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BSc Thesis Management Studies

E-commerce in the Brazilian Flower Sector: Characterization, analysis and trends

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Abstract

This thesis addresses the E-commerce and ICT systems in the Brazilian flowers and ornamental plants' supply chain. The Brazilian supply chain of flowers and ornamental plants is described, with special attention to three of the supply chain drivers: transportation, inventory and information. This research provides two concrete illustrations of flower companies in Brazil: Veiling Holambra and Floranet. A visit took place in their facilities and interviews were conducted with managers of the companies. Some trends for the sector, especially regarding E-commerce and ICT are provided, most of them pointed out in the interviews carried out with the managers or with an expert of the sector, Mr. Eric van Heck. The validity of these trends was confirmed by the supporting literature, which has also provided an idea of the impacts of these trends in the supply chain drivers mentioned above. A hypothetical ICT infrastructure is proposed and its impacts on the supply chain drivers are analyzed. A list of critical factors and "good to have" factors to apply such a system is also provided to serve as an input to DaVinc^{3}i project. Finally, recommendations are made to the Brazilian situation, using as a reference the Dutch flower and ornamental plants sector, represented by Flora Holland.

Keywords: flower industry, electronic commerce, ICT, supply chain

1. Introduction

1.1. Background

In this section a general overview of all the features involved in this thesis is provided is given. The Brazilian flower sector is presented, as well as both of the Brazilian companies involved in this thesis, Veiling Holambra and Floranet. Afterwards, in a few words, the Dutch flower sector is described and Flora Holland is introduced. A small paragraph is destined to E-commerce and, finally, DaVinc^{3}i's project is presented.

1.1.1. The Flower sector in Brazil

The flower sector in Brazil has been growing fast in the past 10 years. The market has reached R$ 4 billion (over € 1.7 billion) size in 2010, according to Silvia Regina Van Rooijen, the president of the Federal Sector Chamber of Flowers and Ornamental Plants. This represents an increase of 15%, when compared to the year of 2009. The planted area is estimated to be over 6.2 thousands hectares, and it is concentrated especially in the country side of the state of São Paulo, which holds at about 70% of the production (AGRIANUAL, 2001). The internal demand absorbs more than 98% of the Brazilian production (HORTICA Consultancy, 2010). Even with that, the average expenditure per person in Brazil is only R$ 28/year (at about € 13), which is considered very low for the sector (O TEMPO newspaper, 2011).

The country's exports have a different profile than the other South-American countries like Colombia and Ecuador that are more focused in fresh cut flowers. Brazil's exports are mainly products for vegetative propagation, traditionally ornamental plants' seedlings (HORTICA Consultancy, 2010). In the last 3 years, the exports of the country have decreased due to the financial crisis – that reduced the demand by the main buyers of the Brazilian floricultural products (Netherlands, USA and Japan) - and overvaluation of the country's currency, which has turned the exports less attractive than the internal market. Besides this, other challenges for the Brazilian flower sector are creating a more standardized production, improving post harvesting practices and logistics to maintain the products' quality (Junqueira and Peetz, 2008).

1.1.2. Veiling Holambra

The Brazilian Cooperative Veiling Holambra is the largest flower company in Latin America. The company was founded in 1989 by a group of Dutch immigrants who established themselves in the country side of the state of São Paulo after the World War II. These families, already experienced in growing and trading flowers, made a very important contribution to the professionalization of this sector in Brazil. The Cooperative is owned by the growers, who receive a fixed percentage of the company's revenue and a greater percentage of their own sales (Van Heck et al, 2004).

Today, Veiling Holambra accounts for about 45% of the whole Brazilian flower and ornamental plants' market, working with more than 400 suppliers and selling both in the national and international market. The sales are made both by the "supply driven way", i.e. the auction system, and by the "demand driven way", i.e. mediation between buyers and suppliers by the Cooperative.

1.1.3. Floranet

Floranet was founded in 1998 in Holambra, Brazil, by a group of professionals with notable experience in the Brazilian Flower sector. The enterprise is specialized in building strategies for flower trading in Brazil. It sells flowers from more than 40 growers, members of Cooperflora, a cooperative founded by dissidents of Veiling Holambra. Although the companies are not institutionally related, they are located in the same area and practically, Floranet works as Cooperflora's sales representative.

1.1.4. Dutch Flower Sector

The Dutch Flower and Ornamental plants sector had, in 2006, the leading position in the European market, with about 44% of all the sales (van der Vorst, 2006). It is also widely recognized as the largest trade and knowledge center in the world, exporting about € 4.9 billion in floricultural products in 2009. Some factors that contributed to this position are: a strong home demand, the existence of highly specialized research organizations in flower cultivation, packaging and shipping, an efficient infrastructure in flower handling and air freight, among others (Porter, 1998).

The majority of its production is concentrated in "western Netherlands". It is responsible for about 150 thousand full-time jobs and has a positive effect on the Dutch trade balance.

1.1.5. Flora Holland

Flora Holland is the largest flower company in the Netherlands and the largest auction in the world, with no comparable competitors. It has a cooperative structure in which the growers are the owners of the business. There are more than 8 thousand growers involved, mainly in the Netherlands, but also beyond. Its primary aim is to optimize growers' business.

Flora Holland is constituted of 6 auction centers in the Netherlands, totalizing almost 120 thousand clock transactions a day. It sells its products to more than 3 thousand exporters and wholesalers, employing over 4.4 thousand people in more than 40 countries.

The cooperative had a total turnover of € 3.8 billion in 2009. Its imports come mainly from Kenya, which has reached 252 tons in 2008 (37.8%), Israel (13.2%) and Ethiopia (12.2%), while their biggest importers are Germany, with over € 1.4 billion in imports (28.9%), UK (14.6%) and France (13%). Flora Holland's members export to almost 140 countries around the world.

1.1.6. DaVinc^{3}i

This research aims to serve as an input to the DaVinc3i (Dutch Agriculture Virtualized International Network with Coordination, Consolidation, Collaboration and Information Availability) project, carried out by WUR, Flora Holland, Vrije Universiteit Amsterdam, among other institutions. A brief description of the project follows.

The project's objective is to strengthen the international leading competitive position of the Dutch horticulture sector in a global, virtualized trade network by researching (1) the opportunities for new coordination, consolidation and collaboration concepts in extended international tradeparc networks, and (2) the possibilities for making chain information directly and real-time available and usable to support decision making of all partners in the horticultural network. This proposal links to the Transport

Hubs in Control program: it develops new network coordination concepts and building blocks for a voluntary information infrastructure and corresponding IT architecture, resulting in an improved use of the logistics infrastructure.

To develop these concepts is mandatory to go further specific research issues, defined by five different work packages (WK):

(WP1) Scenarios for an international virtualized horticultural trade world

(WP2) Design of value-added logistics services

(WP3) Virtual information exchange and transparency

(WP4) Business models for network coordination

(WP5) Integration, implementation and knowledge dissemination

DaVinc^{3}i project will contribute to innovation from an academic perspective on four aspects:

- Coordination, consolidation & collaboration concepts, models and algorithms for perishable products with high supply and demand uncertainty;
- Dynamic network design concepts incorporating product quality development;
- Building blocks for a voluntary new ICT infrastructure;
- Development of effective business models for this sector with its specific characteristics.

1.1.7. E-commerce

The E-commerce is the process of buying and selling or even exchanging products, services or information via a computer network, which includes the internet (Turban *et al*, 2000). E-commerce can, of course, be seen by different perspectives. For instance, from a business perspective, e-commerce is nothing more than applying technologies to perform sales transactions automatically and faster. While from a communication perspective, the electronic commerce is the delivery of information, products/services or payments via phone lines, computer networks or any other kind of electronic device.

In the year 2010 R$ 14.8 billion (€ 6.4 billion) have been billed in sales of consumer goods in the Brazilian E-commerce, which meant an increase of 40% over the R$ 10.6 billion (€ 4.6 billion) in 2009. Since it has been inserted in the Brazilian market in the end of the 90s, E-commerce has experimented impressive growth rates (an average of 35.5% of growth in the amount of money billed from 2006 to 2010), mainly due to the democratization of the internet in the country, which has included almost 38% of the population digitally (IBOPE/NILSEN, 2010) and due to the increase of the phenomenon of "group-buying" as well. The best-selling categories in 2010 were Appliances (14%), Books, Magazines and Newspapers Subscriptions (12%), Health, Cosmetics & Medication (12%), Computers (11%), and Electronic devices (7%).

