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Definition of distribution archetypes for aseptic carton-packaged products in South America

Authors:

Isabella Gómez

Amanecer Peña

Supervisors:

Annette Immelborn, Tetra Pak

Annika Olsson, Packaging Logistic, LTH

ABSTRACT

Product integrity depends on the way the package is handled and transported; therefore packaging has a big impact on logistics, costs and efficiency along the entire distribution chain. Damaged or leaking packages are the result of an inconvenient distribution, and lead to product waste and a negative image of the brands involved. Even though Tetra Pak gives guidelines and recommendations concerning correct product handling and transportation to their customers, the logistic process depends directly on the clients and on the local conditions along the distribution chain.

Using a multiple case study design, this research focuses on describing the distribution chain for the ambient carton-packaging sector in South America from Tetra Pak's customers to the retailers. The results reflect the distribution of dairy and juice products in the three main markets for Tetra Pak in this continent: Brazil, Argentina and Venezuela. Applying a questionnaire to different actors involved in the physical process of distribution, such as producers, distributors, wholesalers, retailers and Tetra Pak's employees, both levels of analysis were developed: specific industry cases and the country's overview. The distribution flows are presented through distribution archetypes and the parameters affecting these flows are also pointed out.

Despite the primary objective of this research was to build a generic view of the distribution archetypes in South America, after analyzing the selected countries, it became clear that generalizations at such a broad level cannot be made.

In order to link the parameters with the distribution flow or archetypes, a tool was developed. In this tool, the level of risk for package damage is measured in terms of the effect of the different parameters over the whole distribution flow.

The method and the tools resulting from this research could be established as an operational tool within Tetra Pak. The risk assessment tool will enable the company to optimize distribution solutions for new products as well as to increase effectiveness when dealing with distribution problems.

ACKNOWLEDGEMENTS

This Master Thesis would have been impossible without all the people who dedicated their time and efforts supporting us. Therefore we would like to express our deepest gratitude to all of them.

First of all we would like to thank all the people at Tetra Pak Brazil and Argentina for making us feel welcome during our visit, dedicating their time and providing valuable information for the development of this research.

We would also like to express our gratitude to the companies we visited: Coca Cola Brazil, Unilever Brazil, Pamcary, Shefa, Sancor and Williner. The knowledge they shared was a key element for our findings.

Finally, we would like to give a special thanks to our supervisors Annika Olsson and Anette Immelborn for their time, guidance, dedication and for the great learning opportunity they offered us.

Lund, June 2008

Amanecer and Isabella

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GLOSSARY

- *All commodity volume (ACV)*: represents the total annual sales volume of retailers that can be aggregated from individual store-level up to larger geographical sets.
- *Archetype*: Is a generic, idealized model of a person, object, or concept from which similar instances are derived, copied, patterned, or emulated.
- *Automated guided vehicles (AGVs)*: Are electrically powered driverless trucks for picking up, moving and placing unit loads. They are computer-controlled and used in manufacturing and warehousing operations.
- *Automated storage and retrieval systems (AS/RS)*: A system of rows of rack, each row has a dedicated retrieval unit that moves vertically and horizontally along the rack picking and putting away loads. Versions include unit-load ASRS and mini-load ASRS.
- *Bar code reader*: any device that can convert a bar code image into data. Common bar code readers consist of pistol-type scanners, wand scanners, and fixed position scanners
- *Big stores*: This term includes stores with more than 20 Ck.
- *Checkouts (Ck)*: The point in a store at which shoppers pay for their purchases and have them bagged.
- *Convenience stores*: Small self-service food shop with particularly long opening hours and a noticeable focus on convenience items, such as ready meals and fast food. Some are located at a petrol station.
- *Cross docking*: It is the action of unloading materials from an incoming trailer or rail car and immediately loading these materials in outbound trailers or rail cars thus eliminating the need for warehousing. Many "cross-docking" operations require large staging areas where inbound materials are sorted, consolidated, and stored until the outbound shipment is complete and ready to ship.
- *Dairy*: The word dairy describes milk-based products and processes. The dairy industry comprises establishments primarily engaged in milking dairy cattle and milk production.

- *Discount stores*: Efficiency-based self-service food outlet selling a small number of items. Two different versions: hard discount stores are almost exclusively own-brand based and completely price-driven, whereas soft discount stores feature wider ranges of both manufacturers' branded products and fresh food.
- *Distribution center*: Is a warehouse or storage facility where the emphasis is on processing and moving goods on to wholesalers, retailers, or consumers rather than on storage.
- *Distribution Chain*: A network of connected and interdependent organizations working together to control, manage and improve the efficient movement of finished product from the end of the production line to the consumer. These activities include freight transportation, warehousing, material handling, protective packaging, order processing, marketing forecasting and customer service.
- *Distributor*: Company that specializes in distributing other companies' products, that has certain rights, responsibilities and restrictions related to marketing and selling the vendors' products to the ultimate end-users. In most of the case they have sole rights over a territory or product.
- *First in First-out (FIFO)*: Describes the method of rotating inventory to use oldest product first.
- *Forklift*: Vehicles used to lift, move, stack, rack, or otherwise manipulate loads.
- *Gross Domestic Product (GDP)*: is defined as the total market value of all final goods and services produced within a given country in a given period of time.

$$\text{GDP} = \text{Consumption} + \text{gross investment} + \text{government spending} + (\text{exports} - \text{imports})$$

- *Human Development Index (HDI)*: Is the normalized measure of life expectancy, literacy, education, standard of living. It is used to determine and indicate whether a country is a developed, developing or underdeveloped country.
- *Hypermarkets*: Self-service store with a sales area of more than 5,000 square metres, offering both a comprehensive food range and a wide choice of non-food items.
- *Independent Stores*: Owned by a small retailer that is independent. This type of retailer usually owns only one single outlet. The type of outlet changes depending on the geographical area, but the huge majority are very small outlets, in most of the cases not at self-service.

- *Intermodal freight transport*: Is the use of more than one mode of transport to move a shipment to its destination. Many combinations are possible, with the most common being truck/ rail. Intermodal freight transport involves the transportation of freight in a container using multiple modes of transportation (rail, ship, and truck), without any handling of the freight itself when changing modes
- *Last-in first-out (LIFO)*: In warehousing, it describes the method for using the newest inventory first.
- *Medium stores*: This term comprises all stores that have between 5 and 19 Ck.
- *Mercosur (Southern Cone Common Market)*: is a Regional Trade Agreement among Brazil, Argentina, Uruguay and Paraguay, founded in 1991. Bolivia, Chile, Colombia, Ecuador and Peru currently have associate member status and Venezuela signed a membership agreement on 2006. Its purpose to promote free trade and the fluid movement of goods, people, and currency.
- *Modern Trade*: it represents the “organized trade”, operating with more than one outlet. Almost all of these outlets are at self-service. This trade is referred to chains, buying groups, cooperatives etc. E.g. hypermarkets, supermarkets, mini-markets, convenience stores, discount stores, neighborhood stores among others.
- *Mom and pop business*: Is a common colloquial expression for a single-family operated business with few (or no) employees other than the owners.
- *Multiple delivery routes*: The transportation vehicle delivers the freight goods to more than one outlet.
- *Relative humidity*: The relative humidity of an air-water mixture is defined as the ratio of the partial pressure of water vapor in the mixture to the saturated vapor pressure of water at a given temperature. Relative humidity is expressed as a percentage and is calculated in the following manner:

$$\text{Relative Humidity} = \frac{\text{actual vapor density}}{\text{saturation vapor density}} \times 100\%$$

- *Small stores*: Stores that have between 1 and 4 ck.
- *Supermarkets*: Self-service store with a grocery product offer, ranging from 400 to 2,500 square metres.

- *Third Party Logistics (3PL)*: Describes businesses that provide one or many of a variety of logistics and distribution-related services. Types of services would include public warehousing, contract warehousing, transportation management, distribution management, freight consolidation among others.
- *Traditional trade*: Is instead constituted by independent retailers (that usually own only one single outlet, in most of the cases not at self service) or by home delivery. E.g. bakeries, kiosks, home delivery and independent stores.
- *Wholesaler*: A merchant middleman who buys large quantities of goods (easy to sell and with high rotation) and resells it. Wholesalers, frequently physically assemble sort and grade goods in large lots, break bulk, repack and redistribute in smaller lots. They don't have any kind of exclusiveness and neither have they offered merchandising services to their vendor's products

1. INTRODUCTION

1.1 Background

Distribution is an important feature of business that involves all the processes and methods to bring a product from manufacturers to consumers. In the food and beverages business, the high rate of demand and the need to ensure availability, forces the industry to allocate a large amount of resources in distribution. The main objective in all food distribution is to move the product as cost-effectively as possible, while retaining maximum quality.

Regarding food products and groceries, quality depends almost entirely on the packaging because it is the only mean of protection for the content. Different foods have different packaging requirements. Drinks, frozen meals, cheese, meats, candies, they all need different levels of protection against external factors such as micro organisms, gases, light, mechanical damage, temperature or humidity. However, the most important aspect to be considered when treating with packaging is preservation for food safety.

Product integrity depends on the way the package is handled and transported; therefore packaging has a big impact on logistics, costs and efficiency along the entire distribution chain. The package needs to be compatible with the processes through which it will pass; hence the design must take into account potential damages and deteriorations during distribution.

According to a research conducted by Kraft Foods NA, one of North America's largest food companies, "unsaleable" merchandise in the food and groceries distribution industry totalled \$2, 57 billion in 2004, and almost 60% of those losses could be attributed to damaged goods [1].

One of the leader companies in the aseptic liquid food packaging solutions industry, Tetra Pak, has performed distribution chain analysis and audits for several customers on emerging markets during the last few years, aiming to have a better knowledge of the impact of the distribution processes. Even though Tetra Pak does not participate actively in the distribution of packaged products to the points of sale, the company has made efforts to understand package's performance along the distribution chain under different conditions in order to ensure their

packages reach the final consumer with a high quality standard and also to recognize possible opportunities for improvement.

The China and Sweden's distribution chains were investigated in a Master Thesis finalized by March 2008 in Tetra Pak Lund. That project aimed to define dairy distribution archetypes present in China and establish a comparison with distribution chains of dairy producers in the Nordic region. The nine archetypes identified in that Master Thesis will be used as a starting point to develop this research work (see Figure 1.1) [2].

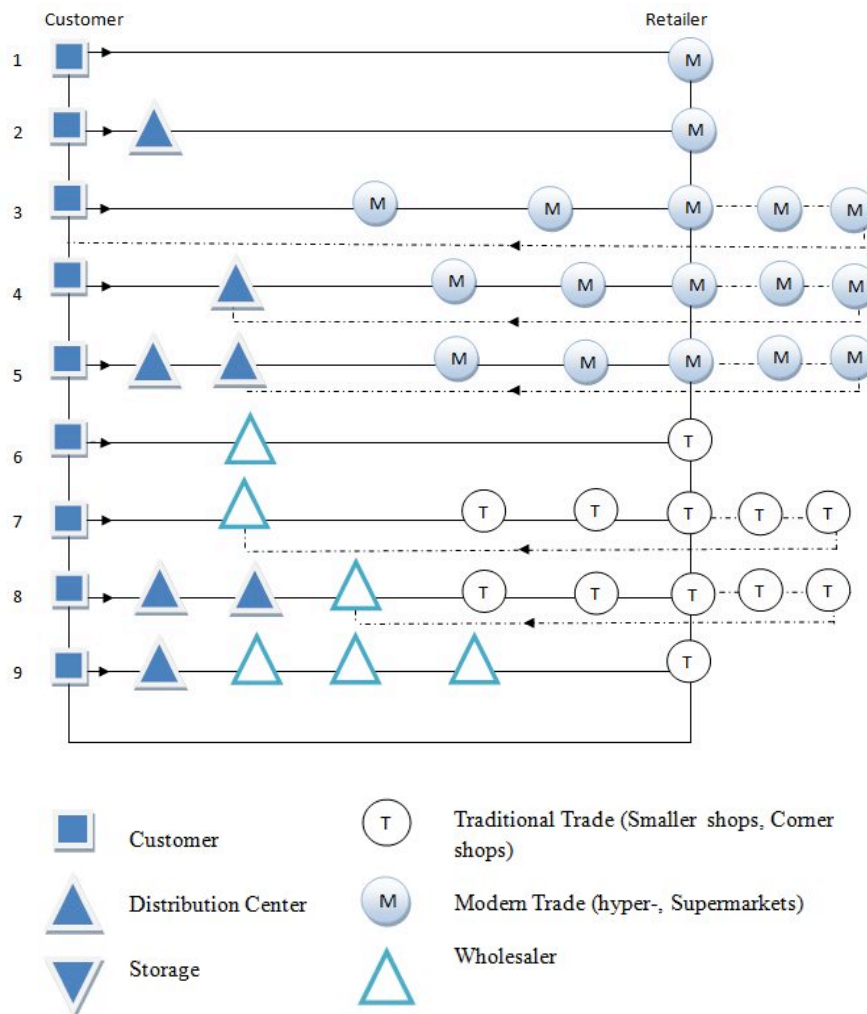


Fig.1.1 The nine archetypes identified for dairy distribution in China (1-9) and Sweden (1-8)

1.2 About Tetra Pak

Tetra Pak is a multinational company that provides systems for processing and packing liquid food products. The company is one of three independent industry groups that belong to the Tetra Laval Group (see Figure 1.2), which also includes DeLaval, a producer of accessories and machinery for dairy production and animal husbandry, and Sidel, which focuses on packaging lines for liquid food packaged in glass bottles, plastics or cans. Tetra Laval Group is supported by Tetra Laval International, which provides financial services in order to ensure the growth of all the industry groups.



Fig.1.2 Tetra Laval Group's organization chart

In the early 1950s, Dr. Ruben Rausing founded Tetra Pak in Lund, Sweden, as one of the pioneer companies in the field of packaging liquid products. He recognized a business opportunity in the need for milk with a long shelf life that could be transported to areas where it was impossible to deliver fresh milk, and then found a solution by developing a new carton-based packaging material for dairy products. Tetra Pak's innovation in the area of aseptic liquid food packaging which, when combined with Ultra High Temperature processing (UHT), allowed liquid food to be packaged and stored under room temperature conditions without the need of preservatives and offering a long shelf-life. This technology completely changed the distribution and sale of milk and later on, of the entire liquid food industry.

Making food safe and available everywhere is Tetra Pak’s vision, and this principle has driven the company to become one of the world’s largest suppliers of packaging systems for milk, fruit juices and drinks, and many other products. Today, Tetra Pak is the only international company in the world capable of offering integrated solutions for providing and designing systems for processing, packing and distributing liquid groceries. (See Figure 1.3)

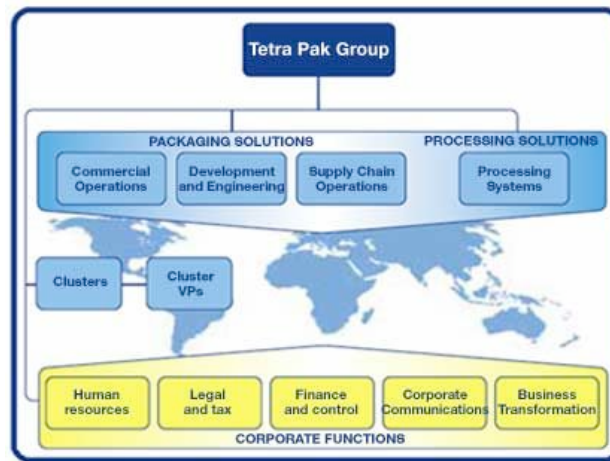


Fig.1.3 Tetra Pak Group’s organization chart

Tetra Pak plays the leading role in the world's packaging industry due to its continuous innovations in search of new types of packaging for various products and introduction of breakthrough technologies that enable the company to keep Dr. Ruben Rausing’s conception about packaging: “*A package should save more than it costs*”. [3]

Today, there are 43 Tetra Pak market companies and 72 sales offices across the world, 43 packaging material and closures plants and 11 packaging machine assembly factories. The company employs 20 859 people and achieved in 2007 net sales of 8, 6 billion Euros. Only in 2007, the company delivered 137 302 million packages. [4]

Tetra Pak covers more than 150 countries and these markets have been classified into 11 clusters, in order to develop local business strategies that adapt better to the different customer needs. These are: Central Europe, Central & South America, East Europe & Central Asia, Greater

China, Greater Middle-East, Northeast Asia & Oceania, North America, North Europe, South Europe, South & Southeast Asia and Sub-Saharan Africa.

1.3 Problem Statement

Incorrect product handling and rough transportation have a negative impact on the package performance and quality. Damaged or leaking packages are the result of an inconvenient distribution and lead to product waste and a negative image of the brands involved. Even though Tetra Pak gives guidelines and recommendations concerning correct product handling and transportation to their customers, the logistic process depends directly on the clients and on the local conditions along the distribution chain.

The distribution chain from manufacturer's site to point of sale in the carton-packaging sector on emerging markets is more complex than distribution on advanced markets. In the case of South America, there is a need to better understand specific conditions that influence the way products are distributed and have an impact on the package's performance along the process.

To offer a high quality carton economy product at points of sale, a robust product design is required. To be able to design the right level of package robustness there is a need to generalize product distribution and logistics by defining distribution archetypes in specific regions of the world.

1.4 Objectives

Primary Objective:

To understand and define the distribution archetypes for the ambient carton packaging sector in South America from Tetra Pak's customers, e.g. food producers, to the retailers.

Secondary Objectives:

- Find key archetypes for both traditional and modern trade.

- Identify and define the local parameters influencing the quality of carton packages along the distribution chain. (Flow, load/unload equipment, distance, road conditions, vehicle types, temperature, relative humidity, etc).

The archetypes resulting from this research could be established as an operational tool within Tetra Pak. This tool will enable the company to optimize distribution solutions for new products as well as to increase effectiveness when dealing with distribution problems. By recognizing and defining local parameters affecting the distribution in South American markets, there is a possibility to improve package's design so it could be better adapted to the specific conditions of the region.

1.5 Focus and Delimitations

As South America is a large region and each country represents a different market size for Tetra Pak, this research has been narrowed to three markets: Brazil, Argentina, and Venezuela. The first three are the most important markets for Tetra Pak in terms of number of packages sold per year, in that order, and the last one has been added due to its significant sales growth in the last few years within the carton economy sector.

Some other considerations have been taken when defining the limits of this research:

- The supply chain will only be analyzed from the moment the packaged product is stored by the manufacturer, ready for delivery, until it reaches the storage location of retailers.
- Only ambient (shelf stable at room temperature) carton packaged products will be included in the research, this means focusing on customers that use Tetra Classic Aseptic, Tetra Fino Aseptic, Tetra Wedge Aseptic, Tetra Brik Aseptic or Tetra Prisma Aseptic packages. (See appendix A). The reason for this is that chilled products require different distribution conditions.
- Even though Tetra Pak's stronger business strategy relays on dairies, this research will include also products as nectars, juices and energy drinks, as they share common distribution processes and are important products in the studied markets.

1.6 Target Group

This project is aimed for Tetra Pak and also for all the actors within the distribution chain segment to be analysed: manufacturers, distributors, wholesalers and retailers. This Master Thesis is also written for students in the packaging logistics area and everyone with an interest on packaging logistics and food distribution in South America.

2. METHODOLOGY

2.1 Approaches to research

A research approach refers to an integrated set of research principles and general methodological guidelines. The strategies, methods and philosophical assumptions build a framework for research design. There are three main frameworks in which a research can be developed:

- *Quantitative approach*: It is based on developing numeric measures and observations followed by unbiased analysis process. The problem studied reflects a need to examine causes that influence outcomes. This approach aims to reduce the problem into small, discrete set of ideas to test, such as variables, employs strategies of inquiry as experiments and surveys to measure these variables, and collects data on predetermined instruments that yield statistical data. [5]
- *Qualitative approach*: This approach refers to any type of research that produces findings not arrived at by statistical procedures or other means of quantification. Qualitative research is fundamentally interpretative, although some of the data may be quantified as with census or background information about the objects studied. It consists in developing a description of a setting, analyzing data for categories, and finally makes an interpretation or drawing conclusions about its meaning personally or theoretically, in order to develop themes from the data. It usually uses strategies of inquiry such as narratives, phenomenology, ethnographies, grounded theory studies or case studies. Qualitative analysis does not refer to the quantifying of qualitative data but instead to a nonmathematical process of interpretation, carried out for the purpose of recognizing concepts and relationships in raw data and then organizing these into a theoretical explanatory scheme. [5, 6]
- *Mixed methods approach*: This approach employs the practices of both: qualitative and quantitative research. The data collection process involves gathering both numeric information as well as text information, so that the final database represents both quantitative and qualitative information. This includes multiple methods of data collection and analysis, therefore the design turns out to be more complex. [5]

A qualitative approach is the most suitable for this research, since the objective is to collect data from a phenomenon and then analyze it and organize the conclusions into a theoretical scheme, which in this case will be the archetypes to be defined.

2.2 Purpose of the Study

Qualitative methodology theory establishes three major purposes for research, which result in three types of studies [7]:

-Descriptive: the purpose bases on documenting and building a rich description of complex circumstances that shape the phenomenon of interest.

-Exploratory: the purpose consists in investigating little understood phenomena to discover important categories of meaning. It generates hypothesis for further research.

-Explanatory: they identify relationships between events and how those shape the phenomenon.

This research is descriptive and exploratory, since it aims to develop a description of a process and its context. The key goal is to understand how the selected distribution chain works, and identify important features within it.

Once the approach and the purpose have been established, a research strategy has to be defined. The chosen strategy for this research is the case study methodology, since it allows taking into account the contextual manner of the phenomenon.

2.3 Case Studies

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly established. The background, development, current conditions and environmental interactions of one or more individuals, groups, communities, businesses or institutions are observed, recorded and analyzed for stages of patterns in relation to internal and external influences. This method is used to cope with contextual situations, in which the phenomenon is influenced by a large number of potentially relevant variables. This makes too complex to assess the prevalence of

phenomena, as any statistical analysis of the relevant variables would require considering an impossibly large amount of cases. [8]

Case studies are generalizable to theoretical propositions and not to populations. Sampling logic cannot be applied in this method, since the case study does not represent a sample of the universe being analyzed. The method lies in the assumption that the case being studied is typical of cases of a certain type so that, through detailed and intensive analysis, generalizations may be made that will be applicable to other cases of the same type. Therefore, the method aims to generalize theories and not to assess prevalence or frequency of a phenomenon. [8, 9]

2.3.1 Multiple case studies

The case study methodology can include several cases within the same research. In this situation a multiple case study methodology is required. The logic underlying the use of multiple-case studies is the same used in multiple experiments: replication instead of sampling logic. Each case must be carefully selected so that it either:

- (a) Predicts similar results (a literal replication) or
- (b) Predicts contrasting results but for predictable reasons (a theoretical replication). [8]

2.3.2 Holistic vs. embedded case studies

The same case study can involve more than one unit of analysis. This occurs when, within a single case, subunits must be considered. Even though a case study might refer to a single organization, this might involve a large number of departments, programs or groups, which would then be considered as embedded units. No matter how these units are chosen, the resulting design would be called an embedded case study design. In contrast, if the case study investigates only the global nature of an organization, a holistic design should be applied [8].

