure necessary to the after sales services and IS. However, the small companies represent the larger amount of companies that negotiate with the final consumer. The small companies also barely use the resources available by IS to support their internal processes and the relationship with the distribution channels, as shown in Figure 2.



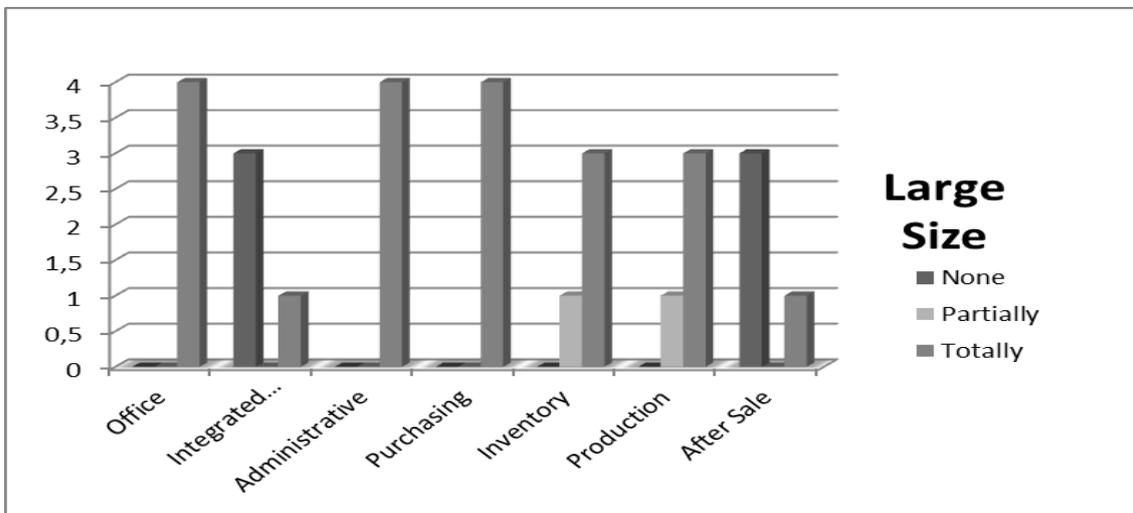
**Figure 2:** The software used by the companies (Source: Authors).

The use of applications increases when we observe the medium companies; however, their after sales processes are not fully supported by software, as shown in Figure 3.



**Figure 3:** The software used by the companies (Source: Authors).

The large companies, as shown in Figure 4, make intensive use of software in their administrative processes, purchase control, inventory control and production control; however, they represent a lower use rate in the after sales control.



**Figure 4:** The software used by the companies (Source: Authors).

The analyzed companies represent low usage of IS to support the relationship with their clients and suppliers. Only one small size company uses this full resource to interact with its suppliers. Six companies do not use any information system resource to relate to their suppliers. Only eight companies partially use applications to interact with their suppliers. This scenario could be improved if the companies worked cooperatively with each other [6], [23].

This application improves the communication, but does not represent a structured content that could affect the operational results of the company. We identified that 19 (nineteen) companies use email and

14 (fourteen) use their own site to relate with their clients. The email can generate data to compose a database for multiple purposes, such as administrative decisions taking.

Social networks, such as Facebook, are not still largely used by the companies of this research as a tool to interact with their clients, and only one small company reported using Facebook this way; however, 21 (twenty one) of these companies use Facebook as a major resource to present their corporate profiles. They do not realize yet that Facebook is a new and innovative tool, a new marketing channel for promotions, offering a solid relation between the public and the company [22]. It is worth notice that 55% of Latin America uses the Internet, and the Facebook users are still growing [23]. These web pages can be accessed by the Internet searching tools, are easy to manage, and are characterized as easy use tools for the companies that cannot support additional costs [24].

The findings suggested the necessity of these companies to invest in innovative technological tools. When an organization makes use of IS to support its information needs in the various levels of an integrated management system, it can reach a competitive advantage. The usage of resources, such as integrated management software, computer networks, and the Internet can bring intelligence to their business to provide competitive advantage [8], [23].

## 5 Conclusions and Outlook

This research analyzed the furniture cluster located in the city of Umuarama, at the Northeast of the state of Parana, Brazil, that is responsible for the movement of US\$ 119 million per year, generating approximately 13,000 direct employments [2]. We studied the use of the Information System (IS) resources, their internal technological processes, as well as the relationship between the companies that belong to this cluster, and their clients and distribution channels.

The results showed that just a few companies use IS as a tool to provide competitive advantage. The small companies barely use the resources available by IS to support their internal processes and the relationship with their distribution channels. The analyzed companies showed a low usage rate of IS to support the relationship with their clients and suppliers, and not even Facebook is used in its full potential.

We also verified that the usage of IS, supporting resources, and software tools are concentrated in the large companies. This cluster requires effective support to use computing resources and to invest in consultancy and guidance, as a way to improve and be more competitive. These companies can be considered as in initial stage of the use of IS.

Nevertheless, it is necessary to highlight the importance of the government agencies and the development institutions in the effort to support the development and improvement of small and medium companies in Brazil. Information technology consists in a powerful alternative for these companies to stay competitively in the market.

The furniture cluster of the city of Umuarama can significantly contribute to the growth of the local and regional economic development, and the investment to introduce new technologies, such as IS that privilege the development of the network, can allow them to be more competitive in the market and also provide regional growth.

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