Regarding E-commerce in the Netherlands, it is obvious that a country with one of the highest Internet penetration – more than 85% (Internetworldstats.com, 2009) and IT development in the world, like Holland, is supposed to be among the E-commerce leaders as well. One of the reasons for the high level of electronic commerce in The Netherlands, typically represented by B2C and B2B markets, is explained by the well-supported technological infrastructure, since the E-commerce industry is sustained by the Dutch government that actively invests in schools Internet connecting and spurs the businesses to be more informed about E-commerce. According to Economist Intelligence Unit the most popular online purchases are music, books, films, consumer electronics, and travel and tourism. The sector has billed more than € 3.4 billion in 2006.

1.2. Research Questions and Objectives

This thesis aims to ***characterize and describe the role and the current situation of e-commerce in the Brazilian flower sector***. To a minor extent, the thesis also intends to ***establish comparisons with the Dutch Flower Sector, due to its widely known efficiency and importance.*** More precisely stating, the research questions are:

1) What does the current flower system (supply chain) in Brazil looks like?
2) What are the trends for the E-commerce and ICT (Information and Communication Technology) in this sector?
3) What will be the impact of these trends in this supply chain?
4) State the lessons learned (outputs of the research) for **DaVinc^{3}i** and, in a minor extent, by means of benchmarking with the Dutch model, recommend adaptations to the Brazilian system.

1.3. Research Methodology

1.3.1. Frameworks

To support the answers, it is intended to use adapted versions (one different version for each of the companies) of the "Supply Chain Decision-Making Framework" proposed by Chopra & Meindl. This framework is represented below in Figure 1, followed by a brief explanation.

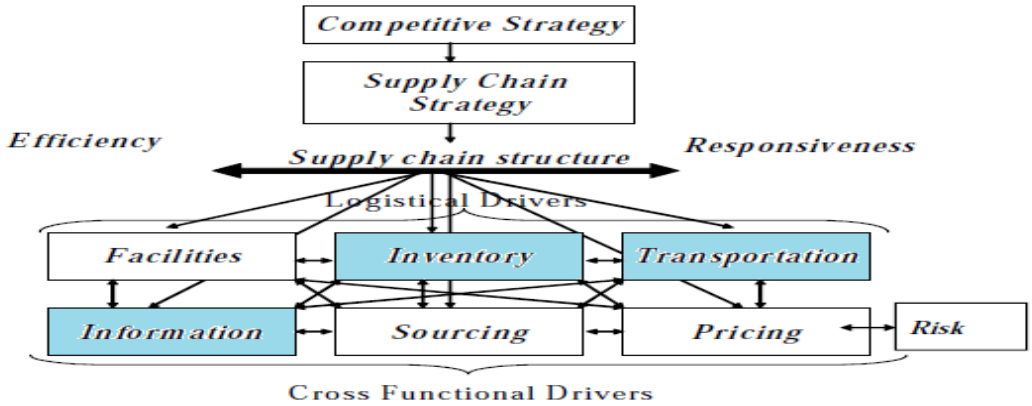

Figure 1. Supply Chain Decision-Making Framework. Source: Supply Chain Management: Strategy, Planning, and Operating; Chopra & Meindl, 2001.

The framework represents all the factors that directly or indirectly influence the decision making when defining a Supply Chain Strategy, which will, in turn, guide the Supply Chain Design, Planning and Operating.

The Competitive Strategy of the company has to be supported by the Supply Chain Strategy in such way that they have aligned goals, achieving, then, the **strategic fit.**

After the strategic fit is achieved, the Supply Chain Structure is defined by the allocation/structuration of the drivers. The goal in this phase is to achieve the desired level of responsiveness (stated in the company's competitive strategy) at the lowest possible cost. The trade-off between responsiveness and efficiency is, therefore, guided by the way in which these drivers are allocated.

Since this research's focus is not to design, study or assess supply chain strategies, this framework was chosen just due to the representativeness and relevance of the supply chain drivers included in it. Two of the logistical drivers, transportation and inventory, and one of the cross-functional drivers, information, are extensively discussed in this thesis and the description of the supply chains has its main focus on them, along with customers and sales channels.

In sections 3.1.2, 3.2.2 and in the Appendix, the adapted frameworks are shown and described, respectively applied to Veiling Holambra, Floranet and Flora Holland.

1.3.2. Research Methods

The two research methods that were applied in this thesis are:

Desk Research: Different handbooks and articles provided useful insights into Supply Chain Management, the flower sector in Brazil, the flower Sector in the Netherlands and the role of e-commerce in trading horticultural products, as well as trends and expectations for the future. This research combines concepts and frameworks, and apply them to the cases of the companies involved in the thesis. Newspapers' articles, companies' websites, governmental websites and public information available on the internet were collected and are presented in this research as well. This information provides a strong basis to assess the current situation of these markets, performance in the last years, trends for the future, and so on. Not only that, but this also helps in the understanding of the e-commerce and flower industry as a whole (and the intersection between them), providing information about moves in the market, innovations, opportunities and threats.

Interviews: This thesis was supported by four interviews, three of them with the companies described in chapter 1, and one with an expert of the sector. For the companies' interviews, a generic questionnaire was prepared and applied to each of these enterprises. In the case of the expert's interview, a different questionnaire was prepared. All these questionnaires can be found in the Appendix, and some important remarks about these interviews are available below.

Interviews and visits were also carried in this work. A visit took place in the biggest flower auction of Flora Holland (and also the biggest of the world), in Aalsmeer, The Netherlands. Besides the visit, a questionnaire was answered via e-mail by the company. The visit in Flora Holland was carried out by

Felipe Vizzoto in May 16th, it was guided by the Supply Chain Manager of the Company. In this opportunity, Vizzoto was able get acquainted with the company's facilities and ask general questions about Flora Holland. A formal interview, using the referred questionnaire as a basis, did not take place at that time. This questionnaire was sent to Flora Holland's Supply Chain Manager by e-mail in June 13th, and sent back, properly answered, in June 20th of 2011.

In Brazil, two visits/interviews were carried. Firstly, a visit to the biggest flower auction in Latin America, Veiling Holambra, located in the city of Holambra, Brazil. The second visit took place in Floranet, an important flower trader in Brazil. Strategically located in the city of Holambra, Floranet is a company specialized in building strategies for trading flowers. These visits, both in Veiling Holambra and Floranet, were carried by two researchers from ESALQ-LOG (Group of Research and Extension in Agroindustrial Logistics), Pedro Paulo de Carvalho Teixeira and Aline Bianca Paulo, both Agronomic Engineering students in University of São Paulo (ESALQ/USP), in June 1st of 2011. In Veiling Holambra, the visit took 4 hours, and it was guided by the Supply Chain Manager of the company. In the occasion, the researchers were able to follow the auction process, to get acquainted with the company's facilities, and to have an interview with the Supply Chain Manager. In Floranet, the visit was guided by the General Director of the company and it lasted 2 hours. The company's facilities were presented to the researchers, part of Cooperaflora's facilities as well, and an interview took place with the General Director of the company.

In addition to the visits carried in the companies in Brazil and in The Netherlands, an interview with an expert of this sector was done by Felipe Vizzoto in Rotterdam, The Netherlands, in June 1st of 2011. Eric van Heck holds the Chair of Information Management and Markets at Rotterdam School of Management, Erasmus University, where he is conducting research and is teaching on the strategic and operational use of information technologies for companies and markets. He published several articles about information technology in the flower auction, which were used as part of the literature in this work. The interview took 1 hour and a different questionnaire was used in this case, more focused in trends to ICT and e-commerce in the flower sector than in the supply chain itself.

The Brazilian Flower Sector was chosen, among other reasons, because it has an extraordinary growth potential, mainly due to its natural conditions (availability of land, water, sunlight, and other natural resources), the current economic situation of the country – Brazil is considered a developing country, integrates the BRICS countries group, and had a 7.5% GDP growth in 2010 – and also the great improvisation capacity of the Brazilian people, one of Brazil's most recognized cultural characteristic, already mentioned by Pozzebon and van Heck (2006) being able to apply and adapt, according to their conditions requirements, generic systems like the "Dutch Veiling".

Floranet was chosen to be part of this research because of its innovative concept, helping growers to build strategies to sell flowers in the Brazilian market. In addition to that, Floranet represents a more common situation, in terms of sales channels, in the Brazilian Flower Sector, since it does not trade flowers by means of auctioning (the only Flower Auction in Brazil is Veiling Holambra).Therefore, its representativeness is strategic to better describe the Brazilian Flower Sector.