2.3.3 Chosen design

The embedded multiple-case design was the methodology chosen for this research and it is explained in Fig.2.1, adapting Yin's model [8] to the specific context of the study.

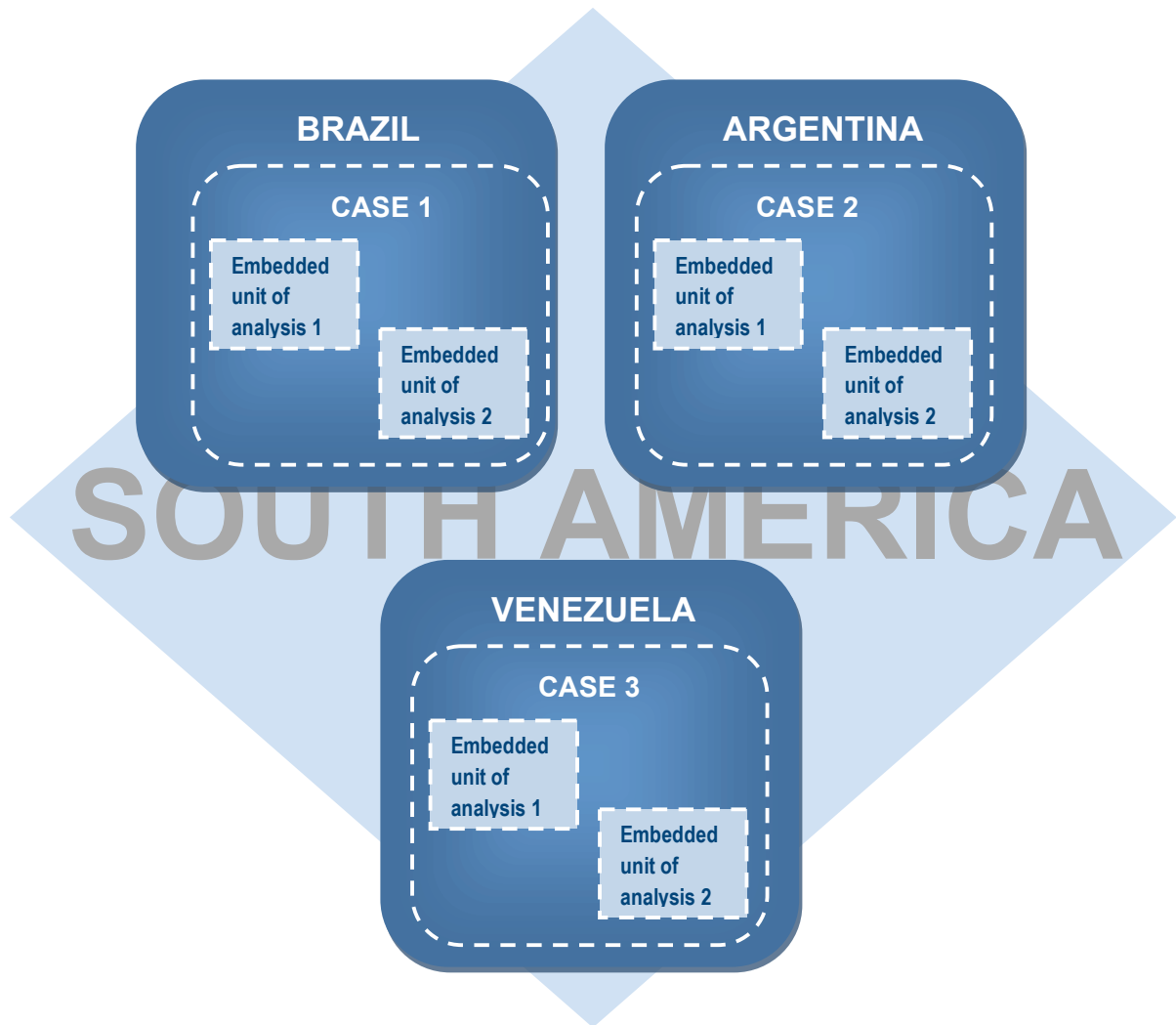


Fig.2.1 Embedded Multiple-case study design [8]

As the study has been narrowed to three countries in South America: Brazil, Argentina, and Venezuela; the design consists of three case studies, all within the framework of the South American continent. Each distribution chain in each of those countries will be considered as a

single case to be analyzed under the local conditions or context of the country. Since the chain consists of several actors and multiple products and brands, each actor to be studied (e.g. dairy manufacturer) will be considered as an embedded unit of analysis within the particular case.

Following the diagram of embedded case study design in figure 2.1, each of the three cases has been designed as shown on the example in figure 2.2. For instance, the context refers to the country in which distribution is carried out, in this situation Brazil; the case is the Brazilian distribution chain of ambient carton packaged products, and the embedded units of analysis are all manufacturers, Tetra Pak Brazil’s customers, wholesalers, distributors and retailers interviewed.

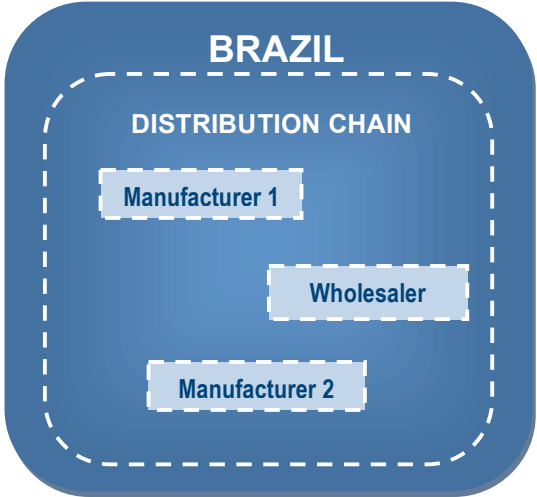


Fig.2.2 Embedded case study design for Brazil

The main target of analysis of this research is the distribution chain of ambient carton packaged products in South America. The chain segment selected for investigation is shown in figure 2.3. The product distribution will only be analyzed from the moment the packaged product is stored by the manufacturer, ready for delivery, until it reaches the storage location of retailers. Although Tetra Pak will be a source of data for this research, the study will not take into account the product flow between the company and its customers or food manufacturers, since it focuses only on already packaged products.

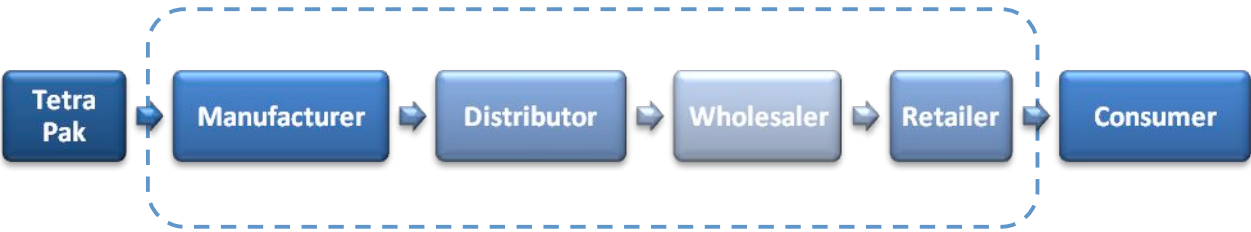


Fig.2.3 Distribution chain (Segment of the supply chain under study)

2.4 Methods of Data Collection

In order to gather information on the target of study and all actors involved, two different approaches may be used: data collection through secondary sources and data collection through primary sources. The first one refers to information that must be collected by the researcher and the second one to information that is already available and only needs to be extracted and analyzed. Figure 2.4 shows the approaches and different methods of data collection. [9]

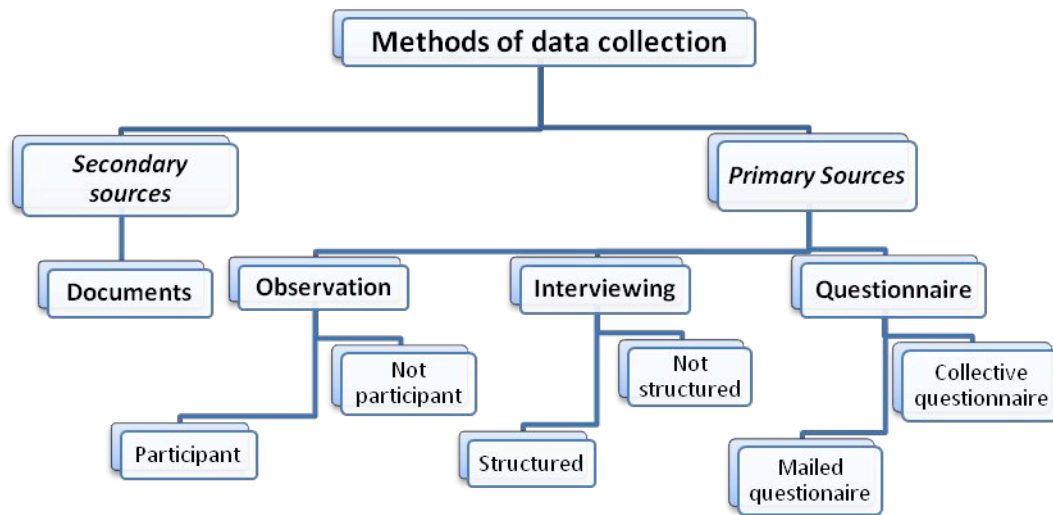


Fig.2.4 Methods of data collection

This research covers all the methods of data collection shown before. Secondary sources used include articles, books, magazines and organization's records, while primary sources are Tetra Pak and all the actors in the distribution chain of each country that could be reached. Following there is an explanation of how the primary sources were approached according to each method of data collection.

2.4.1 Questionnaire

The questionnaire is the main data collection instrument of this research. It was developed with the intention of being mailed to the selected embedded units of analysis, but also to be the basis for the structured interviews.

Development and preparation

Based on previous studies and literature research, a list of parameters that may affect the distribution process was identified. Then, the questions were formulated based on these parameters:

- Temperature and relative humidity during storage and transportation.
- Modes of transportation.
- Training of distribution personnel.
- Level of technology.
- Handling and loading practices.
- Logistics: organization and outsourcing.
- Local factors.

A rough draft was written, with several questions that at first seemed to be of great interest. After a critical review, some questions were suppressed, either because they did not contribute with the study's objectives or because they increase the complexity of the research. The purpose of these actions was to extend the level of participation by reducing the questionnaire length.

Then the second draft was revised by different persons: two professors from the Management Operations Department at Simon Bolivar's University (Venezuela), a professor from the Packaging Logistics Department at Lund's University (Sweden), Tetra Pak's Carton Economy Department Manager, and a person within Tetra Pak with an extended experience in Distribution Chain Analysis (DCA). After gathering the criticisms and the different suggestions, a provisional questionnaire was developed.

This provisional questionnaire was adopted as the final version, after verifying with different people that it could be understood and filled in by everyone, this means not necessarily a person with logistics knowledge.

The questionnaire, as in its final version, aims to collect information about 6 main topics: general information, products and clients, logistics, distribution flow, technologies and product handling (See Appendix B).

Answers categories

Given the extended range of information that is expected to be collected, different types of questions were formulated:

- Category 1: Quantitative answers. (E.g. stacking height, percentage of usage of the railway transportation mode)
- Category 2: Yes or No answers (E.g. Does the company use logistic providers?)
- Category 3: Select one or more answers from the pre-established options. (E.g. which of the information technologies are used along the distribution chain?)
- Category 4: Open answers, difficult to assess. (E.g. how the package performance varies with seasons?)

Depending on the category, answers were analyzed in different ways. As a qualitative approach was chosen, no statistical assessments of the data was developed.

Application

The first step consisted on contacting the three market companies. An email was sent with the information and description of the project. After confirming that they were the right contact within the company, a conference call was made in order to explain with more details the objectives of the project and what was needed from them.

Mailing the questionnaire was the method of data collection chosen for Venezuela, as the contact with the liquid food manufacturers was made through the market companies. In Brazil and Argentina, there was the possibility to visit different companies related to the distribution chain of aseptically carton-packaged products.

Following there is a list of the different companies on which the questionnaire was applied. In Brazil and Argentina, the units of analysis were studied in more detailed by carrying out interviews and, in some cases, observation visits.

Brazil	<ul style="list-style-type: none"> • Companhia de Bebidas Ipiranga (Coca Cola Brasil Ltda.) • Agropecuaria Tuiuti (Shefa) • Unilever Best Foods Brasil Ltda. • Pamcari (Logistics Consultant and Risk Assessment)
Argentina	<ul style="list-style-type: none"> • SanCor Cooperativas Unidas Ltda. • Sucesores de Alfredo Williner
Venezuela	<ul style="list-style-type: none"> • Excelsior Gama (Supermarket chain) • Cativen

2.4.2 Interviews

In order to collect more detailed information from the different actors during the visit to Brazil and Argentina, a list of questions was developed. This tool, consist on a series of open-ended questions that reinforce the data collected using the questionnaire (See Appendix C).

Structured interview method was chosen in order to facilitate the analysis of data and to guide the interviewees towards the specific topics under studied (parameters). One main advantage of this method is that provides uniform information, which assures the possibility of comparing data.

The questionnaire was not only applied to the units of analysis in all three cases, it was also used as a tool to interview people within the different market companies, who could offer a broad overview of the distribution chain in their country.

2.4.3 Observations

During the visit to Brazil and Argentina, there was the possibility to carry out non-participant observation of some of the actors within the distribution chain. Two production sites were visited

in Brazil, one distribution center in Argentina and several distributors and retailers in both countries.

In Brazil, a visit to one of Coca Cola's production sites was carried out in Ribeirão Preto and another one to Shefa's factory in Campinas; both are cities close to São Paulo and deliver products to this region. In Buenos Aires, the visit consisted on a guided tour through the main distribution center for SanCor, which supplies dairy products for all the capital city area. The interviews were carried out along with the visits, only for manufacturers, while in the case of distributors and retailers in those countries, the visits consisted only in observation of the product display and the general state of packages in the final link of the segment of the distribution chain being analyzed.

2.5 Method of Analysis

The analysis of the empirical data collected through all the applied methods was developed following the different levels within the research design, which means starting with the analysis of specific data and getting to a more general description of the phenomena. As mentioned before, generalizations are not focused on assessing the prevalence of a characteristic or fact, but rather on building knowledge, which may be applicable to other cases of the same type and in the same context.

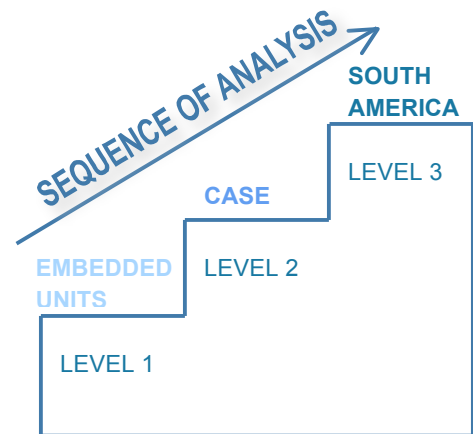


Fig.2.5 Sequence of data analysis

2.5.1 Analysis by embedded units: Level 1

The first level of data analysis was carried out by individually assessing each of the embedded units included in each of the cases. This analysis shows the key data found in the questionnaires, observation visits and interviews results, classified by the topics in the questionnaire: products and clients, logistics, distribution flow, technologies and product handling. After this, what it was

considered to be the most important issues and best practices regarding distribution for each individual unit were pointed out.

Building the distribution archetypes

In order to describe how products reach the retailers, models were built based on the answers given in the distribution-flow section in the questionnaires, especially from the diagram in figure 2.6

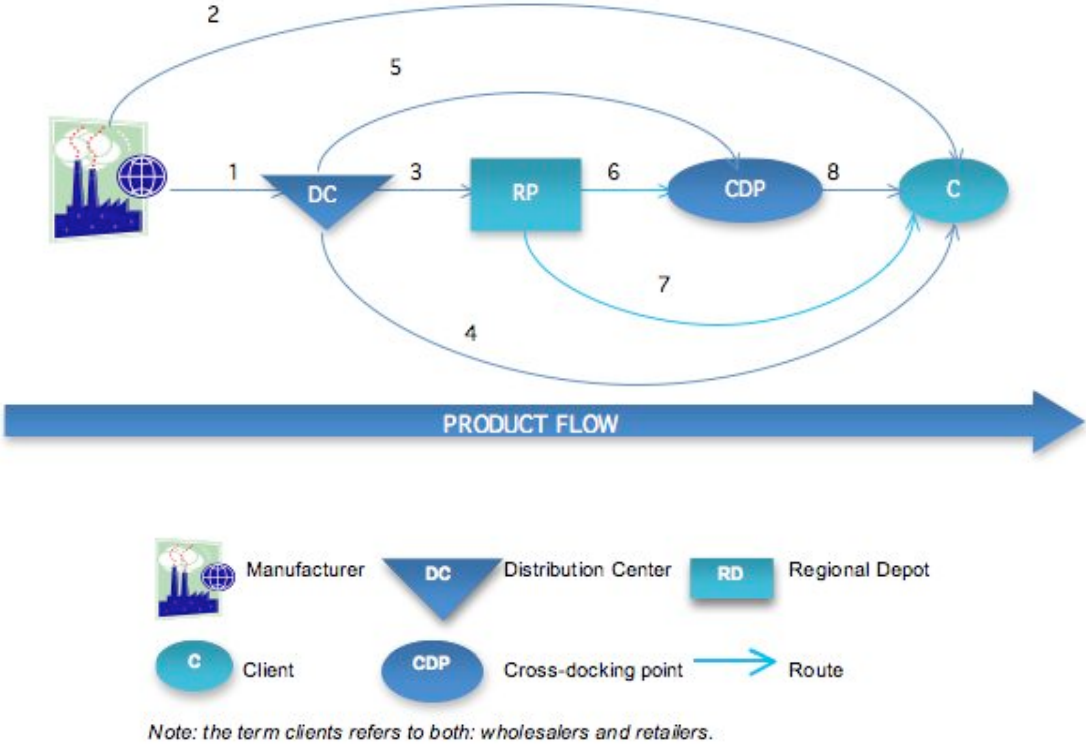
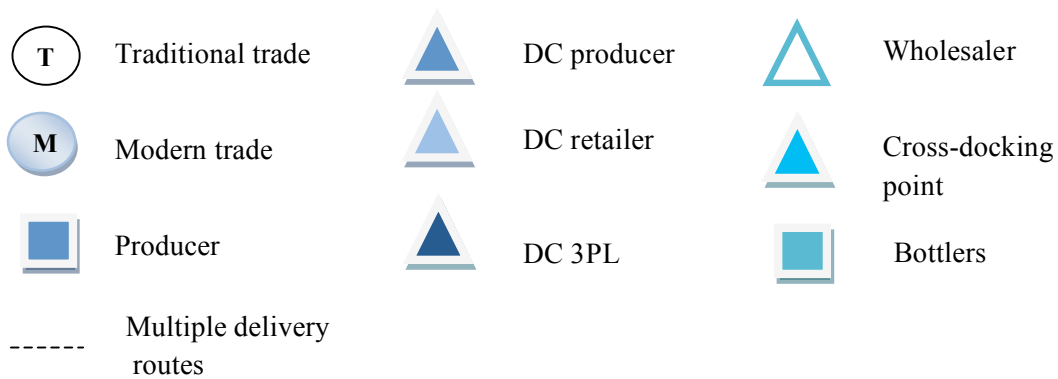


Fig. 2.6 Distribution Flow Diagram [10]

In order to translate this information into a model or archetypes, some kind of graphic representation was needed. This was developed based on the archetypes in the previous master thesis, but some changes were included in order to add more details into the description. After considering the different unit results, it was decided that the best way to build the distribution archetypes to describe the product flow was by using the following elements:



Consider one example for the flow of a product from the production site to a modern retailer. Figure 2.7 shows a flow in which the product travels from the producer to a distribution center owned by the company, then to a distribution center owned by a retailer and passing by a cross-docking point starts a delivery route through several modern trade points of sale.

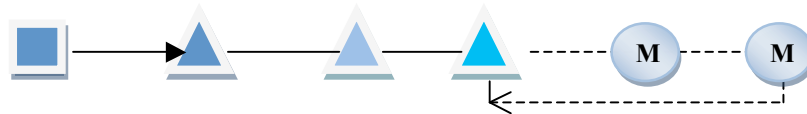


Fig.2.7 Example of an archetype

Limitations and considerations

Since these models are a representation of a complex process, not every detail can be shown on them. There are some limitations and considerations that must be taken into account in order to make the archetypes as simplest and informative as possible:

- The product always flows from left to right, as the initial arrows show.
- Not all transportations are carried out by the same vehicle or type of vehicle; the lines only represent the movement of the product between locations.
- In order to represent the case of a retailer who does not receive the goods at its outlet and must buy them from a wholesaler or distributor, an arrow in the opposite direction is added at the end of the chain (see figure 2.8).



Fig.2.8 Traditional outlet that buys product from wholesaler

Naming the archetypes

A nomenclature was established in order to differentiate the archetypes in each model. The initials of the embedded units of analysis (company name) were added to the number of each archetype within each model and, for level-2 analysis, the initial of the country was added.

2.5.2 Analysis by case: Level 2

After individually considering each of the units, a general analysis of the case was carried out. This analysis results from the information that was common for all units studied within the case, and for the general view of the distribution process given by Tetra Pak market companies and other interviewees.

2.5.3 Overall analysis: Level 3

After following the same pattern of analysis for each of the three cases, level 1 and then level 2, an analysis for the entire South American continent was developed. The results from this analysis gave rise to the development of tools that exceed the original objectives of this research.

3. THEORETICAL FRAMEWORK

3.1 Value Chain

The value chain begins with the new product development, which creates specifications for the products. Marketing and sales generates the demand, brings customer input back to new product development, and its strategy specifies how the product will be positioned, priced and promoted, as well as how the market will be segmented. Distribution takes the product to the customer and finally, service responds to customer's request. In addition, finance, accounting, information technology and human resources support the functioning of the value chain.



Fig.3.1 The value chain [11]

From a value chain perspective, the supply chain strategy determines the nature of procurement of raw materials, transportation of materials to and from the company, manufacture of the products, and distribution of the product to the customer, along with any follow up service. [11]

3.2 Supply Chain

A supply chain consists of all parties involved directly or indirectly in fulfilling a customer request. A typical supply chain may involve a variety of stages: customers, retailers, wholesalers, distributors, manufacturers, and raw material suppliers. The appropriate design will depend on both the customer's needs and the roles of the stages involved.

This concept recognizes that there are many organizations and intermediaries interacting to get the product to the market place, creating a logistics pipeline that enables an efficient and effective flow of products through to the final customer. [11]

3.3 Logistics

The US National Council of Physical Distribution Management defines logistics as the following:

“The efficient movement of finished product from the end of the production line to the consumer, and in some cases includes the movement of raw materials from the source of supply to the beginning of the production line. These activities include freight transportation, warehousing, material handling, protective packaging, inventory control, plant and warehouse site selection, order processing, marketing forecasting and customer service.”

There are many other definitions of logistics, but any could be placed above another since products, companies and systems differ. Logistics is a dynamic function that must be flexible and must adapt to the various constraints and demands imposed upon it and according to the environment in which it works.

Even though it is a broad concept, the following is a widely accepted view of the relationship in which the logistics definition lies:

LOGISTICS = SUPPLY + MATERIALS MANAGEMENT + DISTRIBUTION

Since logistics is concerned with physical and information flows from raw materials through the final distribution of the finished products, supply and material management represent those flows into and throughout the production process, while distribution represents those flows from the final production site until the customer.

The level of logistic integration within a company can be measure and divided in the following phases:

- *Phase 0:* Activities such as: warehousing, transportation, inventory planning, order processing, among others; are scattered across different departments within the company.
- *Phase 1:* Supplying, operations and transport functions are carried out, but there is not a logistics department either a pre-established procedure to coordinate those functions through meetings, integrated data bases, etc.
- *Phase 2:* There is a pre-established procedure to coordinate the internal logistic within the company through meetings, integrated data bases, etc; or either exist a logistics department

- *Phase 3*: In addition to what was described in Phase 2, activities are carried out aiming to improve the coordination of the material and information flow management with other companies, clients, third party logistic providers, etc [10]

Attitudes towards distributions and logistics have changed in the recent years. Despite the cost related to the movement and storage of goods, it is now recognized that distribution and logistics also provide a very positive contribution to the value of the product, since this operation provide the means by which the product can reach the customer or end user in the appropriate condition and required location.

An important and growing area is that of third-party distribution or the outsourcing of distribution operations. The decision to outsource is often made in the interest of lowering firm costs, redirecting or conserving energy directed at the competencies of a particular business, or to make more efficient use of labor, capital, technology and resources. Some of the major potential disadvantages to outsourcing include poor quality control, decreased company loyalty, a lengthy bid process, and a loss of strategic alignment. [11]

3.4 Physical Distribution

Physical distribution is part of the larger process of distribution, which includes wholesale and retail marketing as well. Physical distribution consists of a series of interrelated physical activities such as storage, materials handling, packaging and transport. [11]

3.4.1 Storage

A storage warehouse holds products for moderate to long-term periods in an attempt to balance supply and demand for producers and purchasers. Warehouses or distribution centers can operate at national or regional level, depending on the supply chain structure, or they can use conventional handling and storage systems, or can be designed to use automated or even robotic technology. However, the fundamental distinction is based on the inventory level; therefore there are two main types:

- Stock-holding warehouses.
- Stockless depots, such as cross-docking points.

3.4.2 Materials Handling

Another important component of a small business physical distribution system is material handling. This comprises all of the activities associated with moving products within a production facility, warehouse, and transportation terminals. These will have a major impact on how effectively materials flow through the system, and on the cost, amount of resources and time taken to get orders out to customers. In addition, handling equipment can be capital-intensive, and the act of movement can be labor intensive.

3.4.3 Packaging

Packaging is a key element within physical distribution and logistics for many reasons. However, the most important reason is because it protects the product from damage or loss during handling and movement through the supply chain. Some of the potential damages the package could be exposed to include:

- Mechanical shock, impact, vibration, compression or abrasion.
- Environmental factors such as water, pressure and temperature changes, light and other forms of radiation, contamination and exposure to air.
- Pilferage.

Packaging hierarchy

There are three fundamental levels of packaging [12]:

- *Primary package.* Holds the basic product and makes it available to the end consumer at points of sale.
- *Secondary package.* It is a transport package that contains several primary package units. Examples of this are: corrugated cardboard box or tray and plastic crates.
- *Tertiary package.* It refers to the one used when assembling several primary or secondary packages on a pallet.



Fig.3.2 The different levels of packaging

Aseptic Technology

The aseptic package technology, can free products from the chilled chain and all the costs and logistical issues related to it, add months to shelf life and enable broader distribution both geographically and in the types of retail outlets served.

Aseptic packaging consist in the sterilization of a food product by destroying the harmful bacteria and micro-organism through high temperature, so it can later be filled into a pre-sterilized packaging material and sealed in a sterile environment. The heat treatment is performed in a couple of seconds to ensure that the product retains its quality and nutritional value. The result is a shelf-stable product that requires neither refrigeration nor preservatives in order to remain fresh for months.

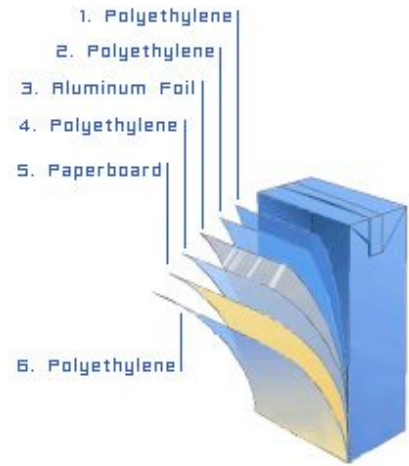


Fig.3.3 Layers of aseptic packaging material

The packaging material for carton-based aseptic packages is composed of a laminate of paper, polyethylene and aluminum foil. This combination of material varies to suit each different product category, but in each case the only material to be in direct contact with the contents of the package is food grade polyethylene. (See figure 3.3).

Combining the best attributes of paper, plastic, and aluminum, the multi-layer, high-performance aseptic package protects the content from light and air, seals in nutrients and flavor and makes it possible to keep the product's freshness for months. [3]

3.4.4 Transport

Categories

The two main categories of transport are the following:

- *Delivery transport* is concerned with the delivering of orders from the depot to the customer or retailer. This can be carried out by a company using its own fleet of vehicles or by a third-party carrier.

- The *primary transport* or trucking is the supply of products in bulk (i.e. in full pallet loads) to the depots from the central finished goods storage location or production point.

Basic means of transport

There are five basic modes of transporting freight utilized by manufacturers and distributors: water, road, rail, air and container systems. Many distribution networks consist of a combination of these modes of transportation. [11]

- *Water transport.* Water transportation is the least expensive and slowest mode of freight transport. It is generally used to transport heavy products over long distances when speed is not an issue. Conventional sea freight (without containers) is disadvantaged by the inefficient handling methods still used, as the need to double-handle cargo tends to cause more damage for both products and packaging.
- *Road transport.* Accessible and ideally suited for transporting goods over short distances, trucks are the dominant means of shipping in many countries of the world. There is a greatly reduced need to transship goods and packages, and for direct, full-load deliveries this is completely unnecessary. This saves time and minimizes the possibility of load damage.
- *Rail transport.* This mode is typically used for long-distance shipping. Less expensive than air transportation, it offers about the same delivery speed as trucks over long distances and exceeds transport speeds via marine waterways. Still, access to the network remains a problem for many businesses. Two main disadvantages of this mode of transport are that shunting shocks can cause load damage and that there is a need to double-handle many loads, since the first and last parts of the journey often need to be carried out by road transport.
- *Air transport.* Air transportation offers the advantage of speed and can be used for long-distance transport. However, air is also the most expensive means of transportation, so it is generally used only for smaller items of relatively high value. The airfreight mode does not experience severe physical conditions, and so loads are not prone to damage and breakages.
- *Container systems.* Containerization makes possible to carry out intermodal systems of freight transport, enabling the easy movement of goods in bulk from one transport mode to another. They offer a reduction in the handling of goods, as they are distributed from the point of origin to point of destination. There is also a reduction in damage to products caused

by other cargo, but at the same time damages can occur due to rain or seawater leakages in the container. [13]

Operational factors

There are operational factors that even though are external, have a relevant influence on freight transportation since they can vary significantly from country to country. They include: basic infrastructure, trade barriers (customs duty, import quotas, etc), law and taxation, financial institutions and services, economic conditions (exchange rate stability, inflation, etc), communication systems, culture, climate. [11]

As there are many local factors influencing logistics and distribution, following there is an overview of the external environments on which this research focuses.

3.5 External environment

3.5.1 South America

South America is the fourth largest continent on the planet, with an estimated population of 380 million. Together with Central America, it is the most urbanized region, with around three-quarters of its population living in and around cities (planet retail). It contains twelve nations: Argentina, Brazil, Bolivia, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela. In addition it contains French Guiana, a French overseas department.

Also South America's climate is predominantly wet and hot, and along the equator is a belt of humid tropical climate. However the large size of the continent makes the climate of South America varied with each region having its own characteristic weather conditions.



Fig.3.4 Map of South America

The processing of agricultural commodities remains the most widespread and important industry in the continent. The internal marketing and exporting of agricultural products account for a substantial part of the commercial and manufacturing activity. The main agricultural products are: vegetables, fruits, and dairy items.

Industrial development on the continent, however, continues to face several problems: the small size of the national markets, inadequate technology, and weak transportation and distribution networks. [17]

The South American food retail sector shows little consolidation, as it is mainly made of small mom and pop stores, although in some key markets like Chile, Argentina and Brazil the modern sector has already reached a substantial degree of development. Modern retailing in the key markets set to progressively expand from the already competitive big cities into smaller towns. However, this is not the case for less mature markets like Bolivia and Peru, as these countries lack the infrastructure and degree of development needed.

	Argentina	Brazil	Chile	Colombia	Dominican Republic	Guatemala	Panama	Peru	Venezuela
<i>Nominal GDP (US\$ bio.)</i>	251.9	1,270.5	163.3	134.7	38.2	39.9	17.6	106.1	229.6
<i>Real GDP Growth (%)</i>	8.7	4.7	5.2	6.4	5.0	3.4	6.5	8.5	9.0
<i>PACKS GROWTH (%)</i>	7.0	3.1	13.0	13.4	7.8	27.6	10.1	40.6	9.6
<i>Population (Mio Residents)</i>	39.3	184.8	16.1	47.5	9.0	13.2	3.4	28.8	27.4
<i>Per Capita Income (US\$)</i>	6,410	6,712	10,143	2,837	4,201	3,023	5,256	3,684	8,378
<i>Inflation (%)</i>	8.6	4.0	5.8	5.1	6.0	8.0	2.0	3.9	22.5
<i>Foreign Debts (US\$ billion)</i>	133.7	154.3	45.4	41.1	n.a.	n.a.	10.0	34.4	40.1
<i>Trade Balance (US\$ billion)</i>	10.3	42.3	14.2	0.1	(5.8)	(4.9)	(1.9)	8.4	21.4
<i>Unemployment rate (%)</i>	8.3	9.4	8	10	16.3	n.a.	1	8.4	8.6

Fig.3.5 Central & South American market figures [Source: Tetra Pak Brazil]

In the less developed markets of the region, traditional retailers and small supermarkets get their supplies from a series of small wholesalers. Thus, in countries like Bolivia, Ecuador and Peru wholesalers continue to play a key role in the national food supply, although big manufacturers tend to have their own distribution network.

The hypermarket & superstore sectors are by far the largest retail format, but in the other hand private labels are on the rise in the two largest South American markets, Argentina and Brazil; and discount stores are also becoming more popular in the region. In the South American market, forecourt stores have a much stronger presence than convenience stores. The cash & carry sector is lead by SHV Makro, present in Brazil, Argentina, Colombia and Venezuela.

Retail sales are highly sensitive to economic conditions, and therefore this variable showed a weak performance in South America in the early 2000s. However, once the economic upturn consolidated, retail sales have expanded more vigorously, as consumers increased their spending helped by higher incomes.

To accelerate economic growth and promote free trade, in 1991 South America established the Mercosur association which now comprises Brazil, Argentina, Paraguay, Uruguay and Venezuela, with five other countries (Bolivia, Chile, Colombia, Ecuador and Peru) enjoying the status of associated members.

3.5.2 Brazil

Brazil is far the largest country in the region and fifth largest country by geographical area. While Brazil is one of the most populous nations in the world, population density drops dramatically as one move inland. Just the metropolitan areas of São Paulo and Rio de Janeiro together have around 32 million inhabitants, being those two main economic centers of South America.

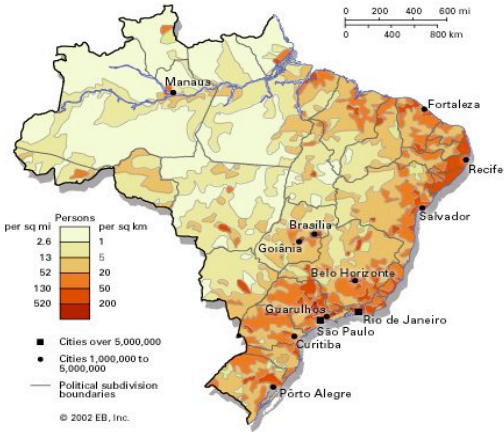


Fig.3.6 Brazil's population density

Brazil has five climatic regions: equatorial, tropical, semiarid, highland tropical and subtropical. The climate is mainly tropical but presents important differences between regions.

Mountains, rivers, and its broad size have all been obstacles to transportation in Brazil, but the country has an expanding transport network.

Roads and trucks are the most used method of transportation; a national highway system links all the state capitals. Despite of the existence of several rivers, waterways are very rarely used with

Transportation Matrix

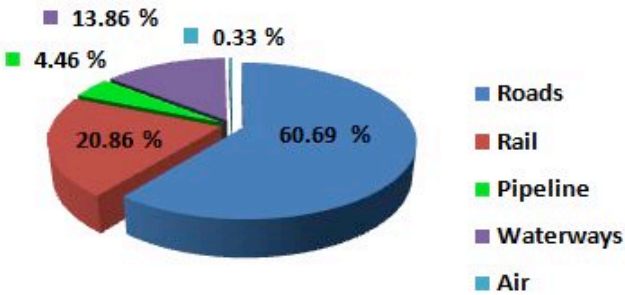


Fig.3.7 Freight transportation-
Source GEIPOT

the exception of the Amazon region, where rivers are usually the only mean of transportation. The use of trains for cargo transportation is mostly restricted to minerals. In addition the railway system has variations in track gauges, what hinders the use of this mean of transportation.

Brazil is currently about the world's 10th largest and first South American economy. Its GDP is the highest of Latin America with

large and developed agricultural, mining, manufacturing and service sectors. But still it has been unable to reflect its recent economic achievements into social development due to main social issues such as: poverty, urban violence, inefficient public services, among others. [18]

The liberalization of its economy and the creation of the Mercosur, have had an impact on the retail market, favoring foreign inward investments into the retail sector in the recent years. Brazil accounts for more than half of all retail sales in the region, relatively high retail sales per capita when compared to the rest of South America, but still relatively low compared to Western standards.

Hypermarkets are the main format used by the largest retail groups in the country, followed by supermarkets. Supermarket groups are using their

growing purchasing power to bypass wholesalers and negotiate directly with suppliers. Although

Banner food sales 2007

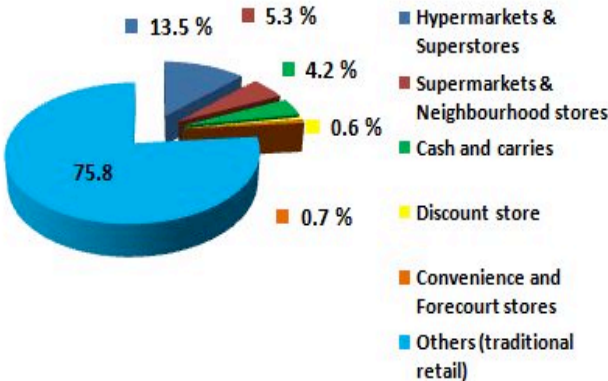


Fig.3.8 Food sales in Brazil by type of outlet
[15]

the discount store sector is relatively small, it has experienced a significant expansion in the last years. Private labels had around 8% shares of supermarket sales in 2004, and own label participation is set to continue growing.

Consumer spending is expected to increase by around 10% during 2008, driven by a more stable economic situation and social policies carried out by the government, such as the increase of the value of the minimum salary. [15]

3.5.3. Argentina

Argentina is second in size on the South American continent and eighth in the world. The current population of Argentina stands at around 40 million, of which almost half live in the province of Buenos Aires, which stands out as a major South American metropolis.

Because of longitudinal and elevation amplitudes, Argentina is subject to a variety of climates. It is mostly temperate and arid in the southeast and sub-Antarctic in the southwest.

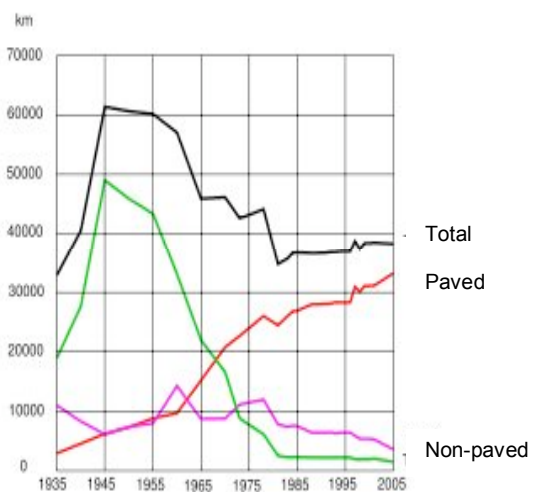


Fig.3.9 Evolution of roads in Argentina

Argentina's transportation infrastructure is good compared to other countries in Latin America. There are lots of national and provincial routes spread throughout the country. In addition multilane highways connect several main cities and more are under construction. The country also has a number of national and international airports. Fluvial transport is mostly used for cargo; in contrast long-distance trains are unimportant for people and freight transport.

Argentina benefits from rich natural resources, a high literate population, an export-oriented agricultural sector, and a diversified industrial base. The main industries include: food processing, consumer durables, metallurgy, and steel.

Argentina has the highest Human Development Index level and Gross Domestic Product (GDP) per capita in purchasing power parity in Latin America [14]. The country is growing strong again following its worst economic crisis ever, which ended in 2002.

Retail sales were badly affected by this economic crisis. For example, hypermarkets experienced a fall in sales, but the improved current economic situation is allowing them to recover client base and improve sales. In the other hand, discounters benefited from the crisis, and in subsequent years they have continued increasing their market share.

In the last years there has been an important increase in supermarket sales, as consumer confidence intensifies. Private labels had a share of around 13% of supermarket sales in 2006, and own label participation is set to continue growing. Convenience stores managed by Asians are growing rapidly due to their competitive prices and a more limited product range.

Retail sales are expected to continue increasing in 2008, as the economic recovery continues making its impact in consumer confidence and sales. [16]

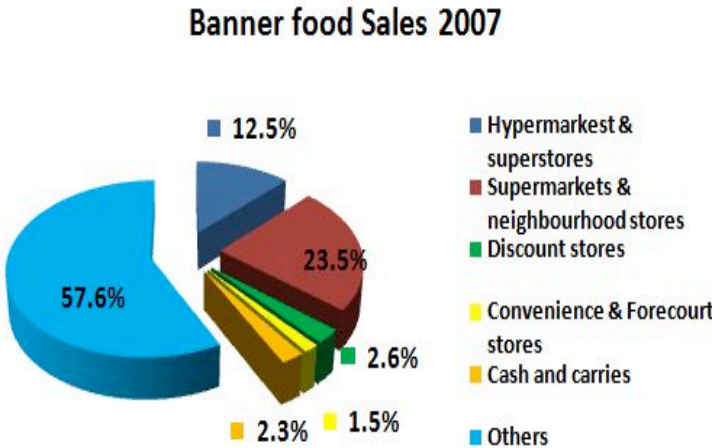


Fig.3.10 Food sales in Argentina by type of outlet [16]

3.5.4 Venezuela

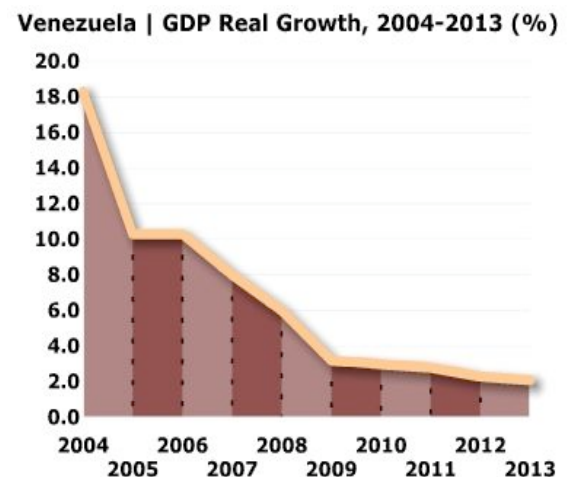
Venezuela is a country on the northern coast of South America, bordering the Caribbean Sea. Its landscapes range from Andes Mountains in the north to tropical jungles in the south. Its population is about 26,084,662, and it is highly concentrated along the coast, with about one of every five Venezuelans living in Caracas and its suburbs.

Its climate is tropical, extremely humid, and hot but moderate in highlands. Most precipitation falls between May and November, and the dry season is from December to April. The country

has an extensive road network, as roads are the principal means of transport for good and people. The railway network by contrast is undeveloped, and its use for freight transport is unimportant. All the country's foreign commerce is carried by sea; also transport on interior waterways, specially the Orinoco River is important.

Agriculture plays a much smaller role in Venezuela's economy than in economies of other South American countries, as oil production is the main economic activity. The leading manufactured goods in Venezuela include petroleum, steel, cement, aluminum, processed food, beverages, and clothing. The country's economy ranks fourth in Latin America thanks to oil revenue, as Venezuela has so far failed to diversify its economy. Like many Latin American countries, Venezuela has a high percentage of poverty, corruption and governmental patronage.