The choice of Veiling Holambra was made due to its leading position in the Brazilian and South-American market. Besides that, the cooperative has done the implementation of the "Dutch Veiling System" successfully, adapting the system to the different environment found in Brazil.

In the same way, Flora Holland's choice was done taking into account its leading position globally, and its trendsetting and innovative behavior.

1.3.3. Research Material

The material used in the desk research includes handbooks and scientific articles about Supply Chain Management, ICT, e-commerce and the Brazilian and Dutch Flower Sector. General information about both the Dutch and the Brazilian flower sector and the role of e-commerce in trading horticultural products contained in newspapers' articles, companies' websites, governmental websites and public information available in the internet. The convenient information was gathered during the research. A handbook that deserves to be highlighted due to its extensive usage in this work is *Supply Chain Management: Strategy, planning and operation, Chopra and Meindl (2010).*

The visits and interviews conducted in this research also provided valuable material. These are all the data that was recorded from the questionnaires applied in the interviews conducted in the listed companies (Floranet, Veiling Holambra and Flora Holland) and from the visits made to their installations themselves. The expert interview, with Professor Dr. Eric van Heck, is also included in this category. This data was not available and had to be collected, analyzed and included in the thesis.

1.4. Conclusions

This research basically two different methods to achieve its objectives and answer the raised questions: (1) Desk Research; and (2) Interviews. The frameworks, presented in section 3, and Questionnaires, available in the Appendix, were drawn based on the Literature Review to support our answers, and show in a more schematic way the functioning of the company's supply chains and the impact that the found trends would cause in them. It is important to state that - having in mind that the Literature Review is limited - the approach of the questionnaires has also a considerably narrow reach, including some of the key questions of our research, but failing, naturally, to collect all the desired knowledge to answer the research questions and achieve the research objectives in a perfect way. Finally, the research material included a range of scientific articles, newspapers' articles, handbooks, companies' websites and data derived from the interviews.

2. Literature Review

2.1. Supply Chain

Chopra and Meindl (2001) state that a *supply chain* consists of all parties involved, directly or indirectly, in fulfilling a customer request. Therefore, a supply chain may involve not only manufacturers and suppliers, but transporters, warehouses, retailers and final consumers as well. Moreover, Chopra and Meindl (2001) characterize supply chains as dynamic systems, with constant flow of information, product and funds between different stages along both directions of these chains. As a matter of fact, most supply chains, according to them, can be seen as supply networks or supply webs, due to the fact that several players may be involved in each stage.

The primary objective of any supply chain should be to maximize the overall supply chain surplus, which is basically the difference between what the final product is worth to the customer and the costs the supply chain incurs in filling the customer's request. To pursue this objective, it is crucial that the supply chain is designed, planned and operated to support the company's competitive strategy, which is guided basically by a trade-off between responsiveness and efficiency. Chopra and Meindl (2001) propose six drivers to evaluate the performance of a supply chain. They are divided in two groups, logistical and cross-functional drivers. Logistical drivers are facilities, inventory and transportation. Cross-functional drivers include information, sourcing and pricing.

According to Chopra and Meindl (2001) inventory exists in the supply chain because of a mismatch between supply and demand. It encompasses all raw materials, work in process and finished goods within a supply chain. High level of Inventory increases the supply chain responsiveness. Furthermore, it facilitates a reduction in costs because of improved economies of scale. On the other hand, inventory holding costs increase with a high level of inventory.

Transportation is responsible for moving a product between different stages in a supply chain, and it can take the form of many combinations of modes and routes. Faster transportation modes increase the responsiveness of a supply chain, although it increases transportation costs as well.

Information is potentially the most important driver of a supply chain, because it deeply affects every part of the supply chain and impacts all the other drivers, advocate Chopra and Meindl (2001). Information allows a supply chain to improve both responsiveness and efficiency. However, as all the other drivers, information may reach a point in which a trade-off between responsiveness and efficiency has to be made. Beyond a certain point, the marginal cost of handling additional information increases, whereas the marginal benefit from additional information decreases.

2.2. Information Technology

IT can, in a broader sense, be defined as all forms of technology used to create, store, exchange and utilize information in its various forms, including business data, conversations and still images, just to list some of them. From a supply chain perspective, according to Chopra and Meindl (2001), information technology "consists of tools used to gain awareness of information, analyze this information and execute on it to increase the performance of the supply chain". The information captured by IT makes

the supply chain visible, enabling companies to make decisions over a broader scope that crosses both functions and companies. Meanwhile, advocate Chopra and Meindl (2001), information must have four main characteristics to be useful: (1) Must be accurate; (2) Must be accessible in a timely manner; (3) Must be of the right kind; (4) Must be shared. Information systems gathering, processing and analyzing information without these characteristics may represent nothing more than an extra expense to the company, once the outcomes may not provide a strong basis for decisions' support.

The contribution of IT to business has been systematically analyzed in different researches. Van Heck and Vervest (1998) argue that the rapid development of information and communication technology (ICT) has resulted in electronic markets being increasingly popular. Significant benefits are obtained by reducing transaction costs, increasing the circle of potential customers and improving the search-and-find capabilities for all parties concerned. Furthermore, according to Cunden and Van Heck (2004), information technology and specially the Internet have brought two major changes in the conduct of business: (1) They have significantly reduced the cost of doing business; (2) They have established complex relationships between organizations and their stakeholders.

According to Cunden and Van Heck (2004), the correct usage and implementation of IT provides potentials for companies to reach a wider customer base and increased customer services. In their research, it is shown how African flower growers can use IT to have access to new and large European markets and remove the quality uncertainty of the products offered by them. Similarly, Pozzebon and Van Heck (2006), describe how the biggest flower company in South America, the Brazilian Cooperative Veiling Holambra, used IT to trade flowers in the international market. They relate the success of a generic IT implementation, in that case the reverse auction, to three main factors: (1) The size of the design-use gap; (2) The adoption of a mutual-influences approach; (3) The occurrence of culturally-dependent adaptations. This supports the hypothesis that IT, if well implemented, can bring considerable benefits to flower businesses.

2.3. E-commerce

There is a growing interest in the use of electronic commerce as a means to perform business transactions. E-commerce is a strategic area for research, because of its relative novelty and exploding growth. There is no universal definition accepted to this term. Kalakota and Whinston (1997) provide an embracing circumscription for it:

- From a *business perspective*, electronic commerce is the application of technology toward the automation of business transactions and workflow.
- From a *communications perspective*, E-commerce is the delivery of information, products/services or payments via telephone lines, computer networks or any other means.
- From an *online perspective*, E-commerce provides the capability of buying and selling products and information on the internet and other online services.
- From a *service perspective*, it is a tool that addresses the desire of firms, consumers and management to cut service costs while improving the quality of goods and increasing the speed of service delivery.

By this definition, it is possible to have an idea of the complexity of e-commerce, a phenomenon that permeates almost every sector of the global economy today. According to Turban *et al*. (2004) electronic markets are most useful when they are directly able to match buyers and sellers. They serve to reduce search costs, thus allowing consumers to find sellers offering lower prices. This was also pointed out by Malone *et al.* (1987). In the long run, this may reduce margins for sellers, yet it may also lead to an increase in the number of transactions that do take place, argue Turban *et al.* (2004). Another impact of lower search costs, indicated by Bakos (1991), is the dis-intermediation in the marketing channels and commoditization of the market, resulting in increased price competition.

Turban *et al.* (2004) propose that another impact of electronic commerce is the trade-off between the number of customers a company can reach (called "reach") and the amount of interactions and information services they can provide to customers (called "richness"). The trade-off is simple: the more customers a producer wants to reach, the fewer the services provided to them. Cunden and Van Heck (2004) analyzed this proposition and concluded that these two concepts are not mutually exclusive and firms may seek to increase its reach while providing richness in terms of superior customer service.

Chopra and Meindl (2001) assess how the emergence of e-businesses, naturally accompanied by e-commerce, changed the distribution networks of firms. Interesting contributions of the e-commerce are: (1) A more efficient funds transfer; (2) Greater product availability, due mainly to the more accurate forecasts derived from IT; (3) Greater product variety than regular outlets; (4) Better "customer experience", once the sales can be done 24 hours a day, 7 days a week.