Venezuela's retail sector is the least developed of Latin America's major economies. Supermarkets account for around half of retail food sales, while the rest are mostly traditional retail stores. In Venezuela, traditional retailers and small supermarkets get their supplies from a series of small wholesalers. Lower income urban neighborhoods and interior towns support many traditional mom and pop stores, as this stores offer credit to customers.



Source: Planet Retail Ltd - www.planetretail.net

Fig.3.11 GDP Growth in Venezuela [25]

The unstable political situation and the lack of a modern grocery retail sector in a country dominated by traditional stores have discouraged international retailers from investing in the country. Lastly, the country has been experiencing a shortage of certain basic food products in recent months. While retailers blame shortages on government-imposed price controls (more than 170 basic food products) that force companies to sell at a loss, the government claims that speculators, including retailers and distributors, have been accumulating food to boost prices. [25]

4. RESULTS AND ANALYSIS

Despite the primary objective of this research was to build a generic view of the distribution archetypes in South America, after analyzing the selected countries, it became clear that generalizations at such a broad level cannot be made. Regarding the definition of distribution archetypes in each country, is important to point out that even though there are similarities in the channels used; the size, type, location, market and many other aspects of the company will influence or determine all the logistic process to deliver the products. Although this distribution chain can be affected and shape by the local parameters of the country, each particular distribution flow for a particular product should be considered or studied in order to evaluate the package performance.

To develop this particular analysis the following method can be applied: First use the questionnaire to obtain the basic information to describe the process of distribution, then build the archetypes to categorize each distribution flow, and finally use the risk level tool to typecast each archetype. This new tool will be explained in detail at the end of the chapter.

4.1 Case Study 1: Brazil

4.1.1 Companhia de Bebidas Ipiranga (CBI)-Coca Cola Brasil Ltda.

This company produces Kapo, one of the juice drinks with the highest market share in Brazil, in a TWA presentation. It supplies approximately 30000 points of sale in more than 300 cities in the São Paulo state and in the south of Minas Gerais.



Fig.4.1 Kapo juice in TWA 200ml

Key findings:

Products and Clients	<ul style="list-style-type: none"> - For Kapo juice, the product volume delivery is approximately 60% for traditional trade and 40% modern trade (mainly supermarket chains).
Logistics	<ul style="list-style-type: none"> - Phase 3 of logistics organization. Logistic activities are integrated along the whole supply chain. - CBI owns every step of the distribution, including the vehicle fleet. No 3PL providers are involved in the distribution of Kapo.
Distribution Flow	<ul style="list-style-type: none"> - There are three main channels of distribution: the production site delivers products to outlets in a 100Km radio, to other distribution centers in other regions, which distribute up to 100Km from their facilities and to other Coca Cola's bottlers which manage and carry out the distribution by their own. See figure 4.2 for the product flow model. - CBI has a high rotation of inventory, which allows it to deliver products 24 hours after orders.
Technologies	<ul style="list-style-type: none"> - Very high level on information technologies (bar codes, routing and loading configuration software, SAP). - CBI implemented a gravity fed storage system in distribution centers, which facilitates inventory rotation by using rollers in a FIFO principle.
Product Handling	<ul style="list-style-type: none"> - CBI gives training to employees regarding product handling, in collaboration with Tetra Pak. They also implemented some other tools as balance scorecard and information posters. - Pallets are used during storage and transportation. Manual handling only used when assembling pallets and picking orders. - Kapo is the most expensive product to storage, as they stack only one pallet per shelf level to avoid damaging the packages. - All distribution is carried out by land, with a fleet of 100% closed trucks. Curtain side trucks are the most common type used, as these facilitate the unloading process at points of delivery. - CBI uses also motorcycles, which follow trucks along some routes, to deliver to smaller outlets nearby the truck's points of delivery (See archetypes 3c and 4c in figure 4.2). - Constant maintenance of fleet of vehicles, carried out in their own facilities at the production site in Riberão Preto. - Kapo is loaded on trucks with other products such as cans and bottles, but it treated as a sensitive product for its package material.

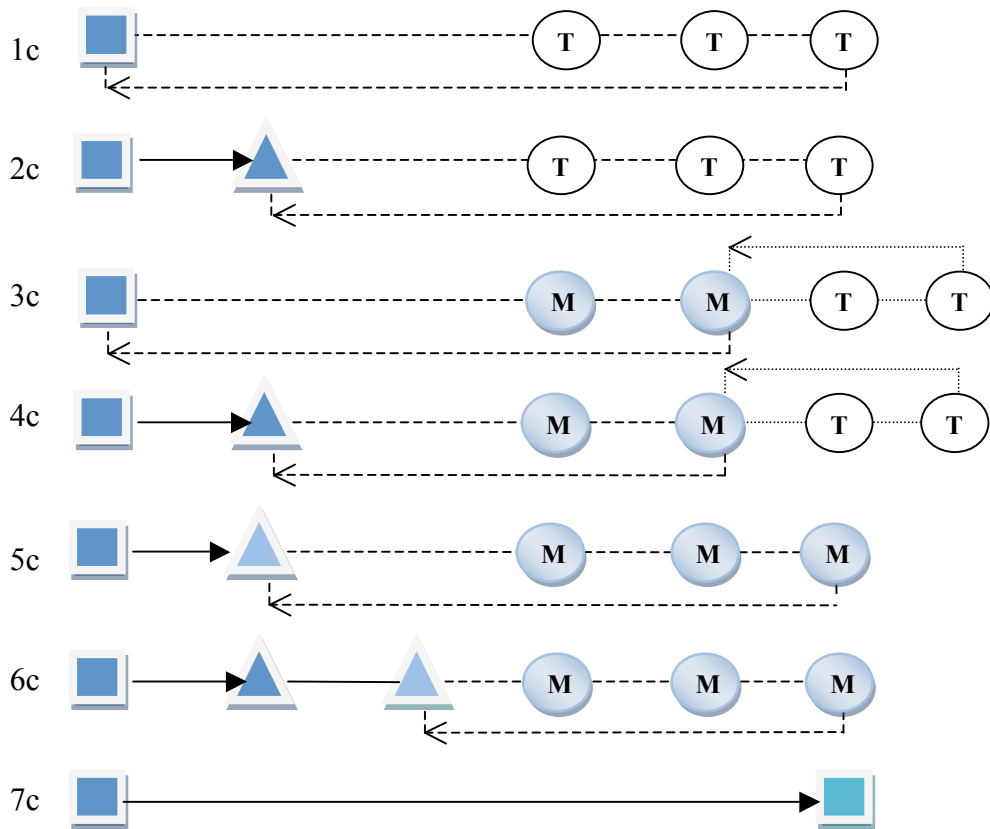
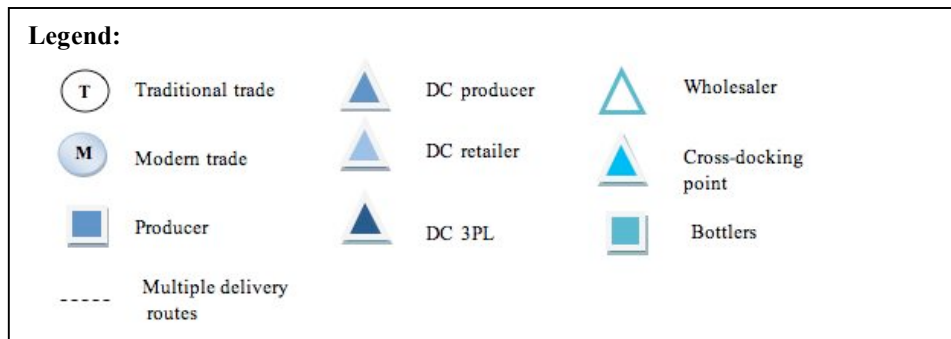


Fig.4.2 Coca Cola's distribution flow



Success factors and main issues:

- The high level of information technologies allows CBI to optimize the distribution process. Traceability of products is possible through the bar code system and delivery time decreases by using software applications to plan the most efficient delivery routes and to assemble the optimal load configuration. The load configuration planning also facilitates the unloading

process by always assuring access to all types of products inside the truck when reaching a point of sale, and also reduces load damage during transportation by considering the interaction between the different types of products being stacked in the vehicle.

- Ownership of truck fleet and developing their own maintenance facilities, assures the good state of transportation vehicles and with this, less impact to the load when travelling long distances.
- Training to employees is carried out according to Tetra Pak's guidelines and in collaboration with it; therefore it focuses on the best handling practices to minimize package damage during distribution.
- Coca Cola uses trains as mean of transportation for products in cans. In this case, intermodal transport is used to avoid unloading and loading goods into containers. This could be a good solution for carton-packaged products since vibration can be a more destructive influence than shock on freight, and vibration energy levels for rail modes are comparable to or lower than urban streets and primary highways. [23]

4.1.2 Unilever

A multinational corporation that owns many of the world's consumer products brands in foods, cleaning agents and personal care products and beverages. In the beverage category, one of the most important products in Brazil are the soy-based juices, which Unilever produces in TBA slim presentation under the brand name AdeS (In Europe the brand name is Adez).



Fig.4.3 AdeS soy-based juice. TBA1000S

Key findings:

Products and Clients	<ul style="list-style-type: none"> - Unilever has approximately 2800 clients in Brazil, but only delivers products to customer with 4 or more checkouts. The product volume delivery is around 50% for wholesalers and 50% for modern trade outlets (30% small and medium, 20% big retailers). Independent outlets are served by wholesalers and specialized distributors.
Logistics	<ul style="list-style-type: none"> -All physical distribution activities are outsourced, including transportation and DC management. 3PL companies carry out the distribution and Unilever manages the process from a strategic level. -Integration of the whole supply chain and logistics through the establishments of static circuits.
Distribution Flow	<ul style="list-style-type: none"> - See figure 4.4 for the distribution flow of Unilever’s goods. - Unilever has 12 distribution centers across Brazil and 160 carriers render service from them. - They have nine cross-docking points (transfer points) to split the load inside big trucks into smaller and more convenient vehicles. - For the wholesaler’s channel, they deliver to rural areas, but in big cities wholesalers most pick up the goods from the DC.
Technologies	<ul style="list-style-type: none"> - Unilever utilizes a Transportation Management System (TMS) as a tool to optimize distribution schedules and routes. - All trucks are continuously tracked by GPS control. - Inside distribution centers there is a traditional level of technology: conventional racking system for pallets, forklifts, and hand trucks.
Product Handling	<ul style="list-style-type: none"> - The split of means of transportation used for the total volume of goods across Brazil is: 2% by boat, 3% by train and 95% in closed trucks. - For boats and trains they use intermodal shipping, which means no handling of the freight itself while changing modes (goods remain inside the containers). - Food and health-care products are delivered in the same trucks. - Only 70% of the volume of goods is transported on pallets. The rest is transported without pallets to fit in small trucks.

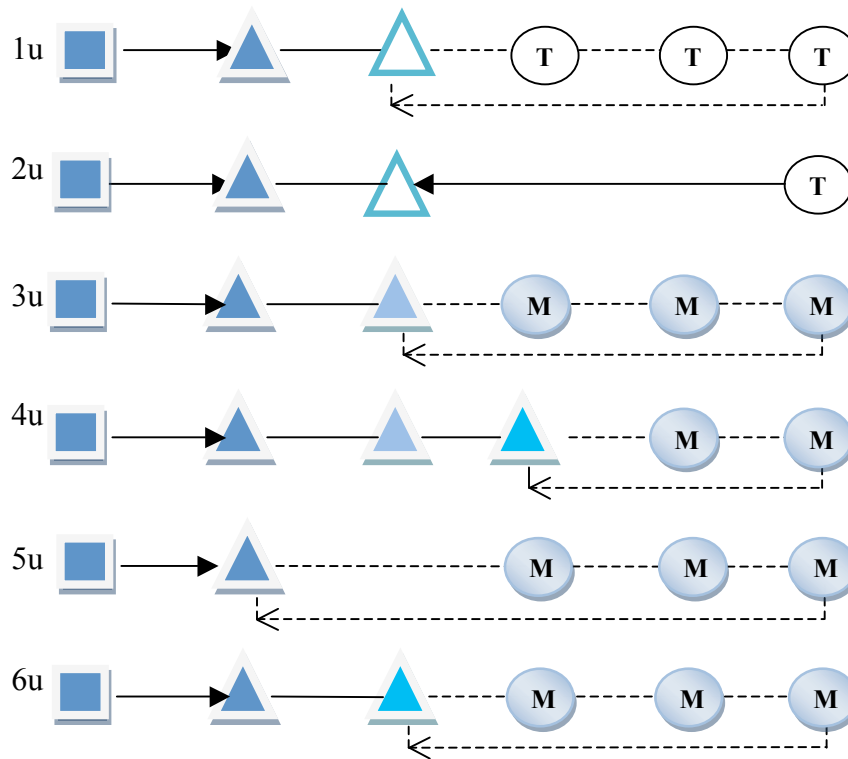


Fig. 4.4. Unilever's distribution flow

Success factors and main issues:

- Integration of the supply chain and logistics through static circuits. Through the establishment of transportation loops, the distribution vehicles can cover different routes along the whole supply chain in order to avoid travelling without any load. This strategy requires the collaboration of suppliers, manufacturers and retailers, so the carriers always load the vehicles after delivery and continue to another point in the supply chain. The goal is to optimize the transportation schedule and costs by reducing stop hours for carriers, decreasing total lead-time and allowing carriers to offer better prices. It is a new trend in Brazil, which is gaining importance due to the benefits in transportation costs reduction.
- Unilever utilizes the services of a specialized consultant to automatically check into a carrier's safety record before hiring it to transport a load. It also offers services to assess risk along delivery routes and to render assistance in the event of accident during freight transport.

- Cross-docking points, or transfer points, are established in a deconsolidation arrangement, where large loads are broken down into smaller lots and transfer into smaller vehicles for ease of delivery within urban areas. Although it facilitates the delivery process, it is a critical point in the chain regarding product damage due to manual handling in short periods of time.
- Unilever receives between 40% and 50% of sale orders from retailers for the last week of each month, which forces them to handle almost half of the volume of goods sold in a whole month in just one week. This is a cultural issue that impacts logistic infrastructure and of course damaged goods levels, as more product volume delivery leads to higher amounts of damaged products.

4.1.3 Shefa/ Agropecuaria Tuiuti Ltda.

This company produces milk, soy-based juices and chocolate drinks. It is located in Campinas, a region within the São Paulo state. At first its market was limited to this region, but in the last few years it has expanded across Brazil. The company has eleven filling machines in operation for TBA and TBA slim.



Fig.4.5 Shefa UHT milk
TBA1000

Key findings:

Products and clients	-The split of total product volume delivery among the clients is: 25% wholesalers and 75 % modern trade outlets. -The smallest retailers they delivered to, have between 5-10 Ck.
Logistics	-Phase 2 of logistic integration. -They outsource the transportation, except for local distances for which they use their own small trucks.
Distribution Flow	-Most common archetype is from the industry directly to the DC of the big retailers. See figure 4.6 for the whole distribution flow.
Technologies	-Traditional technology in their distribution center. They developed their own racks system, using movable racks that allow a flexible layout when storing finished products. -Use of store management system for production and orders control.

Product Handling	<ul style="list-style-type: none"> - Training programs for the correct product handling, not only for the workers at the production site but also for carriers. - The pallets are carried by trucks from the production line to the warehouse, due to the layout of the plant. - Pallets are used during storage and transportation, with the exception of the transportation in small trucks (5%). All the pallets are returnable. - All the transportation is carried out by land, with closed trucks (10%) and open trucks with a canvas.
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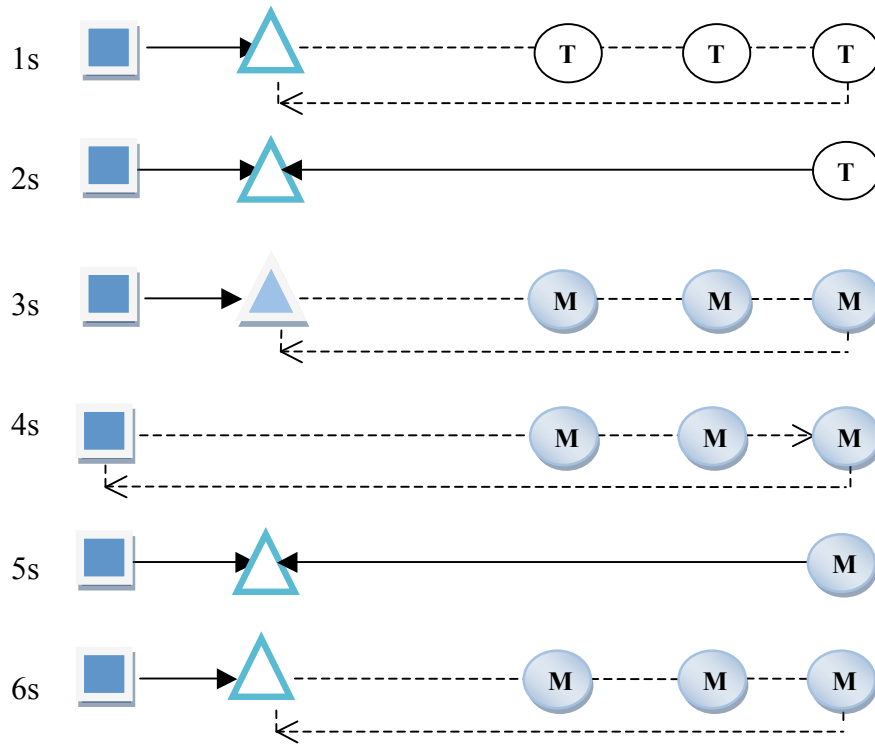


Fig 4.6 Shefa's distribution flow

Success factors and main issues:

- The most common distribution archetype is to deliver the product directly to the big retailer's DC, as the market and sales are concentrated in this retail sector. The smallest retailers they delivered to, have between 5-10 Ck; this means that their products reach the traditional stores through the wholesalers. These intermediaries not only cover the traditional trade but also supply the small and medium modern stores.

- In relation to the logistics integration, supplying operations and transport functions are carried out, but there is not a logistics department and neither a pre-established procedure to coordinate those functions.
- An important issue concerning product handling is that they developed a training program for workers at the production site and also information material for carriers, even though those are independent workers. The training material is based on Tetra Pak's guidelines for product handling.
- In addition to their products, they pack and store a brand of milk for another dairy company. It is important to point out that the company notices that large milk presentations tend to suffer more damages during distribution than portion pack presentations.

4.1.4 General overview for Brazil

Products and market:

- Dairy products are packed with cardboard tray and plastic film and juices with wrap around cardboard box. Dividers are not used inside secondary packages.
- Pallets follow the US standards (1x1.20 m)
- The juice market is really big and important in the country. There are many varieties of products in this category and within it soy-based juices are very popular. Another drink that is increasing its share in the market is the coconut water. According to a research done in 2005 by Latin Panel Institute, milk was in 39% of the answers considered the breakfast beverage, followed by coffee and fruit juices. However, during lunch and dinner the most preferred are the fruit juice and the carbonated beverage. Fruit juice is the most preferred during the afternoon break and milk is the second most preferred with 16% of total choices. To go deeper into the package option, among the options plastic bottle, plastic bag and long life, the most preferred one is by far the long life package, with 70% of the preferences. The least preferred one is the plastic bag with just 8%. [21]
- Private labels constitute a trend that is growing in Brazil, which Tetra Pak should exploit by promoting their packages and technology.

Damages:

- Every company keeps a record of the spoiled goods during distribution, and in most of the cases they take responsibility for the damages by replacing the products. If the problem occurs during transportation, then the 3PL takes the responsibility.
- Most of the problems that packages show by the end of the distribution chain are just damages that affect the appearance of the package, but not leaking. Milk and especially big size packages tend to show more damages.

Storage or transportation:

All companies agreed on the fact that transportation has the highest negative impact on the product, and that in second place comes the product handling inside stores. Inside the retail stores, employees do not respect the stacking height recommended and put more layers than usual to take the most of the available space. In order to offset this issue, the Brazilian Tetra Pak Market Company is carrying out a training program to retailer's employees called "Zero Waste". It has 3 main objectives: improve package appearance and visibility at the stores, decrease waste of Tetra Pak product, and add value through Tetra Pak services for customers.

Guidelines:

All the interviewed customers follow Tetra Pak's guidelines for secondary packaging material. In relation to the guidelines for correct product handling, they had their own, which are based on Tetra Pak's, and are transmitted through training programs. It is important to promote these programs not only within producers, but also to all players involved in the distribution process.

Local factors:

- *All interviewees agreed on infrastructure being a main local parameter affecting the distribution chain.* Most of the Brazilians roads are under jurisdiction of the municipalities and the vast majority of them are not paved (by 1999 only 164,247 Km from a total of 1,724,924 Km were paved [22]). Brazilian cities such as São Paulo and Rio de Janeiro have modern metropolitan expressways, and paved roads link practically all twenty-six state capitals, but road maintenance remains a problem. In the Northeast, the road conditions are

considered really poor and it is far away from the main production and consumption centers (Southeast), forcing carriers to move freight between the north and south by ship, with a considerable longer delivery time. Options to transport goods are limited within the territory. Roads are the most common way to transport freight, as railways are underdeveloped and have a low capacity. Sea transportation is only used for export, since roads linking Brazil and neighbour countries are considered adequate only in the southern regions. However, ports are in need of modernization, and none can handle the latest generation of huge container ships. The privatization of infrastructure is a trend that might change the current situation of transportation infrastructure.

Even though infrastructure seems an obstacle against the transportation of goods in Brazil, delivery times seem to be very short. The three companies interviewed claimed to deliver their products after 1 or 2 days after the retailers make the purchase order.

- *Another parameter that was not initially considered but is very important when defining the Brazilian distribution network is the tax policies of individual Brazilian states, which make it economically difficult for distributors to serve the entire country from one or two locations. There is not a standard tax rate across the country when invoicing manufactured products, which leads to a tax war to bring invoices to each state. This has led a great amount of manufacturers and distributors to send products to travel unnecessary distances in order to have a better tax rate on their invoices. Many of the production sites are established in the São Paulo state, as well as many of the consumption centers, but in Goiânia the tax rate is lower, which drives some companies to take their products from South to North to invoice them there, and take them back to South to make the final delivery (See figure 4.7 for an example). The cost of extra transportation is even lower*



Fig.4.7 Example of route to reduce tax cost on goods

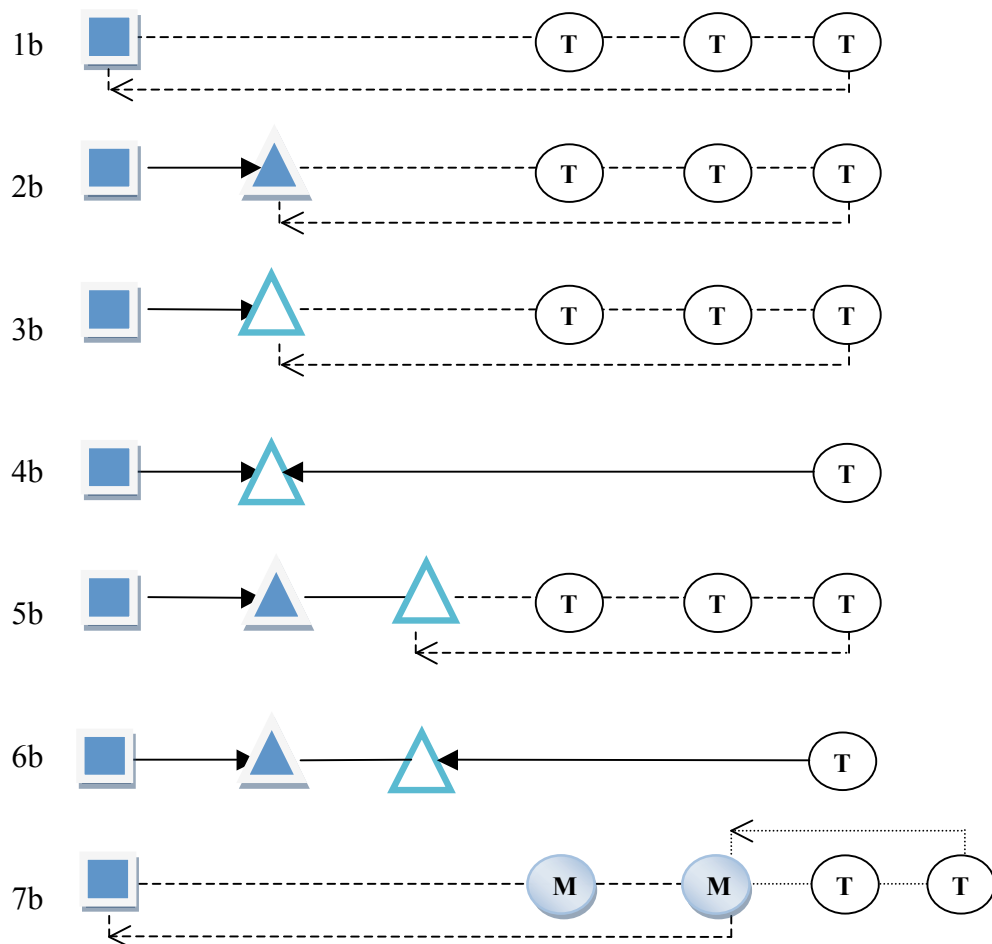
than the tax difference of invoicing in the original destination of the goods. By doing this, the product is subjected to additional potential damage due to transportation.

- *Social conditions* also have an impact on the distribution chain in Brazil. Low salaries for truckers, cargo theft and robberies are common factors across the country. The growing third-party industry is introducing a new breed of logistics experts who are determined to raise service expectations to very high levels to assess the risk of distribution and prevent losses as much as possible; this is the case of Pamcari.
- *Temperature and humidity does not seem to be an important parameter affecting the freight damage rate during distribution.* Interviewees agreed on the fact that package performance does not vary with seasons or while travelling between areas with different climate within the country. This fact contrasts with the findings for the Chinese distribution research [2], which concluded that relative humidity varies so much in this region that could even affect package's performance during storage.

Distribution and market channels:

- Even though the modern sector has reached in the last years a substantial degree of development, traditional trade continues to predominate in Brazil. Although, medium and big modern stores constitute only the 2% of the stores, it account for 60 % of ACV (All Commodity Volume) [24]. The market is specially concentrated in large chains that are now pursuing multi-format strategies encompassing hypermarkets, neighbourhood supermarkets, discount stores and convenience stores. For this reason the most common distribution channel is through the DC's of these big retailers. (See archetypes 14b, 15b, 16b, and 17b in figure 4.8).
- For traditional stores the most common channel is to use specialized distributors and wholesalers as intermediaries. It is common for traditional outlets to go and buy directly from them. (See archetypes 4b and 6b in figure 4.8) Due to the large size of the market, it is common for producers to use these intermediaries not only to distribute to traditional stores but also to small and medium stores. (See archetype 11b in figure 4.8).

- Multiple delivery routes are used in almost all channels except when producers deliver to the CD's of the big retailers, and when retailers pick up their products. Another technique that contributes to the distribution's efficiency, is the "the static circuits", which are performed especially by big companies.
- The main industrial and commercial areas of the country are located in the triangle of São Paulo, Rio de Janeiro and Belo Horizonte. In these cities, due to the traffic congestion, there are laws regarding truck circulation. This issue in addition to the tax policies, and the large distances give rise to the development of cross-docking points, where the product is re-distributed in small-medium trucks and delivered in a fixed route. Not only the producers are incorporating this into their distribution channel (See archetype 13b in figure 4.8), but also big retailers are following this trend. (See archetypes 17b in figure 4.8)



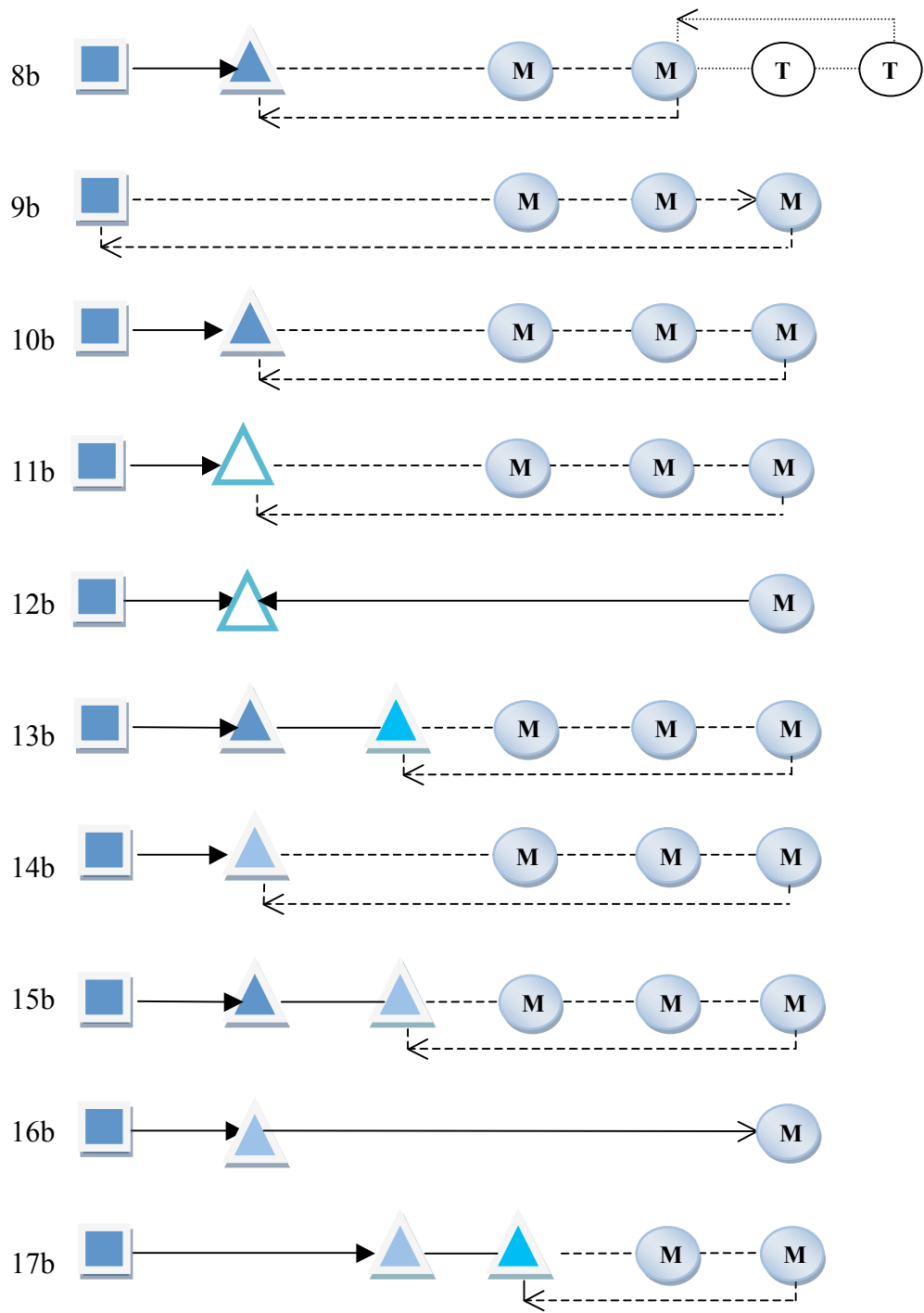


Fig.4.8 Brazil's distribution flow

As shown in figure 4.8, there are many archetypes due to the complexity of the Brazilian market. In general, some archetypes are very similar; the difference arises if either the product goes directly to the retailer or intermediary, or passes through the producer's DC. This will depend on the characteristics of the producer: its size, logistic infrastructure and market. The figure 4.9 shows the most common distribution archetypes use in Brazil, which includes 2 channels for traditional trade and 4 to deliver to modern trade.

When defining the distribution archetypes for this country, it is important to take into account that not all actors within the distribution chain could be reached and studied. The results are limited by the answers given by producers and Tetra Pak Brazil. The performance of intermediaries or retailers was assessed through the manufacturer's point of view.

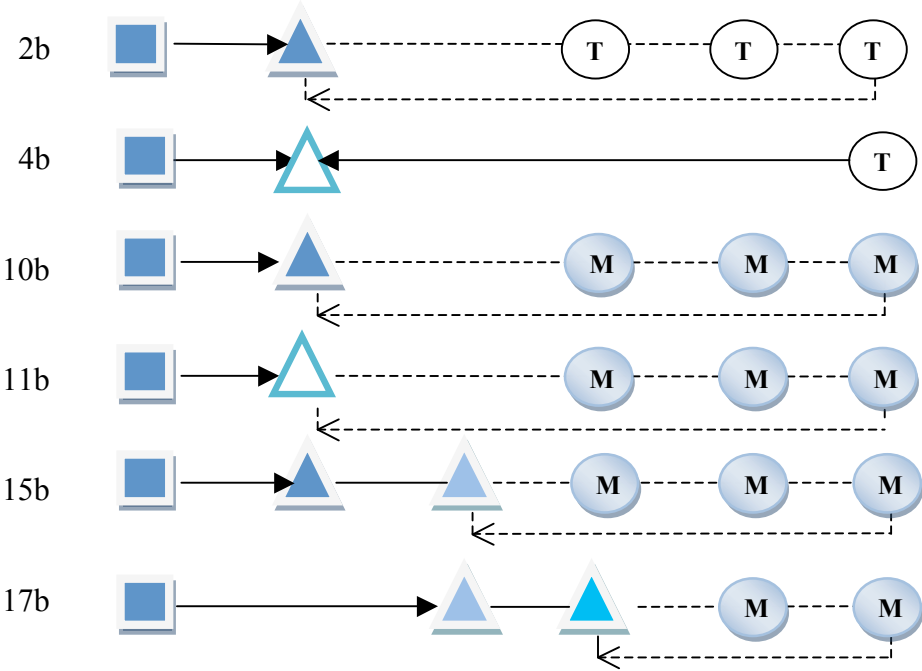


Fig. 4.9. Most common distribution archetypes in Brazil

4.2 Case Study 2: Argentina

4.2.1. Sancor cooperativas Unidas Idtas:

Sancor is a dairy company that commercializes its products all around the world. Its portfolio includes “dulce de leche” (milk jam), yogurts, powder and liquid milk, cheese among others. Sancor is positioned in second place in the Argentinean milk market.



Fig.4.10 Sancor’s skin milk TBA1000

Key findings:

Products and clients	<ul style="list-style-type: none"> -The split of total product volume delivery among the clients is: 35% wholesalers and 65 % modern trade outlets. -Wholesalers serve independent outlets.
Logistics	<ul style="list-style-type: none"> -Phase 2 of logistic integration. There is a department working with all the internal logistics, but it is not integrated with the external logistics. -Sancor out sources 100 % of the transportation and works with 130 distributors. Also they use logistics providers to manage the distribution center.
Distribution Flow	<ul style="list-style-type: none"> - For all the clients, the product pass through Sancor’s DC, where they prepare the orders, except for big retailers, as they deliver directly from the production site to the retailer’s DC. See figure 4.11 for the whole distribution flow.
Technologies	<ul style="list-style-type: none"> -The level of technology in their DC is integrated automation; it has automated storage and retrieval systems. -Sancor also has available many information technologies such as: bar code readers, transportation and delivery planning systems, automated order managements. -Use of handheld devices in the picking zone.
Product Handling	<ul style="list-style-type: none"> -They have training programs for the correct product handling but only for internal employees. Outsourced carriers do not receive any type of training. -Pallets are used for storage and transportation except when it carried out by small trucks -All the transportation is carried out by land, with closed chilled trucks.

Success factors and main issues:

- 100 % of its transportation is outsourced and they work with 130 distributors. These distributors work in two different ways: they deliver to supermarkets, 20 % of the total volume product, and get paid for the transportation service and the rest, 80 % of the volume, they buy it from Sancor and then resell and distribute it to medium and small stores. For the last case they follow planned routes.
- As they work with mixed pallets (cheese, yogurt, and milk), the storage and all the transportation chain has temperature control. One important condition for distributors is to have chilled trucks. For UHT milk and ambient items, all this controls only add cost and not real value to the product, besides making it more difficult to maintain the right temperature inside the DC as these products reach this location at room temperature.
- It is important to point out the high level of technology inside the distribution center that supplies the capital area. They have an automated warehouse system with two transelevators and dynamic and static raking system (FIFO) that has a capacity for 4000 pallets.
- They only use training programs for workers inside the DC, but they think that by extending these training programs to the 3PL, the percentage of damaged products can be reduced.
- The return rates are only 2 %, which 95% is due to expiration and the rest for damages. An important issue is that UHT milk cannot be returned, so distributors take a special care on this product and in case of return from supermarkets they resell it to their clients.

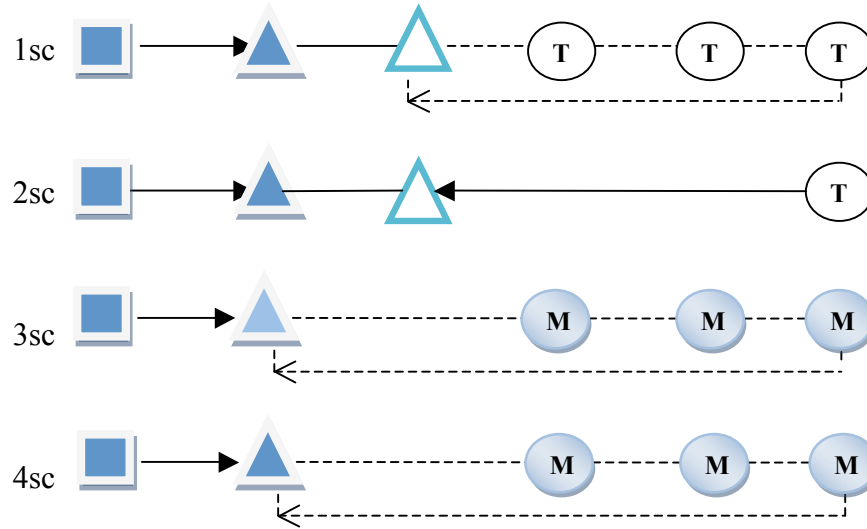


Fig.4.11 Sancor's distribution flow

4.2.2 Sucesores de Alfredo Williner S.A

A dairy company founded in 1975. The products are commercialized under the brand Ilolay, which includes UHT and flavored milk, cheese among others. Of its total production, 50 % is for export, and the other 50 % to supply the internal market. This company is focused mainly in the regional market.



Fig.4.12 Ilolay UHT skin milk,
TBA1000

Key findings:

Products and clients	-The product volume delivery is around 60% for independent outlets and 40% for modern trade outlets. They don't work with wholesalers.
Logistics	-Phase 1 of logistic integration. -They use logistic providers for storage, sales management and transportation services.

Distribution Flow	<ul style="list-style-type: none"> - Williner has 9 DC, outsourced trucks and 50 agents that render service from them. - Distributors (agents) pick up the products at Williner's distribution centers. (See archetypes 1w, 2w and 3w in figure 4.13) - See figure 4.13 for the distribution flow of Williner's goods.
Technologies	<ul style="list-style-type: none"> - Inside distribution centers there is a traditional level of technology: conventional racking system for pallets, forklifts, and hand trucks.
Product Handling	<ul style="list-style-type: none"> - They have training programs for the correct product handling. ISO 9000 certificate. - Pallets are used for both storage and transportation. - FIFO is the most common principle used at warehouses, but sometimes it is not applied - Their distribution is mainly concentrated in the countryside. - All the transportation is carried out by land, with closed chilled trucks.

Success factors and main issues:

- Their distribution is mainly concentrated in the countryside; they own one plant and nine DC. In the cities, where their distribution centers are located, they outsource carriers in order to deliver the product. For the other cities, they use around 50 agents or distributors, and therefore have no participation in the logistic process. These distributors deliver many other types of products, but in the dairy category they are exclusive for Williner. Between 80% and 90% of the total volume is distributed by these agents or distributors to modern stores as dealerships, which means that each of those have an authorization to deliver products in a particular area. They work with stock in consignment and get paid for their transportation services. The rest 10% or 20% of the product volume, Williner sells it to these distributors, so they can supply the independent outlets. As distributors work with stock in consignment, they need to be more careful with the product handling and therefore the percentage of damaged products during distribution is very low.
- UHT goes in chilled trucks from the DC to the point of sales because it is delivered together with other dairy products, but if it is an only UHT milk load, it goes in a not chilled truck (this case occurs only for big retailer chains).

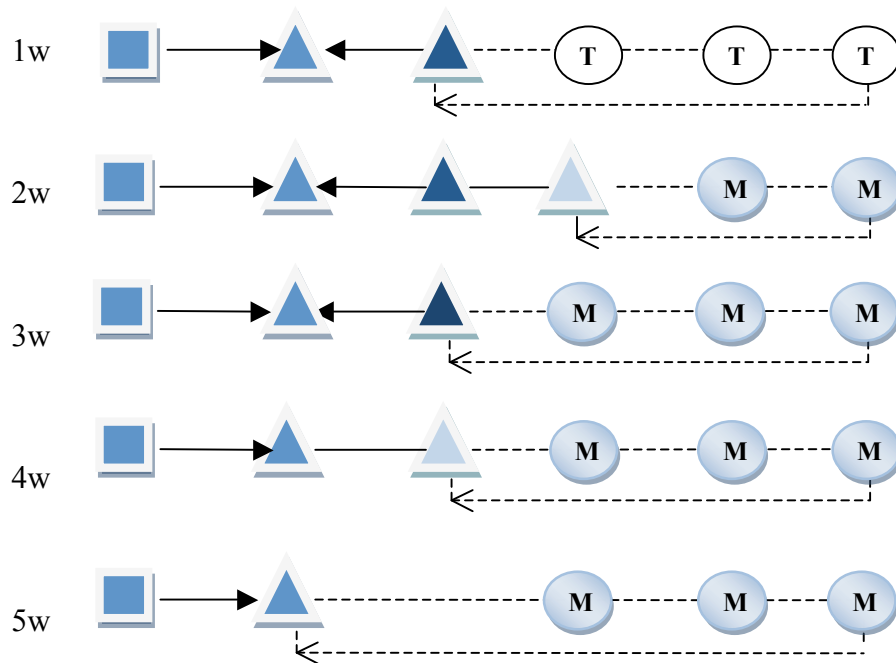


Fig.4.13 Williner's distribution flow

4.2.3 General overview for Argentina:

Products and market:

- As in the case of Brazil, pallets follow the US standard.
- Cardboard-box is the secondary package used for all products, with no internal dividers. In the case of milk, this box is usually wrap-around (2X6, 12 units) since Tetra Pak Argentina recommends it for the reduction of damages on the primary package when stacking and transporting, despite the higher cost of packaging per unit. The use of this type of box allows stacking one more level on the pallets since it is more robust than a cardboard tray with plastic wrap.
- The dairy business is one of the strongest in the Argentinean food sector. Dairy production is ranked third in the food industry, with 11% of the total production in the sector, just after meat and oils. Argentina has also shown a tradition of high levels of dairy products

consumption, ranking 6th in the world for powder milk consumption and 19th for fluid milk. These levels are comparable to consumption of milk in developed countries.

- The dairy products' exports are relatively low in Argentina, since most of its production supplies the internal market (10% of the total production was the average for dairy exports percentage in the 90s). [19]

Despite being Brazil the largest milk producer in the region, it is as well the main importer. Argentina and Uruguay have lower production costs than Brazil, and therefore they are the main suppliers for this country and the rest of the region.

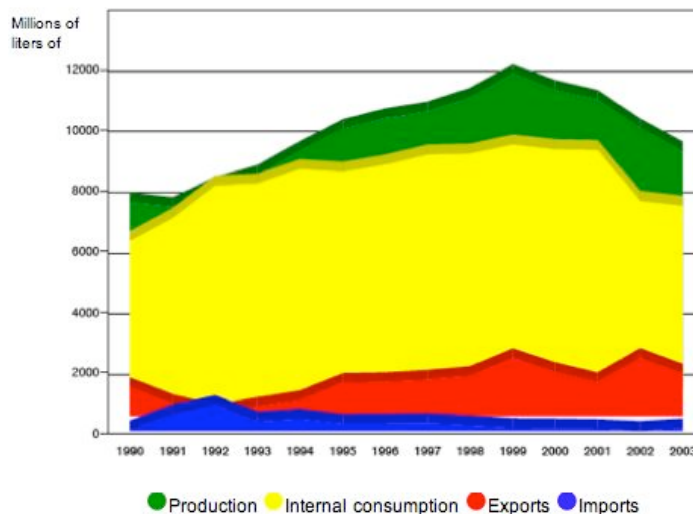


Fig.4.14 Milk industry figures in Argentina 1990-2003



Fig.4.15 Milk in sachet in supermarket

- The Argentinean consumers show a preference on chilled milk over long shelf life milk. According to Tetra Pak Argentina, in the Buenos Aires province, which is the most populated in the country, the consumption of milk splits as following: 25% to 29% UHT milk, around 60% in sachets (plastic pouch) and the rest is chilled milk in carton packages. Sachets offer a lower price and are an important characteristic of the dairy industry in Argentina, as this type of packaging is not common in the rest of the region.
- Masterone dominates the dairy market, with approximately 60% of the market share in the capital area. They try to keep the market preference towards chilled milk in the Buenos Aires area; so local producers cannot supply this market and they remain in the first place in the

category. UHT milk market is more competitive as local producers can reach every point of sale, despite its geographic location.