Although the impact of E-commerce for companies has a considerable number of benefits, the main drawback is the high investment that has to be made to implement this kind of tool. Moreover, Chopra and Meindl (2001) mentioned the larger response time to customers, i.e. products bought in E-commerce generally take longer to be available to the customer than products bought in a physical retail outlet. Similarly, highlight Chopra and Meindl (2001), returning the product is also more complex when buying via E-commerce.

2.4. Conclusions

The Literature Review focus in the three main concepts addressed in this research: (1) Supply Chain; (2) IT; and (3) E-commerce. Definitions are provided to these terms, their main impacts and potentials from a business perspective as well as the main drawbacks related to them. The Supply Chain literature review is focused on defining the role and potentials of the three supply chain drivers analyzed in this research, Transportation, Inventory and Information. Chopra and Meindl (2001) is extensively used in this section. IT's section concentrates itself in showing how IT has changed the business environment and what are the main advantages that can be taken from this technology. Cunden and Van Heck (2004) and Pozzebon and Van Heck (2006) are featured. Finally, E-commerce's portion shows different advantages found in using E-commerce as a sales channel. Alternatively, some disadvantages of this tool are presented. Turban *et al.* (2004) and Chopra and Meindl (2001) deserve to be highlighted.

The Literature review, therefore, provides interesting researches approaching the three different concepts, but due to the short period of time designated to this research, it is limited to a small range of

scientific articles and handbooks. This should be taken into account when assessing the validity of the analysis done in this thesis.

3. Supply Chain Description

In this chapter, Research Question 1 is answered based on the visits made to the companies in Brazil, the interviews conducted in there and the companies' websites. The contents include brief descriptions of the infra-structure of both companies, characterization of the logistical drivers (Inventory and Transportation) and the Cross-functional driver (Information) as well as characterization of the profile of the customers and the sales channels offered by the companies. Therefore, the data presented consists of facts, not including trends, expectations or possible impacts.

Although visits were done and questionnaires were applied, the validity of this data remains to the testimony of the staff interviewed and to the data provided in the websites. In addition to that, the visits and interviews have been done by two Brazilian researchers of ESALQ-LOG group, undergraduate students of University of São Paulo. Their final report of this "field work" was written in Portuguese and translated to English by Felipe Vizzoto. The process of translating can lead to minor mistakes and misunderstanding as well, but surely not huge enough to deviate the results from their original direction.

Regarding the Transportation process, the volumes transported were not clearly defined. Both of the companies could not report the average size of the orders, reasoning that these elements vary according to the transaction. The other characteristics of the Transportation process are properly stated, like the fact that neither Veiling Holambra nor Floranet are responsible for this process, the existence of cooling systems in the vehicles, and a general idea of the distances between the actors involved in this process. The findings in Inventory were predictable: Stock is avoided, due to the fact that plants are highly perishable and to the high costs of holding it. The description succeeds in feature what is the information exchanged between the actors in the chain. On the other hand, the systems used to do so were poorly described. This can have two possible explanations: The low rate of usage of them and the inability of the persons interviewed to describe them, since they are not responsible specifically for this area in the company. Customer categories and Sales Channels offered are properly described.

3.1. Veiling Holambra

3.1.1. Brief description of the infra-structure

Due to an increase in the volumes traded by Veiling Holambra, in 2009, the "New Veiling Holambra Building" was built. It has more than 105.000 m^2 of built area. The representation of the new building can be seen in Figure 2.

Figure 2. Representation of the "New Veiling Holambra Building". Source: www.veiling.com.br
Portaria = Entrance to the facilities
Câmara Fria = Cold Storage Room
Hall de entrada = Entrance to the building
Carga e descarga = Docks
Distribuição e área climatizada = Distribution and environment controlled área
Estoque material circulante = Packaging area
Administração, marketing e financeiro = Management, marketing and financial

The "Asas" (which means wings) are the places where the clients are located. At the time that the visit was done, Asas 3 and 4 were not yet ready. In these places the clients receive the products they bought in the Veiling Holambra and they ship them to be delivered to their external facilities. The "Asa 1" is rented by the clients with higher volumes traded in the Veiling Holambra. Therefore, the clients have their offices in there. The whole area is equipped with cooling systems and there is also a cold storage area available for clients' usage. The "Asa 2" is a common usage area, which means that it is not particularly rented by one client, therefore any client with previous schedule can use it to ship their products. This area is not equipped with cooling systems, but has a cold storage room for common use. The pink area is where the products are received by Veiling Holambra, and from where they are sent to the clients that have bought them. This area has a controlled environment, with temperatures varying from 20°C and 22°C and humidity varying from 70% to 80%. It is represented by Figure 3.
The blue area is destined to stock cut flowers. The cooling technology system installed in this room enables it to maintain different temperatures, in different areas of the room, at the same time. This improves the quality keeping of the diverse flower species in there, increasing the durability of them. This area is connected to the auctioning room, and it is from where the trolleys come before passing in front of the clocks. This area is represented in Figure 4. Laboratories are located in this building, in which quality tests are conducted. The building also offers a canteen and bank facilities.

Figure 3. Distribution and environment controlled area.

Figure 4. Cold storage room.

3.1.2. Supply Chain Structure

To describe the Supply Chain Structure of Veiling Holambra a framework, based on Chopra and Meindl "Supply Chain Decision-Making Framework", is applied to the company. Its main purpose is to support the answers to the research questions, by providing an overview of the processes involved in the supply chain and the actors that perform these processes. Each of the processes involving the supply chain drivers included in this research are described, the customers' "profile" and the sales channels offered by the companies are listed and characterized as well. This framework can be observed in Figure 5.

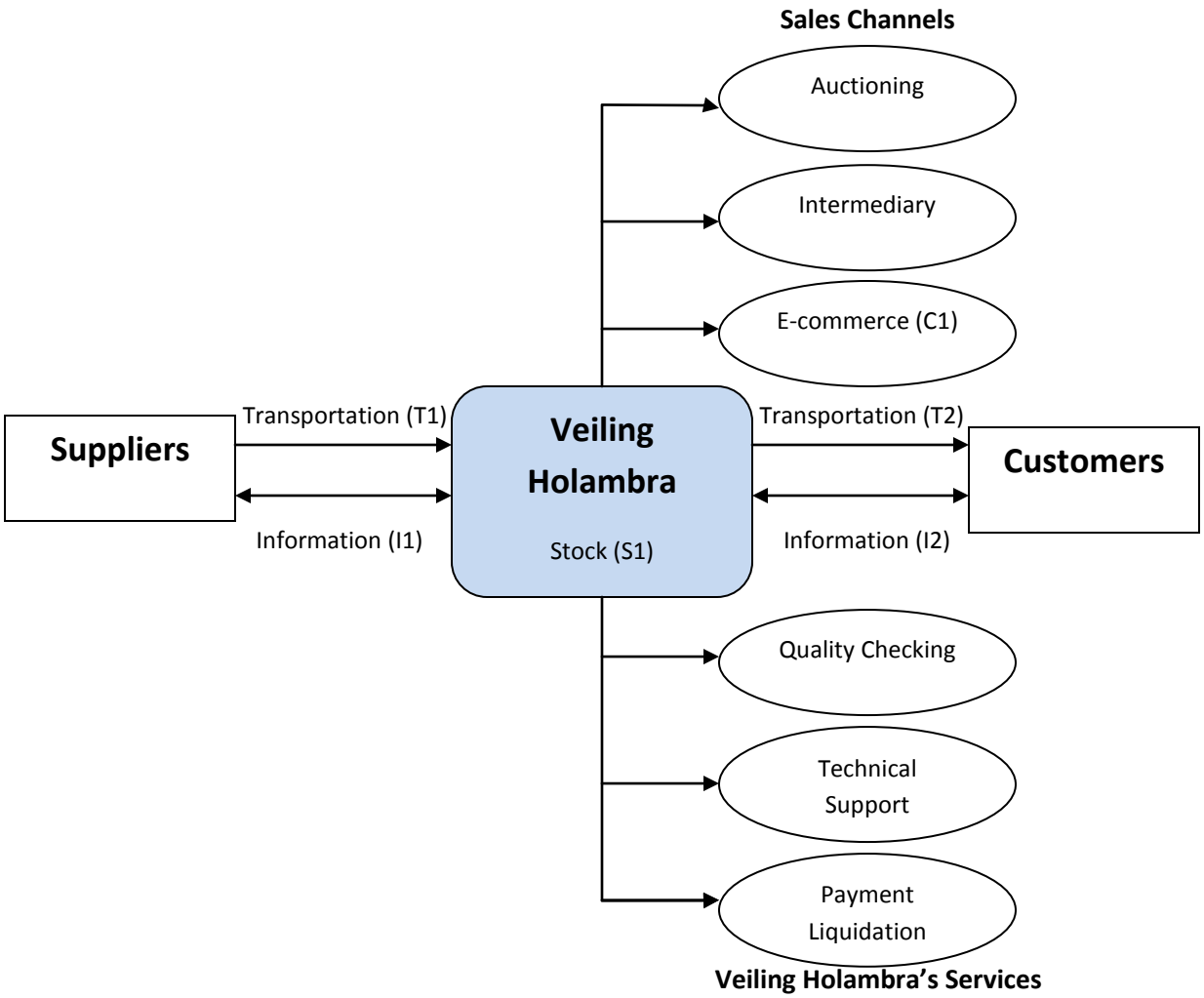

Figure 5. Veiling Holambra's Supply Chain Framework. Source: Adapted from Chopra and Meindl (2001).

Customers: Veiling Holambra trades with approximately 500 customers, which are basically divided in three categories:

1) Wholesalers: big retailers that sell directly to the customers, represented mainly by the Supermarkets.
2) Distributors: these are also wholesalers, but the difference is that they buy in big amounts and later on sell them to the small retail centers.

3) Traditional “Floriculture Shops” and Decoration Companies: only the biggest “Floriculture Shops” and Decoration Companies buy directly from the Veiling Holambra. The former is the most traditional way of selling flowers (retail) in Brazil, and can be found in almost every city in the country. The later represents companies that provide decoration services, acting mainly in weddings, graduation parties, birthday parties, and so on.

Sales Channels: According to one of the Veiling Holambra’s managers, the company’s main role is to facilitate the interaction between the producers and buyers, integrating the production to the market. For that, Veiling Holambra offers three different kinds of sales channels:

1) The auction: This sales channel represents 55% of all sales made by the company. It is a successful application of a generic system exported from The Netherlands. The flowers are transported through the auction room, while all the information regarding this lot is available in the computerized auction clock. The auctioneer puts an initial price per unit according to his/her “feelings about the market”. The auction starts, and the price starts decreasing until someone pushes the button, indicating that he/she will take the product at that price. This process lasts 1.3 seconds, in average. The buyers can either buy the entire lot or only part of the lot, and the leftover is auctioned again. If a lot does not receive any bids until it gets to the minimum price, the lot is disposed and used as fertilizer. This is done to protect the prices from going down dramatically. Veiling Holambra has three clocks that work simultaneously, in the same auction room. The auctions start everyday at 7 in the morning.
   One of the barriers to increase the sales by this sales channel is the fact that some of the clients are located far away from Holambra, making it very difficult for them to attend the auctions. To overcome this situation, Veiling Holambra offers them a special service. The Cooperative trains some employees to represent clients that cannot be present in the auction room. These are called “commissioned salespersons”.
2) Mediation: This sales channel represents 45% of the Veiling Holambra sales. The clients get in touch with the company, mainly via telephone, looking for products. They specify the product, the amount and desired quality. The mediation team, then, mediates the negotiation with the producers to fulfill the needs of the buyers.
3) E-commerce (C1): The C1 in the Veiling Holambra, as well as in the Brazilian Flower sector as a whole, is still incipient. This is mainly due to the low familiarization of the actors involved in the Brazilian Flower Sector with this sales channel. For each of the sales channels listed above, the company offers one tool to make the online sales possible. They are:
   - The “pre-offer”: It is a web-based application provided by Veiling Holambra to its customers, and it works as an online tool for the auction clock. The buyers can bid for a particular product, via internet, before the auction starts. They specify the product, the quality and the quantity. During the auction, if the price reaches the pre-offer set by the client, he/she takes the product. This tool enables buyers that cannot be present in the auction room, due to the long distance between their location and Holambra, for example, to make their offers to the auctioned products. However, it is not very popular among the clients, and it is generally used when the client wants to guarantee that he/she will get the product.

- ISC (Intermediation Sales Center): This is an EDI (Electronic Data Interchange) application developed by Veiling Holambra, and it serves as an online tool for the Mediation sales channel. The growers market their products in advance (even before harvesting the products), providing information about quantity, quality and, of course, product. The buyers have access to this information and can negotiate with the specific grower. Again, this tool is poorly exploited by the clients. Veiling Holambra reported, encouraged by the cooperative, that the growers have been adapting themselves to this system.

Transportation (T1 and T2): The transportation of the products is a very important process in the ornamental plants and flowers chain. It has a huge impact on the quality of the products and on the responsiveness of the chain. This process can be divided in two phases:

T1: It represents the transportation from the growers to the Veiling Holambra facility. The flowers and ornamental plants are transported in trucks, by the roads. According to an estimation made by one of the managers of Veiling Holambra, at about 70% of the growers are located no more than 50 km away from the company's facility. Another 10% have their farms varying from 50 to 100 km from Veiling Holambra. The rest, 20%, face distances larger than 100 km to deliver their products. The manager reported that the majority of the growers have trucks equipped with cooling systems, as well as cold storage rooms in their farms. The growers are responsible for T1.

T2: T2 applies for the transportation from the facility of Veiling Holambra to the clients' facilities. No matter how long the distances are, this process uses mainly trucks. The principal reason pointed by the Holambra's manager to the non-usage of airways is the poor infrastructure of the country in this respect. The clients are located along the whole country, but it can be said that they are highly concentrated in the south-east of the country, where also Holambra is located. The cities of São Paulo, Rio de Janeiro and Belo Horizonte should be highlighted as the main destinies of the products. The clients are responsible for T2; therefore, the presence of cooling systems in the trucks is totally up to their concerns about the quality offered to their final customers. It was reported by Veiling Holambra that a considerable percentage of their clients, specially the small ones, do not have trucks with proper conditions to transport the products.

In the process, Veiling Holambra facilitates the shipment of the products within their building to their clients, providing them the already mentioned "Asas", which are docks where the clients can properly ship their products. The external part of one of the Asas is represented in Figure 6. It takes, in average, 2 hours for a lot sold in the Auction to be available for the clients, in the proper dock, to ship them. In the case of sales done by the Mediation, this period drops to 1 hour.

The clients can choose between shipping their products in bulk and taking the trolleys with them. In the later case, they have to return the trolleys after delivering the products, forcing them to do the "reverse logistics".

Figure 6. Docks in one of the Asas.

Information (I1 and I2): Chopra and Meindl defined Information as the "glue" of the supply chain. It is potentially the biggest driver of a supply chain because it directly affects each of the other drivers. Information support managerial decisions, and in this sector this is especially important in the forecasting process, due to the fact that flowers and ornamental plants are highly perishable. For Veiling Holambra, we can divide the information in I1 and I2:

I1: It represents to the nature of information exchanged between the growers and the company and the particular ICT system used to do so. The growers, before delivering their production to the cooperative, have to pass, by the CVH-net system (a system developed by the company to exchange information with the growers), all the characteristics of the products that will be delivered. This includes species, quality, quantity and minimum price per unit required for the product. As soon as the products arrive, Veiling Holambra checks if they are in line with the I1 previously provided. If any distortions are found, the company, via CVH-net, informs the grower, making I1, therefore, a two-way path.
The CVH-net is an interactive system that enables Veiling Holambra to organize a database to better plan their products supply and to use as a basis for demand forecasting. Besides that, it facilitates the search for specific products in the Mediation sales channel and prevents the company from losing trolleys lent to the clients (as reported by Veiling Holambra, the losses of trolleys decreased a lot after applying CVH-net). The cooperative induces its members to use CVH-net by charging higher prices for receiving products that arrive in the Veiling Holambra facilities without having been included in the system. Nowadays, only 9% of the members do not use the CVH-net.

I2: I2 applies to the nature of information shared between the Cooperative Veiling Holambra and its clients and the particular ICT system used to do so. There are different systems for the different sales channels, but the information shared is basically the same. Veiling Holambra provides the clients a web-based application to enable them to anticipate an offer in the auction, for example. This bid has to

include information regarding variety, quantity, quality and, of course, the price offered. For sales done in the Mediation Channel, it is also used together with an EDI (Electronic Data Interchange) system. The difference is that after the negotiation, the clients are sure that they have the deal, and in the "pre-offer", they have to wait until the product is auctioned.