- Despite the high consumption of milk in Argentina, the juices and nectars market is continuously growing. In contrast with the milk market, for this product category the market preference is much higher for ambient products than for chilled.
- According to Tetra Pak Argentina, wine is also an important product regarding aseptically packaged beverages. More and more wines are being packaged in carton because the government enacted a law which forces wine producers to pack the product in the same location where it is produced. As the vineyards are far away from the capital area, which is the main center of consumption, producers are changing glass bottles to carton packages in order to reduce the risk of damage and costs during transportation.

Damages:

- All interviewees claim to have very small rates of returns, and that the majority of those are due to expiration date and not to damages on the packages. This fact does not mean that packages reached consumer with an optimal appearance, as packages are still offered for sale even though there are some damages.

Storage or transportation:

- Interviewees agreed on the fact that handling inside retail stores has the highest negative impact on the product. Inside the retail stores, employees do not respect the stacking height recommended and put more layers than usual to take the most of the available space.



Fig.4.16 Product display in hypermarket chain

Guidelines

- Producers offer training programs to internal employees, but when it comes to outsourced carriers and dealerships; no training is given as many of them are independent workers.

Local factors:

- *Infrastructure.* Because Argentina is almost 4,000 km long, and more than 1,000 km wide, long distance transportation is an important issue. Besides a few toll highways, there are lots of national and provincial routes that spread throughout the country. Railways and ships have no importance in the transportation of goods inside Argentina. Interviewees agreed on that the road conditions in the country are good, compared with the rest of the region.
- *Temperature and humidity does not seem to be an important parameter affecting the freight damage rate during distribution.* Interviewees agreed on the fact that package performance does not vary with seasons or while travelling between areas with different climate within the country.
- *Supply segmentation.* The improvements on the dairy sector infrastructure has increased products prices and segmented the supply directing it principally towards high-income sectors. Supply segmentation (regular milk – in sachet – and differentiated milk containing calcium, A and D vitamin or iron, whole milk, skimmed milk, semi-skimmed milk, sweetened milk, long-lasting milk, etc.) reflects the social fragmentation in Argentina. Supply is segmented, reflecting the social fragmentation and the income difference between sectors of society. As the industry offers products which are more and more expensive for their more and more specific groups of consumers, high-income sectors spend more to consume more milk products, both in number and variety, while low-income sectors consume mainly liquid and powdered milk, the former because it is the cheapest on the market and the latter because it is supplied by the State. [19]. Supply segmentation is not only noticeable in the product variety, but is also related to the type of outlet or market channel: flavored milk is mainly sold in kiosks, infant products in pharmacies and white liquid milk in supermarkets. For powder milk, segmentation is more a geographic matter, since it is popular only in the northeast.
- *Political issues.* Carriers' union is a very strong organization in Argentina and it affects transportation of any kind of products. Its political power allows them to demand high rates for transportation and benefits that increase the producer's costs. The dairy sector is also very political sensitive in Argentina, since the government tries to keep low prices in order to

reduce the inflation rate. One of the ways to control prices is to subsidize the milk in sachets, which is the cheapest milk product.

- There are transit regulations in the capital area regarding the transit of freight trucks. These regulations force carriers to do deliveries only early in the morning and to follow a tied schedule to complete the route on time.

Distribution and market channels:

- It is very common in Argentina to outsource transportation completely. For modern and traditional trade deliveries, companies hire carriers that can do both: buy the product from the producer and resell it or just render the transportation service.
- As big retail chains manage large volumes of groceries, they have developed a concentrated buying power that translates into a strong influence on food producers regarding logistics. They impose strict purchase requirements, tied delivery schedules and flexible product returns policies that producers are forced to follow in order to keep in business.

These chains are gaining control over the distribution chain, not only by imposing the rules, but also by developing their own distribution systems and carrying out activities that formerly belonged to distributors or manufacturers. This translates into more responsibility over the package performance and appearance when it reaches the customer's hands. [20]

- As the example of the two interviewed companies show, it is common to use chilled distribution on ambient dairy products. This might be mainly due to the fact that producers most handle larger volumes of chilled products. The only cases on which the aseptic dairy products are distributed at room temperature are when they go from the production site to their DC or when a whole load goes directly to a retailer's DC.
- Producers or retailers do not commonly use cross-docking points or transfer points. As vehicles have temperature controls, these transfers could be damaging for the chilled products, which are the main priority during transportation.

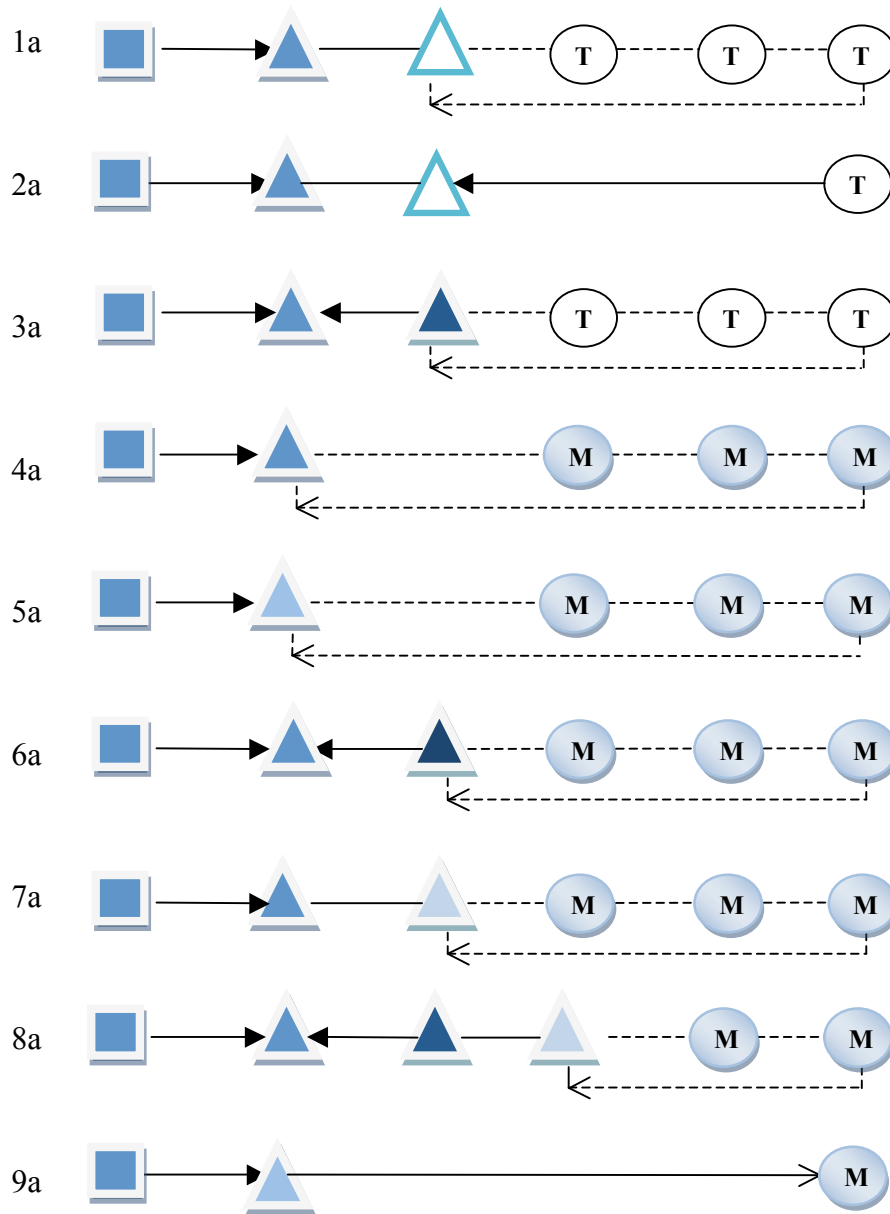


Fig.4.17 Possible distribution archetypes in Argentina

As shown in figure 4.17, there are many archetypes applicable to dairy industry in Argentina, but since there were only two dairy companies in this case, and their distribution flows differ, no saturation of information was reached. Therefore, the archetypes in figure 4.17 are just some possibilities of dairy distribution in Argentina.

For traditional trade, after interviews with the Market Company and producers, it was noticed that the most common distribution channel is through wholesalers and distributors, since companies prefer to delegate this task and avoid managing the invoicing of small product volumes (see archetypes 1a, 3a in figure 4.18). Independent outlets are supplied by wholesalers or distributors, which deliver products but do business in different way. Wholesalers simply buy the product to a producer in large quantities to then resale it to smaller outlets; they are not exclusive to a brand. Distributors work in Argentina as dealership (with established delivery areas) and only own the product when distributing to traditional stores; they are usually exclusive to one brand in each category.

For modern trade, there are two common channels: directly to the Big chain's Distribution Center (see archetype 4a in figure 4.18) and for medium and small stores, from the producer's DC, through multiple delivery routes by using agents or carriers. (See archetype 5a in figure 4.18)

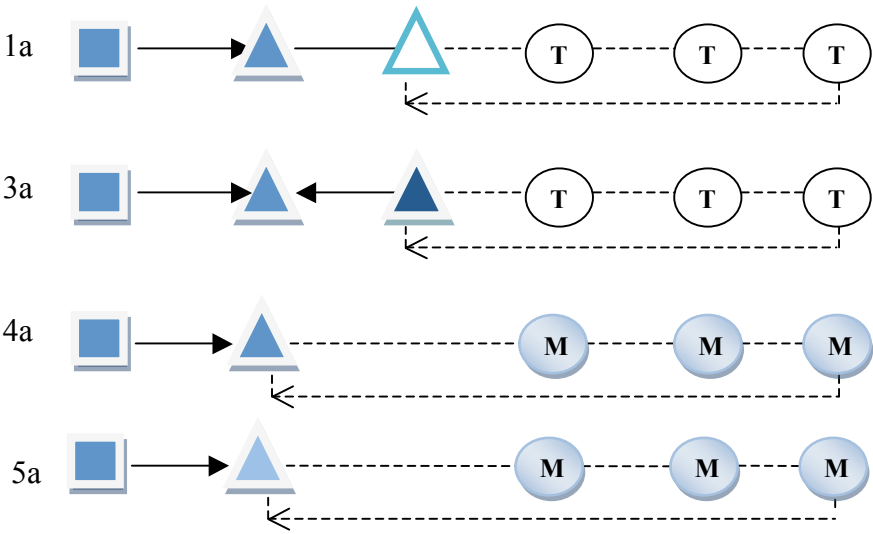


Fig.4.18 Most common distribution archetypes for Argentina

4.3 Case Study 3: Venezuela

4.3.1 Excelsior Gama:



Excelsior Gama is large supermarket chain, operating in the capital, which evolved from a mom and pop store. It has extended its format to convenience stores, with a 24-hour service. It sells a big variety of carton-packaged products, including milk, juices and others in TBA, TWA and TCA presentations.

Key findings:

Products and clients	-It sells a huge variety of products, including milk, juices and others in TBA, TWA and TCA shapes.
Logistics	-Phase 3 of logistic integration. -They do not use any logistic provider. They own their distribution chain.
Distribution Flow	-All their products are sent from the producer to Gama's Distribution Center. From it, the product is delivered to the different branches by using multiple delivery routes. -See figure 4.19 for the distribution flow of Gama's goods
Technologies	-Inside distribution centers there is a selective automation level of technology: dynamic racking systems, handhelds, and radio frequency terminal. - They use many information technologies such as: barcode readers, automated order management, SAP, among others.
Product Handling	-They have training programs and also information posters for the correct product handling. -Pallets are used for both storage and transportation. -Inside storage locations and for loading and unloading the vehicles, the movements are some with forklifts and others manually. -FIFO is the only principle used at the main distribution center. -Their distribution is located in the capital, that's why 100% of the roads used during distribution are urban and city roads. -100% of the transportation is by land, using closed trucks.

Success factors and main issues:

There is a pre-established procedure to coordinate the internal logistic within the company, in addition 2, activities are carried out aiming to improve the coordination of the material and information flow management with other companies, clients, etc.

- 0 % outsourcing, they control all their logistic activities, with the help of the mentioned information technologies.
- They are working to expand in the private label segment, and to do so they are building the infrastructure (Tetra Pak opportunity to exploit this trend).

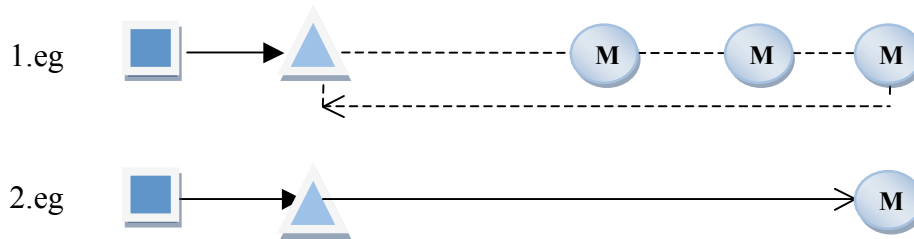


Fig.4.19. Excelsior Gama's goods distribution flow

4.3.2 Cativen (Cada- Queprecios -Exito)

Cativen is a top retailer in Venezuela, which is member of the Casino group. It commercializes its products through three formats: *Cada* supermarkets, *Exito* hypermarkets and a hard discount supermarket Q'precios.



Key findings:

Products and clients	<ul style="list-style-type: none"> - Cativen commercializes juices and dairy products in TCA, TWA, TBA packages. - Cada supermarkets own 39 stores in 22 cities, Exito hypermarkets 6 stores in 5 cities and Q'Precios has 18 stores.
Logistics	<ul style="list-style-type: none"> - Phase 2 of logistics organization. Logistic activities are integrated along the whole supply chain. Not only Cativen, but also Exito has its own logistic organization. - Cativen owns 2 DC and 3 logistic platforms.

Distribution Flow	<ul style="list-style-type: none"> - The producers send their products to the distribution centers and logistic platforms; from those, Cativen supplies the stores. - Only Polar (largest food and beverage producer in Venezuela), which is a partner of this company, delivers the products directly to the different stores. See archetype 4c in figure 4.20 - See figure 4.20 for Cativen's complete distribution flow.
Technologies	<ul style="list-style-type: none"> - Very high level on information technologies (bar codes, automated order management, transportation and delivery planning systems, store management among others). - In their Distribution Center (one of the biggest in the country) they have an automation selective level of technology. This means dynamic racking systems, use of handheld and stock locators.
Product Handling	<ul style="list-style-type: none"> - Cativen gives training programs to employees regarding product handling. Also inside Exito chain, they give training to their workers. - Pallets are used during storage and transportation in Cativen's DC. All distribution is carried out by land, with a fleet of 100% closed trucks.

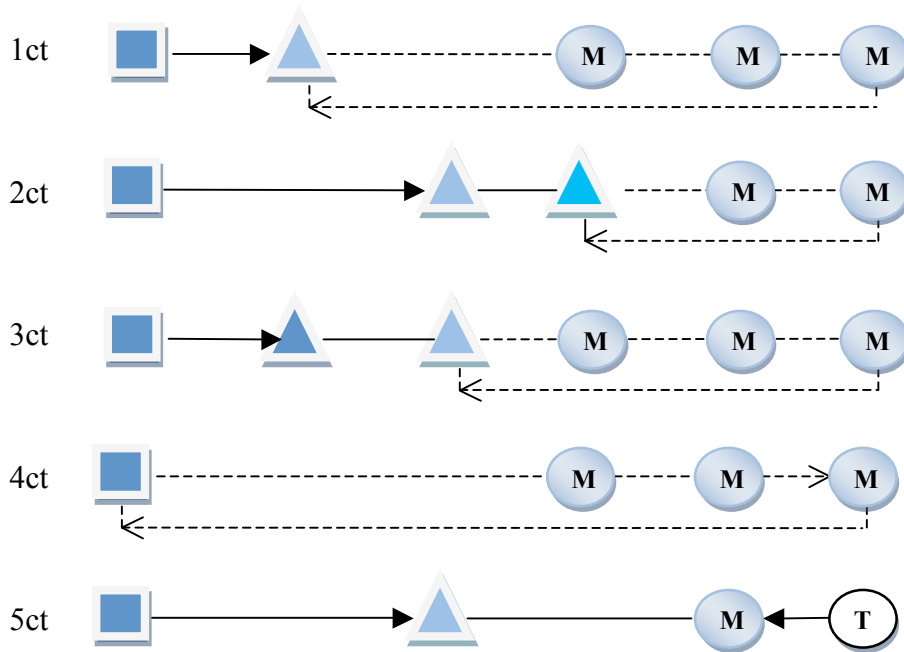


Fig.4.20 Cativen's distribution flow

Success factors and main issues:

- By having the three formats with many stores, they cover almost the whole territory and not only urban areas, since Q' Precio supermarkets are addressed to reach low-income areas, specially the class E, who represents the 50 % of the Venezuelan population. Actually Cativen is offering the mom and pops stores to become a franchise of this hard discount retail format. The Exito hypermarket acts as some kind of cash and carry and due to the low prices, is common for restaurants and traditional stores to buy their products from them.
- Cativen acts as a logistics provider for these three formats and all its branches. The high level of information technologies allows Cativen to optimize the distribution process.
- Cativen has a private label called Leader Price, that is growing up and whose goal is to include 1500 sku under the brand name.

4.3.3 General overview for Venezuela:

Products and market:

- Both milk and juice family packs, have cardboard as secondary package. Juices in portion packs have as secondary package a tray with cardboard.
- *Milk and juice together.* Two groups make up the dairy industry: the first group is formed by big companies that are focused in producing juice instead of milk, but have strategic alliances with small dairy companies with the aim of commercialize their milk. The other group, made up by big and medium companies, is devoted to the production of both juice and milk.
- Milk production has always been below national consumption levels, thus Venezuela is a net importer in the international market of liquid and especially powder milk. The milk consumption patterns had changed due to loss of purchasing power, as powder milk is cheaper than liquid milk.

Damages:

- Damages: No leakages, only damages in the secondary and primary packages. Interviewers coincided that milk packages tend to present more problems than the others carton packed products.
- Supermarkets pointed out, that when they put the products in the fridge for promotion, and then take them back to the shelves, the package weakens.

Storage or transportation:

- From the retailer's perspective, transportation has the highest negative effect over the package's performance.

Local factors:

- *Economic:* Venezuela's retail sector is the least developed of Latin America's major economies, as retail investment has been deterred by the instability of the economy. For that reason the country is still dominated by traditional stores. Venezuela's inflation rate is expected to stand around the 20% mark in 2008, which positions Venezuela as one of the countries with the highest inflation rate in Latin America. [25]
- *Political:* The country is under an unstable political situation, and for that reason, in recent months the country has been experiencing a shortage of certain basic food products including eggs, meat and milk. While retailers blame shortages on government-imposed price controls (more than 170 basic food products) that forces companies to sell at a loss; the government claims that speculators, including retailers and distributors have been accumulating food to boost prices.

These price controls give rise to a restructuring of the supply chain logistics, including the distribution flow. Instead of providing efficient solutions, the government's reaction to these problems has been to increase the imports of these products.

- *Social.* The loss of purchasing power constitutes a serious threat, to the demand of dairy products. In addition in Venezuela, milk consumption is not a strong habit. [26]

In relation to people involved in material handling, it is important to point out they usually belong to the Class D- the working class or the "working poor". This category includes about 6 million Venezuelans, some 23%

of the population. They live in deteriorating homes and public housing. Their household income is some 200 Euros. 37% have a 6th grade education or less, an additional 33% have a high school diploma, 18% have been to technical school and only 12% have a university degree [27]. Due to the lack of education is important to give them trainings programs.

Another issue that is very important and that affect the country in general, its industries and processes, is the high level of crime and violence that exist in Venezuela.

- *Infrastructure:* In general and compared to other South American countries, road conditions are good. Almost all the distribution is by land. In big cities, transit regulations and traffic congestion problems hinder the distribution process. There is an important need to invest in other means of transportation. As a developing country, the information technologies show some important deficiencies.

Distribution and market channels:

- Supermarkets account for around half of retail food sales, while the rest are mostly at traditional stores. The market is very little concentrated, with the four top players accounting for just around 10% of the market. Lower income urban neighborhoods and interior towns support many traditional "mom and pop stores", though prices may be higher than at the

Breakdown of Social Classes In Venezuela

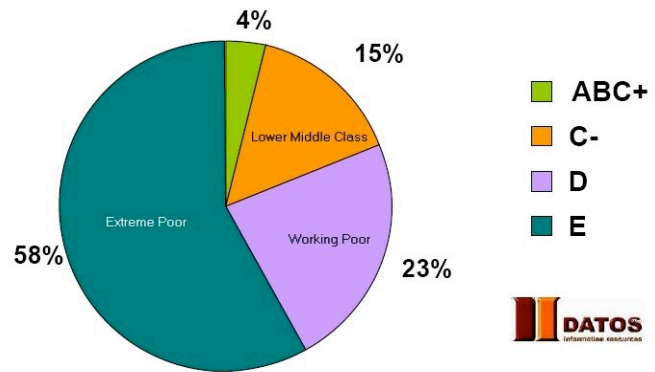


Fig.4.21 Social Classes in Venezuela - Data from the Venezuelan American Chamber of Commerce

supermarkets, these traditional stores often offer credit to customers, thus appealing to a wide range of customers. [25]

- Big supermarkets or chains, as in all countries included in this research, receive their products through their DC. And then the product is delivered from it to the different branches.
- Traditional stores and small supermarkets tend to receive their products from wholesalers that supply them with a variety of products, not only drinks. Multiple delivery routes are more commonly used to deliver to traditional stores. Small supermarkets receive the whole truck.
- Some traditional stores have contracts of exclusiveness and receive the product directly from the producer. In some cases, especially small producers, deliver directly in the near regional areas. (See archetypes 1v and 2v in figure 4.22)
- Polar, a big company in Venezuela, distributes its products (Yuki Pak) directly, this means without intermediaries to all their customers including traditional and modern trade.
- To picture the most common archetype use in Venezuela, we can point out Corporacion Inlaca's distribution flow. It is a big dairy company in Venezuela, who is part of DPA (Dairy partners Americas). It produces juices, tea, yogurts and milk under many brands. (Carabobo, California, MiVaca, Yoplait, Huesitos). Inlaca supplies 50 independent wholesalers that cover the whole territory. These wholesalers have contracts with 800 distributors, who deliver the products to more than 24000 retailers.