Inventory (S1): The inventory, also known as stock, is generally the result of a mismatch between supply and demand. It can also be the case that inventory is held due to a difference in timing between the emergence of demand and lead time of supply. In the case of Veiling Holambra, S1 is kept in the facilities of the cooperative. However, according to one of the managers of the company, the cooperative does not actually keep any inventory. The products generally arrive in the cooperative in the end of the afternoon. They are transported to the cold storage rooms, where they are accommodated until the next auction. The "average inventory time" is, therefore, less than one day. The cooperative's stock capacity is 9.000 trolleys/lots in its cold storage rooms, but the "average inventory kept" is 4.000 trolleys/lots. In demand peaks, this number increases, once the supply to fulfill this demand also increases, but no difference was reported in their inventory policy due to this change.

3.2. Floranet

3.2.1. Brief description of the infrastructure

Floranet was founded in 1998 and it is a company specialized in building strategies for commercialization of flower and ornamental plants in Brazil. Although it is not institutionally related to Cooperflora - a cooperative of flower growers, dissidents of Veiling Holambra - it works as its Sales Representative, also providing technical support to growers. Cooperflora is responsible for administrative, logistical and financial services provided to its members. Therefore, Floranet mediates the contact between the Cooperative members and the customers.

Floranet and Cooperflora are located in the same building. Their facilities include: docks for unloading the products, used by the growers who deliver their products in Floranet/Cooperflora; docks for the shipment of the products by the clients; cold storage room, especially for cut flowers; administrative offices of both Floranet and Cooperflora. The facilities representation is available in Figure 7.

An interesting innovation introduced by Floranet/Cooperflora in this market is the "returnable basket". Its composition is basically malleable propylene, which is completely recycled after an estimated durability of 6 years. The "returnable baskets" were designed to accommodate perfectly the flowers that are being transported, maintaining the quality of them. They are also equipped with radio frequency system, which allows the company to track and trace their goods. The returnable basket can be seen in Figure 8.

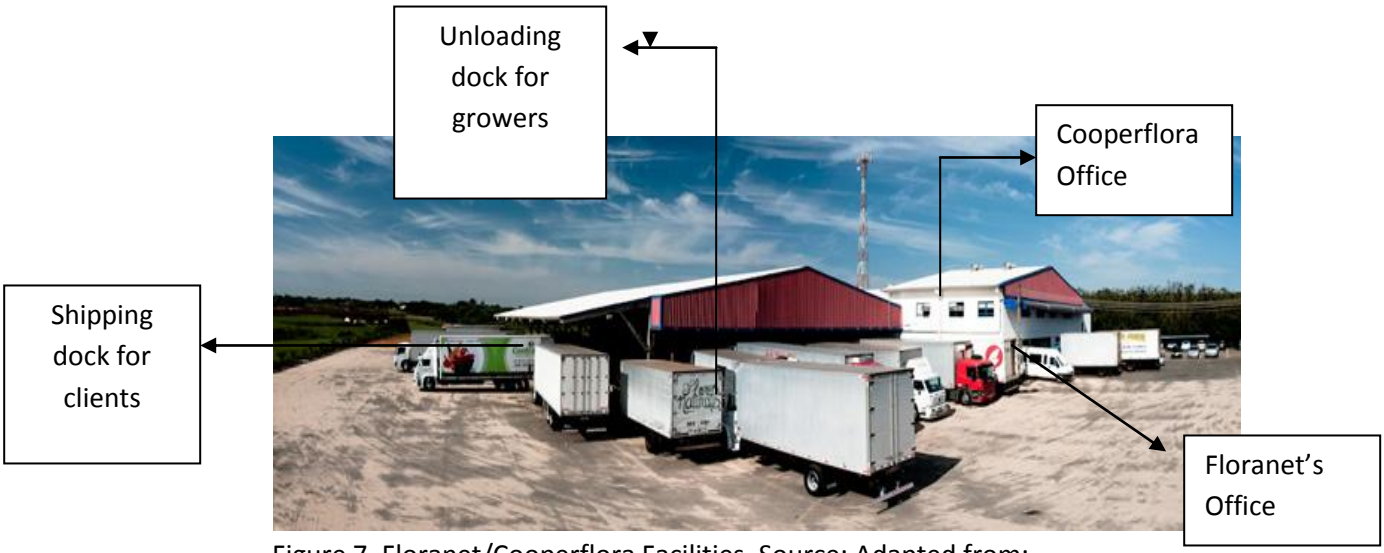

Figure 7. Floranet/Cooperflora Facilities. Source: Adapted from: http://www.cooperflora.com.br/cooperflora.html

Figure 8. Returnable Basket.

3.2.2. Supply Chain Structure

To describe the Supply Chain Structure of Floranet a framework, based on Chopra and Meindl "Supply Chain Decision-Making Framework", is applied to the company. Its main purpose is to support the answers to the research questions, by providing an overview of the processes involved in the supply chain and the actors that perform these processes. Each of the processes involving the supply chain

drivers included in this research are described, the customers' "profile" and the sales channels offered by the companies are listed and characterized as well. This framework can be observed in Figure 9.

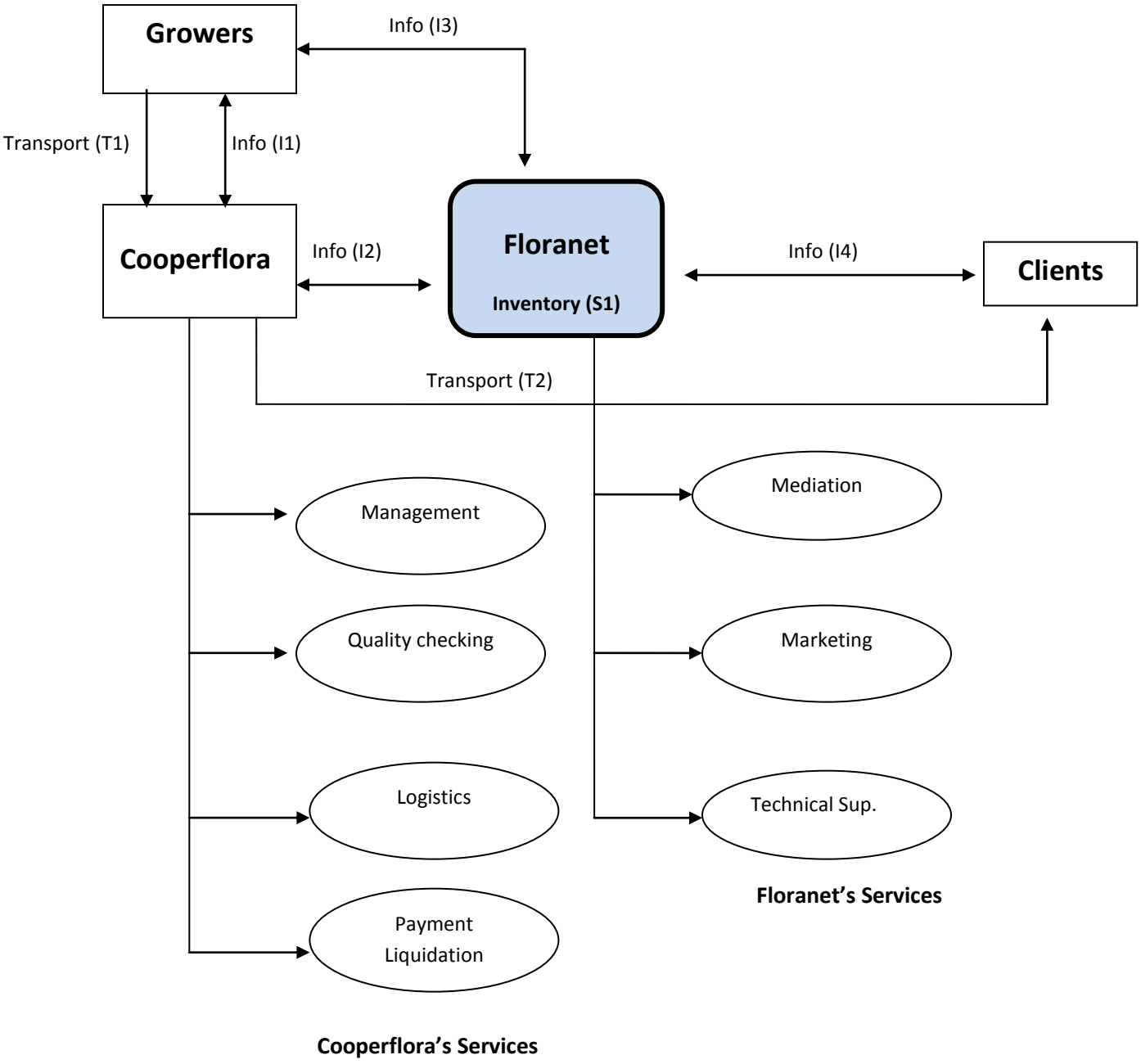

Figure 9. Floranet's supply chain framework. Source: Adapted from Chopra and Meindl (2001)

Customers: Similarly to Veiling Holambra, Floranet works basically with three different groups of customers:

- Wholesalers: big retailers (Supermarkets) who sell flowers directly to the end consumer.
- Distributors: wholesalers who buy big amounts of flowers and later on sell them to small retail centers, they work as intermediaries.
- Decoration Professionals: basically, professionals or enterprises who offer decoration services to events like weddings, graduation parties, and so on.

Floranet is currently not working with external markets.

Sales Channels: Floranet offers only one sales channel, the mediation. The orders can arrive via Telephone, Internet (without a specific platform, only via e-mail) or fax. Initially, Floranet has applied the e-commerce channel, but as reported by one of the managers of the company, the access to high-speed internet at that time was not broadcasted and most of the growers had no intimacy with this kind of technology, which forced the enterprise to switch to a telephone-based mediation channel.

Transportation (T1 and T2): The transportation of the products is a very important process in the ornamental plants and flowers chain. It has a huge impact on the quality of the products and on the responsiveness of the chain. This process can be divided in two phases:

T1: It is the process of moving harvested flowers from the growers to the company, in this case, Cooperflora/Floranet. According to one of the managers of Floranet, all the growers are located no more than 400 km away from Floranet/Cooperflora's facilities, but the majority of them are located in the surroundings of Holambra and in the region of Andradas (90 km from Holambra). The flowers are transported in trucks, all of them equipped with cooling systems. The T1 is of growers' responsibility. The reception of the products is done by Cooperflora, and it generally happens by the end of the afternoon. The variety, quality, quantity checking is also a responsibility of the Cooperative. The products are accommodated in cold storage rooms, waiting for the clients to pick them up.

T2: The transportation between the company's facilities to the clients' facilities. The trucks used in this process are also equipped with cooling systems. The volumes purchased vary depending on how large the client's operations with flowers are. Finally, the T2 process is performed by the clients, and neither Floranet nor Cooperflora has any kind of influence on or responsibility for it.

Information (I1, I2, I3 and I4): Chopra and Meindl defined Information as the "glue" of the supply chain. It is potentially the biggest driver of a supply chain because it directly affects each of the other drivers. Information support managerial decisions, and in this sector this is especially important in the forecasting process, due to the fact that flowers and ornamental plants are highly perishable. For Floranet, we can divide the information in I1, I2, I3 and I4:

I1: I1 encompasses all the information exchanged between the growers and the cooperative Cooperflora, as well as the specific system used to do so. The growers provide general information about their products, like variety, quality, quantity and availability of them. This information is used as input by the cooperative to a database, used for internal supply control. Cooperflora, responsible for the payment liquidation and for the order checking, provides the clients with the receipt of the sale and

with problems in the checking process, if present. The existence of a specific system for this information exchange was not reported by the Floranet manager.

I2: This process comprises all the information shared between the companies, Floranet and Cooperflora. Floranet, after mediating the sales and settling the contracts, provides all the information about the contract to Cooperflora, who will liquidate the payment. Therefore, product, variety, quality and volume of the order are informed to Cooperflora, as well as the delivery date. The existence of a specific system for this information sharing process was not reported by the Floranet manager. However, it is important to remember that the companies' offices are separated by one floor.

I3: All the information exchanged between the growers and the company Floranet, as well as specific systems used to do it. Floranet installs an internal software in all the growers' computers, which allows them to provide information about the availability of their products, variety and quality. As soon as demand emerges, Floranet contacts the grower that can fulfill this demand. The order information is exchanged by this internet-based software. The lot is identified by the bar chips (radio frequency system) at the reception of the product, and can be tracked and traced until its client. Although Floranet provides the growers the software, the growers still do not feed the system with information properly, forcing Floranet to gather all these data by visiting the growers.

I4: I4 comprises the information shared between Floranet and the clients. This exchange process is done mainly by telephone, and the customers provide information about their order: product, variety, quality, quantity and the date they wish to have the product available for picking it up.

Inventory (S1): The inventory, also known as stock, is generally the result of a mismatch between supply and demand. It can also be the case that inventory is held due to a difference in timing between the emergence of demand and lead time of supply. Similarly to Veiling Holambra, in Floranet/Cooperflora the inventory is held only for a short period of time, what they call "accommodation period". The idea is to only carry inventory for one night – the products are delivered by the growers by the end of the afternoon and generally picked up by the buyers the morning after. Sometimes producers deliver products that are not yet sold. The policy of the company for these cases is to keep the products for three days. If they are not sold, they return the whole lot to the corresponding grower.

As reported by the manager, in demand peaks, they ask the growers who have cold storage rooms in their properties to keep the product until it is sold, transporting to the company only after the picking-up is scheduled.

3.3. Conclusions

Although visits were done and questionnaires were applied, the validity of this data remains to the testimony of the staff interviewed and to the data provided in the websites. In addition to that, the visits and interviews have been done by two Brazilian researchers of ESALQ-LOG group, undergraduate students of University of São Paulo. Their final report of this "field work" was written in Portuguese and translated to English by Felipe Vizzoto. The process of translating can lead to minor mistakes and misunderstanding as well, but surely not huge enough to deviate the results from their original direction.

Regarding the Transportation process, the volumes transported were not clearly defined. Both of the companies could not report the average size of the orders, reasoning that these elements vary according to the transaction. The other characteristics of the Transportation process are properly stated, like the fact that neither Veiling Holambra nor Floranet are responsible for this process, the existence of cooling systems in the vehicles, and a general idea of the distances between the actors involved in this process. The findings in Inventory were predictable: Stock is avoided, due to the fact that plants are highly perishable and to the high costs of holding it. The description succeeds in feature what is the information exchanged between the actors in the chain. On the other hand, the systems used to do so were poorly described. This can have two possible explanations: The low rate of usage of them and the inability of the persons interviewed to describe them, since they are not responsible specifically for this area in the company. Customer categories and Sales Channels offered are properly described.

4. Trends and Impacts

By matching different studies, interviews and newspaper articles, several trends could be identified in the Flower Sector, with emphasis in E-commerce and ICT.

Physically decoupled flowers' logistics enabled by ICT integration

In the interview granted by Mr. van Heck, he pointed out that Flower Cooperatives (like Flora Holland and Veiling Holambra) tend to increase the ICT integration along the whole supply chain. The higher level of integration would enable a physically decoupled flowers' logistics, i.e. the transportation process would skip the auction, going from the grower to the customer. This was confirmed by Van Heck (2001), based on Kambil and Van Heck (1998), "The application of information technologies to trading can enable increased efficiencies and separation of informational and physical trading processes. This in turn will permit more varied forms of trading customized to different user requirements". Moreover, advices Mr. van heck, Flower Cooperatives should focus in improving their ICT systems, enhancing their ability to process data and produce useful outcomes from it.

Closing the "information loop" allowed by Track & Trace systems

Furthermore, Mr. van Heck reported the tendency for the "information loop" to be closed along the whole supply chain. This means that Tracking and Tracing systems will become more important. It is understood that Tracking, says Stefansson and Tilanus (2000), stands for following the entity on its way from A to B, while Tracing stands for finding the entity between A to B. Stefansson and Tilanus (2000) present and analyze seven Track and Trace applications applied by different companies in different sectors. They concluded that systems were, at that time, rather simple, having a *passive role*, i.e. simply recording information to be accessed by user inquiries. The trend for the future, according to them, was to have more complex systems designed, systems that would sign non-conformities to the user and provide help to reschedule the transportation process. Radio frequency is cited as one of the technologies that would be available in a more accessible price in some years. This trend has already been observed, and an example of that is the radio frequency system implemented by Floranet. Track & Trace systems provide better customer service, with timely information, and allow the company to monitor the shipments, eliminating losses and increasing the efficiency of the transportation process.