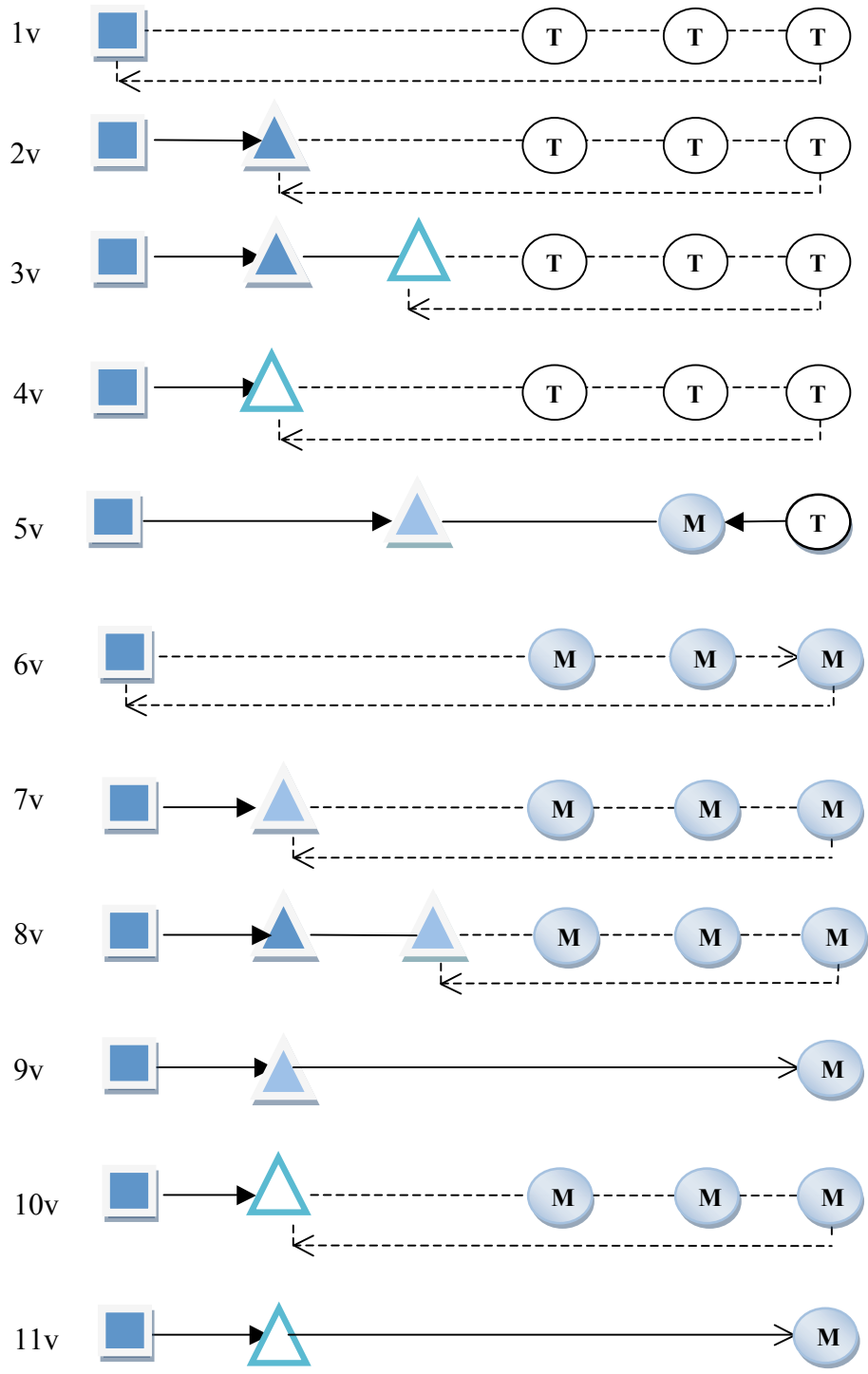


Fig.4.22 Venezuela's distribution archetypes

As it was mentioned in the distribution and market section, for traditional trade, medium and small stores (large percentage of stores in the country) is common to use two intermediaries to deliver the product; a wholesaler and specialized distributors. As these distributors do not own distribution centers, they do not appear in the channel, but they have contracts to deliver to retailers.

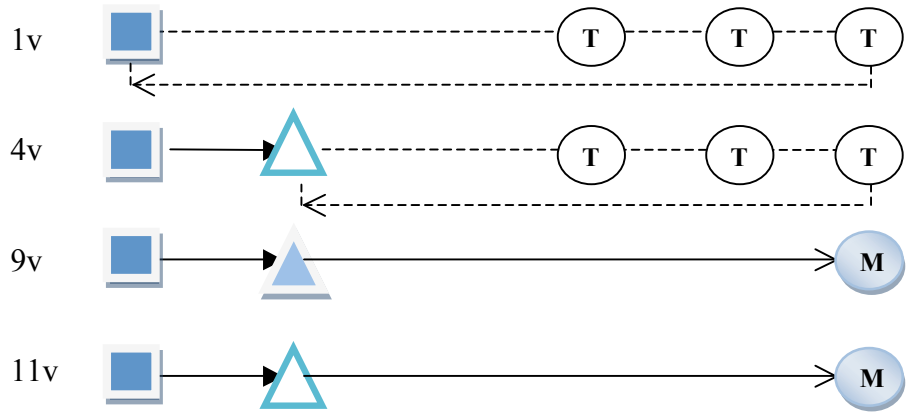


Fig.4.23 Most common distribution archetypes for Venezuela

It is important to point out the limitations in this case study. Regarding the units of analysis, all the interviewees were retailers. For the general overview, web page information from the producers was used, in addition to observation and some studies developed before regarding distribution flow. These enable the establishment of the distribution archetypes.

4.5 Overview of South America

Even though South American countries share common issues and characteristics, each one of them has particular local factors that affect their distribution at different levels. Some parameters, as regional tax rates in Brazil, are not important at all in countries such as Venezuela, in which there is a national taxation policy.

There could be some similarities in the distribution archetypes, especially for modern trade, as their logistics tend to become more and more standardized. But when it comes to parameters causing or increasing the risk of product damage during distribution, a local assessment must be developed.

Still, there are some common trends and issues among these countries that must be pointed out:

- Outsourcing distribution activities is a trend that is gaining more and more importance in the food industry. Not only regarding transportation, but also 3PL experts who offer new services to reduce the risk and costs of distribution.
- South American countries are still in a developing stage; therefore political and social issues affect physical distribution directly, increasing the risks and costs of distribution processes.
- In South American countries, usually the larger percentage of population is concentrated in big city areas, where distribution planning is more complex.
- The South American food retail sector shows little consolidation, as it is mainly made of small mom and pop stores; although in some key markets like Argentina and Brazil the modern sector has already reached a substantial degree of development. The dominant traditional trade channel forces to include several intermediaries in the chain, as producers prefer to delegate this part of the distribution to third parties.
- Modern retailing in the key markets set to progressively expand from the already competitive big cities into smaller towns.
- There is a strong dependence on truck transportation, as other modes of transportation are underdeveloped. Even so, road conditions remain an issue across the region.
- Tetra Fino Aseptic is not present in any of the South American markets.
- Social fragmentation and marked disparity is common among these countries, giving rise to a segmentation of supply and leading to the market success of other economical alternative packaging and products such as powder milk, in cans and carton box, and sachets.

- It was noticed that it was a common belief that the most critical point along the distribution chain for the package integrity was after reaching the retailer's site.
- Industries usually focus on supplying the internal market; therefore international trade is not very dynamic. The roads connecting countries are usually unsafe, making of sea-transport the best option when importing or exporting goods.

Making a comparison between these common characteristics of South American countries, and the finding of the master thesis based in the Chinese market, there are some important differences and similarities to point out:

- Humidity and temperature were not key parameters in the research results, as it was a key issue in China.
- Political and social issues were found to have an important impact in the physical distribution, but these parameters were not considered before.
- Outsourcing and 3PL is growing in the continent as in Europe for the grocery industry.
- In South America as well as in China, the transportation of groceries depends almost entirely in roads, although in China, currently there are large investments to improve the infrastructure and develop alternative modes to transport goods and improve logistics.

4.5.1 The tool

In order to develop valid archetypes, an individual study of each country must be carried out. But as generalizations might not be valid for all cases, when the study of a specific situation is needed, detailed information must be collected. For that, the questionnaire is the right tool to apply. With this it is possible to collect basic information about the performance of a product's distribution chain.

After carrying out the data collection stage in this research, became clear that some of the original questions in the questionnaire did not offer the information needed, or some were missing to complete the analysis. For this reason, some improvements were made on the questionnaire and the modified version can be found in appendix D.

With the information collected, it is possible to define the distribution archetypes. The data can also reflect how the parameters being considered affect the physical distribution process.

In order to link the information about the parameters with the distribution flow or archetypes, another tool was developed. In this tool, the level of risk for package damage is measured in terms of the effect of the different parameters over the whole distribution flow. The list of parameters in this tool is based on the initial parameters included in the questionnaire and also other important factors discovered during the project work were added. In appendix E there is a chart that shows the description of each parameter, this means the effect over the distribution flow, and also it contains the scale used to measure it.

The tool includes 19 parameters with different weights. This relative scale of importance was established according to the results and analysis of the empirical data used in this research. Choosing only one of the options given for each parameter, the sum of all parameter results will lead to determine a level of risk during distribution. The scale used to express this risk consists of 3 levels: high, medium or low risk. See appendix F.

This tool will help to forecast the risk levels from a strategic perspective and determine if there might be a package problem.

4.5.2 The method

Having these tools available, the following method of evaluation could be applied:

- First use the questionnaire (Appendix D) to collect the basic information needed.
- Second use archetypes to define the type of product flow.
- Third, evaluate the level of risk during distribution by answering the chart (Appendix F) with the information requested.
- Finally, if there is a need for reducing the risk level, then modify the existing physical process by focusing on the high importance parameters with a high risk and propose changes.

5. CONCLUSIONS

When choosing a case study methodology, there is no possibility for any statistical analysis. Despite this limitation, a general overview of the most important factors affecting distribution was developed by mixing the information obtained from the examples evaluated in each country, the knowledge of people involved in logistic and distributions, in addition to field observation.

In the case of Brazil, juices were noticed to be the most important and competitive product category for aseptic packaging. After establishing the distribution archetypes, the information showed that transportation is the most critical process affecting the package's performance along the distribution chain. Some local factors support this statement, such as poor road conditions (only 12%), the absence of other means of transportation, in addition to tax policies of individual Brazilian states. Social issues such as low salaries for truckers, cargo theft and robberies also affect the food industry distribution in this country. Due to the complex market size and the mentioned obstacles, there is a new trend for companies to include 3PL in their distribution and add innovating services such as risk assessment and freight tracking.

In the case of Argentina, the results reflect only the dairy industry point of view. Dairy products are traditionally very important in the Argentinean market, and in the case of liquid milk, there is a strong preference for chilled over ambient packaged products. This leads to a particular characteristic of the distribution of aseptically packaged products, as UHT milk has a cold chain delivery. The interviews reflect that, the damages to the package quality have a low rate and the most critical point is after reaching the retailer's storage locations. Transportation is also an important issue, mainly due to the power of carrier's unions. Wine is a market in growth for carton packaging as these facilitates and reduce the cost of distribution compared to the traditional glass bottles, after the enactment of law that force to pack the product at the same location as it is produced

For Venezuela, the results are focused on the retailer's perspective. These claim that transportation has the highest negative impact over the package performance. The unstable political situation, the price control over basic food products and the lack of a modern grocery retail sector in a country dominated by traditional stores have discouraged international retailers from investing in the country. In addition to political issues affecting the distribution process,

there are important social issues such as loss of purchasing power, high crime rates, and concentration of the population in the big cities. Concerning distribution channels, it is common for medium, small and traditional stores to receive the products from a series of small wholesalers and distributors.

Despite the primary objective of this research was to build a generic view of the distribution archetypes in South America, after analyzing the particular cases of each country, it became clear that generalizations at such broad level cannot be made. South America is a big continent, made up by countries that differ in size, culture, level of development, market size, geography among other important factors. Still the results showed that there are some common trends and issues regarding carton packed product's distribution among the studied South American countries such as: traditional trade prevalence, use of many intermediaries, increasing growth of 3PLs and outsourcing, supply segmentation due to social disparities, high impact of political issues in physical distribution activities, and limited options for other means of transportation besides roads even though road conditions remain an important issue across the region.

Comparing these overall results with the findings for China and Sweden's distribution chain, there are some important similarities and differences. Humidity and temperature were not key parameters as they were for China. In South America political and social issues have a high impact over the distribution, whether these were considered neither for China or Sweden. The trend of growth of 3PLs in South America follows the European trend in the food industry. In South America as well as in China, the transportation of groceries depends almost entirely in roads, with the difference that in China there are big investments on improving the infrastructure.

Regarding the definition of distribution archetypes in each country, is important to point out that even though there are similarities in the channels used; the size, type, location, market and many other aspects of the company will influence or determine all the logistic process to deliver the products. Although this distribution chain can be affected and shape by the local parameters of the country, each particular distribution flow for a particular product should be considered or studied in order to evaluate the package performance. The package needs to be compatible with the

processes through which it will pass; and the design must take into account potential damages and deteriorations during distribution.

To develop this particular analysis the following method can be applied: First use the questionnaire to obtain the basic information to describe the process of distribution, then build the archetypes to categorize each distribution flow, and finally use the risk level tool to typecast each archetype.

This method can be established as an operational tool within Tetra Pak, as it could enable the optimization of distribution solutions for new packages as well as increase the effectiveness when dealing with distribution problems.

5.1 Future Studies

The results of this research constitute a base for further investigations within distribution. The tools and the method developed to assess the risk level of package damage during distribution can be applied to other Tetra Pak's customers and markets in the world in order to evaluate their distribution patterns and performance.

As the risk assessment tool has not been applied yet, following there are some suggestions to improve it and assure the validity of its results:

- Consider adding other parameters that might affect the distribution chain.
- Evaluate the relative importance scale of the parameters by comparing with other regions of the world. The tool is flexible and could be adapted to other contexts where the parameters have different levels of impact on the package performance.

It is important to continue to give importance to the distribution process of finished products as it is a key link of the value chain and could be a strategic input to the development of new packaging solutions.

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Appendix A – Description of Tetra Pak’s aseptic packages

	<p><i>Tetra Classic Aseptic – TCA</i></p> <p>It was the first aseptic package developed by Tetra Pak. Flexible filling content between 100-110ml. Produced as singles or in chains for hanging display.</p>
	<p><i>Tetra Wedge Aseptic – TWA</i></p> <p>Aseptic packaging solution that reaches differentiation through shape. Filling content of 125ml or 200ml. It is used for juices, nectars, energy drinks, teas, coffee, plain milk, flavored milk and UHT cream.</p>
	<p><i>Tetra Fino Aseptic - TFA</i></p> <p>It offers a very low-cost aseptic packaging solution but with a high level of content protection. Flexible filling content between 200-1000 ml. It is used mainly for milk products.</p>
	<p><i>Tetra Brik Aseptic - TBA</i></p> <p>TBA 1000 ml has set the industry standard in aseptic food technology and cost-efficiency. Its rectangular shape makes it a highly efficient package to distribute and store. Flexible filling content between 125-2000ml. It is primarily used for yoghurt-based drinks, vegetable juice, milk and flavored milk.</p>
	<p><i>Tetra Prisma Aseptic - TPA</i></p> <p>Its unique 8-sided shape, improved packaging material and high quality printing options, make it a very appealing aseptic packaging solution. Flexible filling content between 200-1000 ml.</p>

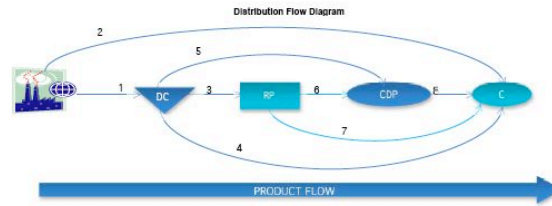
Appendix B – Original questionnaire used during this research

QUESTIONNAIRE													
Purpose:	Evaluation of the supply chain in the ambient (shelf stable at room temperature) carton packaged products' sector in South America in order to identify local parameters influencing the quality of carton packages along the distribution chain (product flow, distribution equipment, distance, road conditions, vehicle types, temperature, relative humidity, etc.).												
Instructions:	Fill in the questions with the information that best reveals the real performance of your company. Please take into consideration the following instructions when answering the questionnaire: - each question can be answered by choosing more than one option. Please choose all the answers that apply to your company. - when pre-established options for answers are given, please mark the cells by using the fill color tool - open questions are expected to be answered by filling the blank spaces assigned for it.												
Chapters:	<table style="border: none;"> <tr><td style="border: 1px solid black; padding: 2px; text-align: center;">1</td><td style="border: 1px solid black; padding: 2px;">• General Information</td></tr> <tr><td style="border: 1px solid black; padding: 2px; text-align: center;">2</td><td style="border: 1px solid black; padding: 2px;">• Products and clients</td></tr> <tr><td style="border: 1px solid black; padding: 2px; text-align: center;">3</td><td style="border: 1px solid black; padding: 2px;">• Logistics</td></tr> <tr><td style="border: 1px solid black; padding: 2px; text-align: center;">4</td><td style="border: 1px solid black; padding: 2px;">• Distribution flow</td></tr> <tr><td style="border: 1px solid black; padding: 2px; text-align: center;">5</td><td style="border: 1px solid black; padding: 2px;">• Technologies</td></tr> <tr><td style="border: 1px solid black; padding: 2px; text-align: center;">6</td><td style="border: 1px solid black; padding: 2px;">• Product handling</td></tr> </table>	1	• General Information	2	• Products and clients	3	• Logistics	4	• Distribution flow	5	• Technologies	6	• Product handling
1	• General Information												
2	• Products and clients												
3	• Logistics												
4	• Distribution flow												
5	• Technologies												
6	• Product handling												
1. GENERAL INFORMATION													
Filled in by: <input type="text"/>	<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px; width: 25%;">Tetra Pak/ Market company</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Manufacturer</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Distributor</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Wholesaler</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Retailer</td> </tr> </table>	Tetra Pak/ Market company	Manufacturer	Distributor	Wholesaler	Retailer							
Tetra Pak/ Market company	Manufacturer	Distributor	Wholesaler	Retailer									
Name: _____	Date: _____												
Title: _____	Contact info: _____ _____mobile _____email												
Company: _____													
Country: _____													
2. PRODUCTS AND CLIENTS													
Filling Product:	<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px; width: 50%;">Jules, neclars, energy drinks, water, etc.</td> <td style="border: 1px solid black; padding: 2px; width: 50%;">Dairies (milk, flavoured milk, milkshakes, creams, etc.)</td> </tr> </table>	Jules, neclars, energy drinks, water, etc.	Dairies (milk, flavoured milk, milkshakes, creams, etc.)										
Jules, neclars, energy drinks, water, etc.	Dairies (milk, flavoured milk, milkshakes, creams, etc.)												
Primary package:	<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px; width: 20%;">Tetra Classic Aseptic</td> <td style="border: 1px solid black; padding: 2px; width: 20%;">Tetra Wedge Aseptic</td> <td style="border: 1px solid black; padding: 2px; width: 20%;">Tetra Fino Aseptic</td> <td style="border: 1px solid black; padding: 2px; width: 20%;">Tetra Brik Aseptic</td> <td style="border: 1px solid black; padding: 2px; width: 20%;">Tetra Prisma Aseptic</td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </table>	Tetra Classic Aseptic	Tetra Wedge Aseptic	Tetra Fino Aseptic	Tetra Brik Aseptic	Tetra Prisma Aseptic							
Tetra Classic Aseptic	Tetra Wedge Aseptic	Tetra Fino Aseptic	Tetra Brik Aseptic	Tetra Prisma Aseptic									
Secondary package:	<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px; width: 33%;">Cardboard box</td> <td style="border: 1px solid black; padding: 2px; width: 33%;">Returnable Plastic crate</td> <td style="border: 1px solid black; padding: 2px; width: 33%;">Plastic Film Wrap</td> <td style="border: 1px solid black; padding: 2px; width: 33%;">Other</td> </tr> </table>	Cardboard box	Returnable Plastic crate	Plastic Film Wrap	Other								
Cardboard box	Returnable Plastic crate	Plastic Film Wrap	Other										
Cardboard specifications:	_____												
Are dividers used in secondary packages?	<input type="checkbox"/> YES <input type="checkbox"/> NO												
Percentage of the total product volume delivery, classified by type of clients:	<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px; width: 40%;">Client Type A: Kiosks, bakeries and independent outlets</td> <td style="width: 10%; text-align: right;">_____ %</td> <td style="border: 1px solid black; padding: 2px; width: 40%;">Client Type B: Hypermarkets, supermarkets, minimarkets, convenience stores, discount.</td> <td style="width: 10%; text-align: right;">_____ %</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">Client Type C: Wholesalers</td> <td style="text-align: right;">_____ %</td> <td style="border: 1px solid black; padding: 2px;">Others (explain)</td> <td style="text-align: right;">_____ %</td> </tr> </table>	Client Type A: Kiosks, bakeries and independent outlets	_____ %	Client Type B: Hypermarkets, supermarkets, minimarkets, convenience stores, discount.	_____ %	Client Type C: Wholesalers	_____ %	Others (explain)	_____ %				
Client Type A: Kiosks, bakeries and independent outlets	_____ %	Client Type B: Hypermarkets, supermarkets, minimarkets, convenience stores, discount.	_____ %										
Client Type C: Wholesalers	_____ %	Others (explain)	_____ %										
3. LOGISTICS													
Does the company have a logistics, materials or supply chain department within its organization?	<input type="checkbox"/> YES <input type="checkbox"/> NO												
Which of the following integration phases describes appropriately the current logistics organization within the company?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center;">Phase 0</td> <td>Activities such as: warehousing, transportation, inventory planning, order processing, among others; are scattered across different departments within the company.</td> </tr> <tr> <td style="text-align: center;">Phase 1</td> <td>Supplying, operations and transport functions are carried out, but there is not a logistics department neither a pre-established procedure to coordinate those functions through meetings, integrated data bases, etc.</td> </tr> <tr> <td style="text-align: center;">Phase 2</td> <td>There is a pre-established procedure to coordinate the internal logistic within the company through meetings, integrated data bases, etc. or either exist a logistics department.</td> </tr> <tr> <td style="text-align: center;">Phase 3</td> <td>In addition to what was described in Phase 2, activities are carried out aiming to improve the coordination of the material and information flow management with other companies, clients, third party logistic providers, etc.</td> </tr> </table>	Phase 0	Activities such as: warehousing, transportation, inventory planning, order processing, among others; are scattered across different departments within the company.	Phase 1	Supplying, operations and transport functions are carried out, but there is not a logistics department neither a pre-established procedure to coordinate those functions through meetings, integrated data bases, etc.	Phase 2	There is a pre-established procedure to coordinate the internal logistic within the company through meetings, integrated data bases, etc. or either exist a logistics department.	Phase 3	In addition to what was described in Phase 2, activities are carried out aiming to improve the coordination of the material and information flow management with other companies, clients, third party logistic providers, etc.				
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Phase 3	In addition to what was described in Phase 2, activities are carried out aiming to improve the coordination of the material and information flow management with other companies, clients, third party logistic providers, etc.												
Does the company use logistical providers?	<input type="checkbox"/> YES <input type="checkbox"/> NO												
Which of the following operations does the company outsource?	<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px; width: 25%;">Storage</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Purchase Requisition</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Distribution Center Management</td> <td style="border: 1px solid black; padding: 2px; width: 25%;">Transportation</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">Others (explain)</td> <td colspan="3">_____</td> </tr> </table>	Storage	Purchase Requisition	Distribution Center Management	Transportation	Others (explain)	_____						
Storage	Purchase Requisition	Distribution Center Management	Transportation										
Others (explain)	_____												

4. DISTRIBUTION FLOW



Note: the term clients refers to both wholesalers and retailers.



Which of the following routes do the products follow to reach the client?

Direct (2)
 Via DC (1+4)
 Via RD (1+5+7)
 Via CDP (1+5+8)
 Via RD and CDP (1+5+6+8)

Others (explain) _____

If any of the elements in the diagram repeats itself or either there are different elements in the product's distribution flow, please describe the chain.

+ _____ + _____ + _____ + _____
 + _____ + _____ + _____ + _____

Choose which of the following routes apply to reach the specific type of client (A, B or C), and write the number of days it takes to distribute the product through these routes. Also if multiple delivery routes are carried out (more than one outlet per vehicle), please mark the cell of the route that applies and write "YES" or "NO" in the MDR cell.

MDR: Multiple delivery routes

Client type A			Client type B			Client type C		
Kiosks, bakeries and independent outlets			Hypermarkets, supermarkets, minimarkets, convenience stores, discount			Wholesalers		
Routes	Days	MDR	Routes	Days	MDR	Routes	Days	MDR
Direct (2)			Direct (2)			Direct (2)		
Via DC (1+4)			Via DC (1+4)			Via DC (1+4)		
Via RD (1+5+7)			Via RD (1+5+7)			Via RD (1+5+7)		
Via CDP (1+5+8)			Via CDP (1+5+8)			Via CDP (1+5+8)		
Via RD and CDP (1+5+6+8)			Via RD and CDP (1+5+6+8)			Via RD and CDP (1+5+6+8)		
others ()			others ()			others ()		

Choose which of the following routes apply to reach the specific type of retailer if wholesalers take part in the distribution chain, and if multiple delivery routes are carried out. (More than one outlet per vehicle). Please mark the cell of the route that applies and write "YES" or "NO" in the MDR cell.

MDR: Multiple delivery routes

W= Wholesaler R= Retailer

Client type A		Client type B	
Kiosks, bakeries and independent outlets		Hypermarkets, supermarkets, minimarkets, convenience stores, discount	
Routes	MDR	Routes	MDR
W1+R		W1+R	
W1+W2+R		W1+W2+R	
W1+W2+W3+R		W1+W2+W3+R	

Total number of distribution routes: _____

Route's coverage and location: _____

5. TECHNOLOGIES

Write down the available technology according to the following scale:

Traditional (T)	Conventional racking system for pallets, piled blocks, forklifts
Selective Automation (AS)	Dynamic racking system, barcode readers, radio frequency terminals, RFID (handheld devices), stock locator.
Integrated Automation (IA)	AS/RS (Automated Storage and Retrieval systems) for unit loads; In-feed and out-feed systems, automated guided vehicles and transelevators.
Other Technologies (explain)	_____

Which of the following information technologies are used along the distribution chain?

Technology

Distribution Center _____

Regional / Local Depot _____

Cross-Docking Point _____

Other facilities _____

Barcode readers
 Automated Orders Management
 Transportation and delivery planning systems

Storage management systems (i.e. SAP)
 Others (explain) _____

6. PRODUCT HANDLING

Is there a established manual procedure for the correct product handling?

YES NO

Which of the following means the company applies to ensure the correct product handling, by distribution staff?

Training programs Information Posters Others (explain) _____

How are the following movements carried out?

Movements	Manually	Forklift
Packaging Line → Finished products warehouse		
Inside distribution centers and depots		
Outline and unloading of vehicles		

Pallets are used in:

Storage Transport

Which principle is followed in the distribution centers, depots and warehouses?

First in First Out Last in First out Others _____

What is the maximum stacking height for products on the storage locations?

_____ cm

Write the temperature and humidity conditions in storage locations

Location	°C	% Relative humidity

In which way the product is distributed? By:

Water: sea, rivers _____ % Land _____ % Air _____ %

Use of land transport vehicles:

Closed truck _____ % Car _____ % Train _____ %
 Open truck _____ % Motorcycle _____ % Intermodal freight transport* _____ %
 Others (Explain) _____

* Intermodal freight transport involves the transportation of freight in a container using multiple modes of transportation (rail, ship, and truck), without any handling of the freight itself when changing modes

Average years of usage of the fleet of trucks:

_____ years

Mark the type of roads used during transport and their percentage of the total distribution

National roads _____ % Urban / city roads _____ % Rural roads _____ %
 Non-paved roads _____ % Other () _____ %

Does the company keep a record of the amount of products damaged along the distribution chain?

YES NO

Which stage of distribution has a higher negative impact on the package performance?

Storage Transportation

Does the package performance vary with seasons?

YES NO

How? _____

Appendix C - Additional questions for interviews

Market Company:

1. Which are the local factors that affect the packaged products distribution process in the country? For example: legal, environmental, political, economic, social, infrastructure, etc.
2. Which is the most common distribution channel used by your customers?
3. Does the company give guidelines and recommendations regarding the correct product handling and transportation? How? When (Proactive)?
4. Have you had issues with customers regarding primary packages? Which are the most common complaints? Cause, type of package.
5. Does the package performance vary with seasons? How?

Customer:

1. Which are the local factors that affect the packaged products distribution process in the country? For example: legal, environmental, political, economic, social, infrastructure, etc.
2. Do you follow Tetra Pak's guidelines for the correct product handling?
3. Do you follow Tetra Pak's guidelines and recommendations for secondary packaging? Packing patterns, materials, cardboard box (size), etc.
4. Do big retailers sell their products to smaller independent outlets? How is the delivery carried out?
5. Who takes responsibility for the damaged products? How does it work?
6. Does the package performance vary with seasons? How?

Distributors:

1. Which are the local factors that affect the packaged products distribution process in the country? For example: legal, environmental, political, economic, social, infrastructure, etc.
2. Do you agree with and follow guidelines for the correct product handling from your client?
3. Who takes responsibility for the damaged products? How does it work?
4. Which stage of distribution has a higher negative impact on the package performance? Storage or delivery?
5. Does the package performance vary with seasons? How?


Wholesalers:

1. Which are the local factors that affect the packaged products distribution process in the country? For example: legal, environmental, political, economic, social, infrastructure, etc.
2. Is it common that retailers pick up the goods by themselves from your depots? Ex: Cash and carry.
3. Does the package performance vary with seasons? How?






Retailers:

1. Which are the local factors that affect the packaged products distribution process in the country? For example: legal, environmental, political, economic, social, infrastructure, etc.
2. How is the package quality when it reaches the stores? (most common problems with primary and secondary packaging)
3. Does the retailer sell their products to smaller independent outlets? How is the delivery carried out?
4. Are you investing in extending your logistics control upstream the distribution chain? (Own fleet).

Appendix D – Questionnaire modified after the research

QUESTIONNAIRE	
Purpose:	Evaluation of the supply chain in the ambient (shelf stable at room temperature) carton packaged products' sector in South America in order to identify local parameters influencing the quality of carton packages along the distribution chain (product flow, distribution equipment, distance, road conditions, vehicle types, temperature, relative humidity, etc.).
Instructions:	<p>Fill in the questions with the information that best reveals the real performance of your company. Please take into consideration the following instructions when answering the questionnaire:</p> <ul style="list-style-type: none"> - each question can be answered by choosing more than one option. Please choose all the answers that apply to your company. - when pre-established options for answers are given, please mark the cells by using the fill color for . - open questions are expected to be answered by filling the blank spaces assigned for it.
Chapters:	 <ul style="list-style-type: none"> 1 - General Information 2 - Products and clients 3 - Logistics 4 - Distribution flow 5 - Technologies 6 - Product handling

1. GENERAL INFORMATION	
Filled in by:	<div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Tetra Pak/ Market company Manufacturer Distributor Wholesaler Retailer </div>
Name: _____	Date: _____
Title: _____	Contact info: _____ mobile _____ email
Company: _____	
Country: _____	

2. PRODUCTS AND CLIENTS	
Filling Product:	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; text-align: center;">Juices, nectars, energy drinks, water, etc.</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Dairies (milk, flavoured milk, milkshakes, creams, etc.)</div> </div>
Primary package:	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 2px; text-align: center;">Tetra Classic Aseptic </div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Tetra Wedge Aseptic </div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Tetra Fino Aseptic </div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Tetra Brik Aseptic </div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Tetra Prisma Aseptic </div> </div>
Secondary package:	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; text-align: center;">Cardboard box</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Returnable Plastic crate</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Plastic Film Wrap</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Cardboard tray with film wrap</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">Others</div> </div>
Are dividers used in secondary package?	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; text-align: center;">YES</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">NO</div> </div>
Percentage of the total product volume delivery, classified by type of clients:	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px; width: 45%;">Client Type A: Traditional stores (0 ctk)</div> <div style="width: 5%; text-align: center;">%</div> <div style="border: 1px solid black; padding: 2px; width: 45%;">Client type B: Small and medium stores (1-20 ctk)</div> <div style="width: 5%; text-align: center;">%</div> </div>
	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px; width: 45%;">Client Type C: Big Chains, Ex: Carrefour</div> <div style="width: 5%; text-align: center;">%</div> <div style="border: 1px solid black; padding: 2px; width: 45%;">Client Type D: Wholesalers</div> <div style="width: 5%; text-align: center;">%</div> </div>

3. LOGISTICS

Does the company have a logistics, materials or supply chain department within its organization?

YES

NO

Which of the following integration phases describes appropriately the current logistics organization within the company?

Phase 0	Activities such as: warehousing, transportation, inventory planning, order processing, among others, are SCATTERED across different departments within the company.
Phase 1	Supplying, operations and transport functions are carried out, but THERE IS NOT A LOGISTIC DEPARTMENT neither a pre-established procedure to coordinate those functions through meetings, integrated data bases, etc.
Phase 2	There is a pre-established procedure to coordinate the internal logistic within the company through meetings, integrated data bases, etc; or either EXIST A LOGISTICS DEPARTMENT.
Phase 3	In addition to what was described in Phase 2, activities are carried out aiming to improve the coordination of the material and information flow management with other companies, clients, third party logistic providers, etc. LOGISTIC INTEGRATION

Does the company use installation providers?

YES

NO

Which of the following operations does the company outsource?

Storage

Distribution Center Management

Transportation

Others (explain)

4. DISTRIBUTION FLOW

Select from the list the elements involved in your product's distribution flow to the different types of retailers and write the sequence. Beside each retailer, select whether it receives a complete load or if is part of a milk run (delivery to more than one point of sale in the same route).

DC's	INTERMEDIARIES	OTHERS
DC producer	Carriers	Cross-docking
DC retailer	Distributors	
DC SPL	Wholesalers	

EX:



+ DC producer + carrier + wholesaler + distributor traditional store

milk run complete load

BIG CHAINS



+ _____ + _____ + _____ + _____ big chain

milk run complete load



+ _____ + _____ + _____ + _____ big chain

milk run complete load



+ _____ + _____ + _____ + _____ big chain

milk run complete load

MEDIUM AND SMALL STORES



+ _____ + _____ + _____ + _____ medium stores

milk run complete load



+ _____ + _____ + _____ + _____ medium stores

milk run complete load



+ _____ + _____ + _____ + _____ small stores

milk run complete load



+ _____ + _____ + _____ + _____ small stores

milk run complete load

TRADITIONAL STORES



+ _____ + _____ + _____ + _____ traditional stores

milk run complete load



+ _____ + _____ + _____ + _____ traditional stores

milk run complete load



+ _____ + _____ + _____ + _____ traditional stores

milk run complete load

Is it common for retailers to pick by themselves their products? Ex.: from wholesalers or distribution centers

YES

NO

Route's coverage and location:

5. TECHNOLOGIES

Write down beside each storage location the available technology according to the following scale:

Traditional (T)	Conventional racking system for pallets, piled blocks, forklift
Selective Automation (AS)	Dynamic racking system, barcode readers, radio frequency terminals, PDA's (handheld device) stock locator.
Integrated Automation (IA)	AS/RS (Automated Storage and Retrieval systems for unit loads: in feed and out feed systems automated guided vehicles and transelevators.
Other Technologies (explain)	

Technology

Distribution Center _____

Cross-Docking Point _____

Other (explain) _____

Which of the following information technologies are used along the distribution chain?

Barcode readers

Automated Orders Management

Transportation and delivery planning systems

Storage management systems (i.e. SAP)

Others (explain) _____

6. PRODUCT HANDLING

Is there a established manual procedure for the correct product handling?

YES NO

Which of the following means the company applies to ensure the correct product handling, by distribution staff?

Training programs Information Posters Others (explain) _____

Who receives this training programs?

Distribution staff SPL

How are the following movements carried out?

Movements	Manually	Forklift
Packaging Line → finished products warehouse		
Inside distribution centers and depots		
Outside and construction of vehicles		

Pallets are used in:

Storage Transport

Which principle is followed in the distribution centers, depots and warehouses?

First in First Out Last in First out Others _____

What is the maximum stacking height for products on the storage locations?

_____ boxes

In which way the product is distributed? By:

Water: sea, rivers _____ % Land _____ % Air _____ %

Use of land transport vehicles:

Closed truck _____ % Car _____ % Train _____ %

Open truck _____ % Motorcycle _____ % Intermodal freight transport* _____ %

Others (Explain) _____

* Intermodal freight transport involves the transportation of freight in a container using multiple modes of transportation (rail, ship, and truck), without any handling of the freight itself when changing modes

Average years of usage of the fleet of trucks:

_____ years

Mark the condition of the roads used during transport and their percentage of the total distribution distance.

Bad: Less than 30% paved, many wholes, no signpost, heavy traffic _____ %

Good: Between 30%-75% paved, wholes, with signpost, traffic _____ %

Excellent: More than 75%, no wholes, with signpost, low traffic _____ %

Does the company keep a record of the amount of products damaged along the distribution chain?

YES NO

Have you had issues with customers regarding primary packages? Which are the most common complaints? Cause, type of package.

YES NO

Which stage of distribution has a higher negative impact on the package performance?

Storage Transportation

Who takes responsibility for the damaged products? How does it work? E.g. Spl, producer

Is relative humidity an element that affects the performance of the package? Ex: high humidity, continuous variations along the distribution flow

YES NO

Which are the local factors that affect the packaged products distribution process in the country? For example: Political (tax, price control), infrastructure (road conditions), environmental, social (low wages, violence, unions)

Appendix E – Table of parameters in distribution risk assessment tool

PARAMETERS		DESCRIPTION	SCALE
Product	Primary package size	After completing the process of observations and interviews, the results showed that family pack size tend to show more damages.	Size of package: <i>Portion pack and family pack</i>
	Secondary package	The cardboard box gives more protection to the primary package than the film wrapping	Type of secondary package: <i>cardboard box, tray with film wrap, and film wrap</i>
Flow	Type of outlet	The logistic process to deliver to modern trade (especially supermarkets) has less steps than to traditional stores. In addition, due to the large volumes delivered to big chains, there have standardized processes.	Type of outlet: <i>Big chains and stores Medium and small stores Traditional</i>
	# Loadings	It measures the number of times, the product is loaded into a vehicle to reach the retailer's outlet. The higher number of steps increase the level due to additional product handling	Number of loadings: <i>1,2 3 > 4</i>
	Outsourced activities	Outsourcing is an effective cost-reduction strategy but at the same time it means losing direct control over the product.	Type of outsourced activities: <i>none, storage or transportation, both</i>
	# Cross-docking points	Although it facilitates the delivery process, there are critical points in the chain regarding product damage due to manual handling in short periods of time.	Number of cross docking points: <i>0, x ≥ 1</i>
	Training programs	Training programs are needed for the correct product handling. As more workers (including 3PL) are involved in these trainings, the damage risk level should decrease.	Who receives training programs: <i>3PL (if are used) and workers, only workers, nobody.</i>
	Chilled transportation or storage	The rapid transition from a cold environment to a warm one, causes the carton to suffers a negative effect on its overall performance.	Whether the process or transportation is chilled? <i>Yes, no</i>
Product handling	Technologies (level)	High level of technology allows product traceability and improve product handling by standardizing processes.	Low : <i>dynamic racking systems, handhelds, stocklocator, SAP</i> Medium : <i>conventional racking, forklifts, bar codes</i> High: <i>no pallets, manual</i>
	Handling (along the flow)	The product handling along the distribution chain, has an impact over the package performance. The product is exposed to suffer more damages when handled manually.	How is the handling carried out: <i>forklifts, manual and forklifts, only manual</i>
	Use of pallets	A tertiary package adds extra protection and avoids the possibility of manual handling, therefore damages are less likely to occur.	In which functions they used pallets: <i>none, storage or transportation, both</i>
	Stacking height	The package can suffer damages if some extra weight and prestion forces are added on top of them, either during transportation or storage.	Number of boxes stacked: <i>x ≤ 7 (less than 7 boxes) 7 < x < 13 (between 8 and 12 boxes) x ≥ 13 (more than 13 boxes)</i>
	Fleet (years of usage)	With the years of usage, the trucks performance as a good mean of transportation is affected. Maintenance problems increase, as well as many other issues.	Years of usage: <i>x ≤ 8 8 < x < 12 x ≥ 12</i>
	% Usage of train or boat	It is important to have other alternative means of transportation. Trains out time and in addition vibrations during transportation are less intense than in trucks for these two modes.	What % of other means (different from trucks) are used in distribution: <i>x ≥ 75% 25% < x < 75% x ≤ 25%</i>
Infrastructure	Road conditions	Trucks are the most common mean of transportation used for freight. The road conditions affect the whole distribution flow.	Bad: <i>less than % paved, wholes, no signpost, heavy traffic</i> Good: <i>between % paved, no holes, with signpost, traffic</i> Excellent: <i>More than % paved, no holes, with signpost, low traffic</i>
	Total distance	As the travel distance increases, the product is exposed for longer time to different factors that can affect its performance.	Total traveled distance (km): <i>x ≤ 300 300 < x < 900 x ≥ 900</i>
	% Humidity (Changes between regions)	Corrugated cardboard absorbs the humidity from the environment and spreads it to its fibers, which weakens the secondary package. Not only high humidities affect the performance but also the continuous variations of humidity along the distribution flow.	Low: <i>small variations or x ≤ 40%</i> Medium: <i>high variations or 40% < x < 80%</i> High: <i>several continuous variations or x ≥ 80%</i>
Local factors	Political issues	Political issues can cause changes in the distribution flow. Such as: tax regulations, price control, union power.	The parameter indicates the level of effect the local political conditions have over the distribution process: <i>low, medium, high</i>
	Social issues	Social issues can cause changes in the distribution flow. Such as: culture, education, purchase power, low salaries, high violence rate.	The parameter indicates the level of effect the local social conditions have over the process: <i>low, medium, high</i>

Appendix F – Distribution risk assessment tool

Instructions	*Read the legend before completing the table *For each parameter select only one choice.				
	IMP	Low risk	Medium risk	High risk	total
Product					
primary package size	0,5	portion pack	family pack		1
secondary package	1,1	cardboard box	tray-film wrap	film wrap	1,1
# type of outlet	0,3	big chains	medium and small stores	2 traditional	0,6
# loadings	1,3	1,2	3,4	> 4	2,6
outsourced activities	0,4	none	storage or transportation	both	1,2
# cross docking points	0,2	0	x ≥ 1		0,4
training programs	0,3	workers, 3PL	workers	none	0,3
chilled transportation or storage	0,2	no	yes		0,2
technologies (level)	0,4	high	medium	low	0,8
handling (along the flow)	1	forklift	manual/ forklifts	2 manual	2
use of pallets	0,6	both	storage or transportation		1,2
stacking height	0,9	x ≤ 7	7 < x < 13	x ≥ 13	0,9
fleet (years of usage)	0,2	x ≤ 8	8 < x < 12	x ≥ 12	0,2
% usage of train or boat	0,2	x ≥ 75	25 < x < 75	x ≤ 25	0,6
road conditions	0,9	excellent	good	bad	0,9
total distance (Km)	0,5	x ≤ 300	300 < x < 1000	x ≥ 1000	0,5
% humidity (changes between regions)	0,5	low	medium	high	0,5
political issues	0,3	low	medium	high	0,6
social issues	0,2	low	medium	high	0,6
					total
					16,2

Select the best option, and write the number (1,2,3) in the corresponding cell.

N° of archetype	Level of risk
6U	B

Level of risk	Scale (10 ≤ x ≤ 30)
level A (low risk)	x ≤ 15
level B (medium risk)	15 < x < 22
level C (high risk)	x ≥ 22