The Netherlands sets trends, Brazil apply them by means of improvisation

In line with Pozzebon and Van Heck (2006), it was identified that the Brazilian Flower Sector tends to continue following the trends that come from The Netherlands, applying them to the Brazilian context by means of improvisation. Veiling Holambra management reported that their main barrier to apply the e-commerce system with real-time online bidding is the difference between the speed of internet connections among the buyers and the company. Bids would arrive with different time lags, and this would make the "Dutch auction concept" unfeasible. The management, therefore, came up with the idea of applying a system that would take into account only the price that is offered by the bidder, and not the order of arrival. The sale would take longer to take place, but the "Dutch auction concept"

would be maintained and at the same time “distant buying” would be enabled. The Netherlands tends to hold its position as trendsetter in this sector and Brazil, compensating its technology limitations with improvisation skills, to follow these trends in an innovative way.

Wholesalers stick to B2B E-commerce; Retailers go for B2C E-commerce

According to Porter and Turban (2005), there are four different modalities of e-commerce, based on the actors involved in the trading process. B2B, Businesses selling to Businesses; B2C Businesses selling to Consumers; C2B, Consumers selling to Businesses; and finally, C2C, Consumers selling to Consumers. We identified, in the interviews with Veiling Holambra and Floranet, different views of the future of e-commerce in the Brazilian Flower Sector regarding these modalities. According to Veiling Holambra management, their e-commerce is only B2B and there’s not a trend to change the current scenario. The management explains that operating in B2C means competing with their own clients, which would in turn generate conflicting interests. On the other hand, Floranet management reported a greater trend for the e-commerce of flowers and ornamental plants in Brazil to grow more in the B2C modality, especially for retail centers. An example to be followed, pointed out by the management, is FTD, an internet and telephone marketer of flowers and specialty gifts. This company connects to its network 16000 retail florists in North-America and more than 45000 in 154 countries, including Brazil. Mazzali and Padilha (2006) provide an example of this kind of business in Brazil. Clickflores, situated in the city of São Paulo, sells flowers via e-commerce in Brazil since 1994. Although in 2006 only 5% of the company’s turnover was originated from e-commerce, it was reported that offering this kind of sales channel allow them to reach a different customer base. For example, a considerable amount of the orders are done by women sending flowers to other women, or men sending flowers to other men, or even flowers sent to married women. The sales’ profile of the physical store, according to interviews with customers conducted by the company, does not include this niche of customers. Clickflores is one the 45000 retail florists in the FTD network.

Brazilian flower companies focusing in the internal market; Supply Chains becoming more local/sustainable

In his interview, Mr. Eric van Heck has stated his opinion about trading Brazilian flowers in the International market: the Brazilian flower cooperatives should focus in the internal market. According to him, the income growth of the population follows a logical sequence of consumption behavior: first, people start eating better, after achieving this “state”, the extra money shifts to leisure, and this includes flowers. Looking to the numbers of the Brazilian economy nowadays, we can foresee that the internal market has a great potential in 10, 20 years from now. Allied to that, opportunities in the international market for flowers tend to become scarcer, considering the increasing pressure for sustainable production/supply chains. Supply chains tend, therefore, to become more local. The “regional energy turnover”, assessed by Schlich and Fleissner (2005), especially for agricultural products, appears to be, in the mainstream view, lower than global food. However, in their study, they relate the ecological quality to the operational efficiency, and not to the marketing distance itself. Further research may take place in this field to clarify the real advantages of local supply chains.

"Bouquet assembling" as a therapy; Supermarkets increasing market share in the retail

Floranet's management sees as an opportunity for increasing sales and creating a "new niche" for flowers and ornamental plants consumers to incentive the "bouquet assembling" as a therapy. The idea involves selling the parts that constitute a bouquet separately and provide, in the small garden centers and similar shops, interactive courses to teach people to make their own bouquets. The General Director of this company reported that for the company it is really difficult to understand the consumer behavior for flowers and ornamental products in Brazil, because they lack a direct contact with final consumers. Moreover, their clients, who sometimes have direct contact with the final consumers, usually do not keep a database regarding consumer patterns, and those who do keep are very individualistic, once they consider this as being strategic information. Another important trend, in terms of consumption patterns, is the increase of the auto-services (supermarkets) market share in the retailing sales. According to Junqueira and Peetz (2008), these supermarkets held, in 2008, no more than 10% of the retailing market share. It is reasonable to think that they will represent at about 23% of the total sales in a close future, since Brazil tends to follow the market behavior of the U.S.A, which had exactly that in 2008.

E-commerce increasing its importance in the Flower and Ornamental Plants sector

The e-commerce is a strong trend for the flowers and ornamental plants sector as a whole, said Professor Eric van Heck in his interview. E-commerce has shown to have potentials to increase the customer base of a company, as well as the customer service and decreasing the uncertainty attached to the quality, proved Cunden and Van Heck (2004). Furthermore, the adoption of electronic markets has largely been conceptualized to equate to reduction in transaction costs in the existing literature for this field. It is difficult to state how long it will take for E-commerce to represent the majority of the Brazilian Cooperatives' sales, but all the actors involved (Growers, Cooperatives, Buyers) are becoming aware of the undeniable benefits of trading online, and therefore, it may be just a matter of time for this shift to happen.

Impacts of E-business in the supply chain drivers

Chopra and Meindl (2001) present some of the potential impacts of an E-business (the difference between e-business and e-commerce is that the first one does not necessarily involves the trade. But most of the E-businesses are accompanied by E-commerce) in the three supply chain drivers involved in this research. Inventory levels can be reduced by a more accurate match between supply and demand. Other examples like aggregating inventory far from customers and postponing the introduction of variety until after the order arrives are listed. The later applies, for example, to bouquets with different compositions. The impact of e-commerce and ICT integration in Transportation would be the separation of information and transportation in the supply chain, the physically decoupled logistics. Finally, according to Chopra and Meindl (2001), the Information can be improved by demand information sharing throughout the supply chain to improve the visibility. Sharing planning and forecasting information can contribute to further coordination in the supply chain. It is important, however, to keep

in mind that e-commerce incurs additional information costs, once the cost of software, hardware and all the ICT system involved may be quite significant.

5. Lessons Learned to DaVinc^{3}i and Recommendations to the Brazilian System

5.1. Lessons Learned to DaVinc^{3}i

As mentioned in chapter 1, this research intended to serve as an input to **DaVinc^{3}i** project. The research tries to characterize the virtual information exchange and transparency in the Brazilian Flower supply chain, using the example of two of the most representative companies in this field in Brazil, Veiling Holambra and Floranet.

DaVinc^{3}i aims to contribute to innovation from an academic perspective on four aspects, as already discussed in chapter 1. One of these aspects is "building blocks for a voluntary new ICT infrastructure". Particularly in this respect, the presented research has interesting insights to introduce to the project.

Matching the current supply chain found in both of the Brazilian companies; trends, expectations and impacts reported in the interviews by the managers and by an expert of the sector; and diverse information collected in different scientific and newspapers' articles, handbooks, companies' websites and general information, a framework was drawn to show the expected changes and impacts of the introduction of a sophisticated ICT infrastructure, allied with e-commerce. This framework, represented in Figure 10, outlines the impacts of a different ICT infrastructure in the three supply chain drivers discussed in this research. Moreover, some of the most important conditions to this ICT application to succeed are pointed.

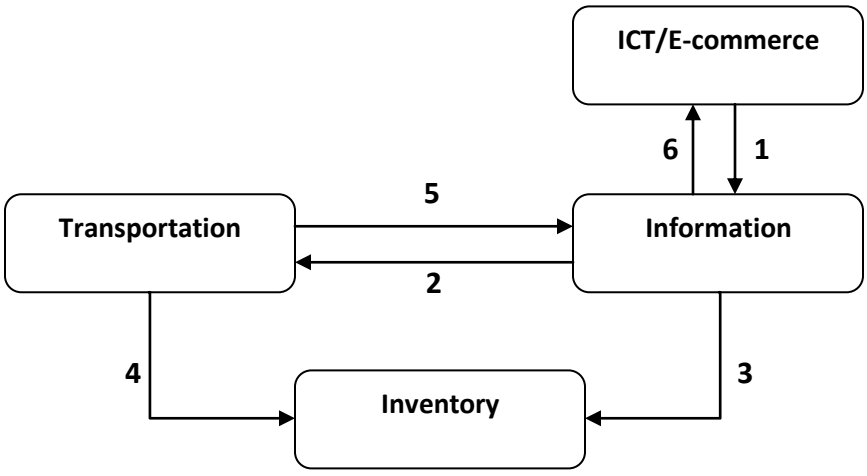

Figure 10. Introduction of "new ICT infrastructure" and impacts on supply chain drivers

The three supply chain drivers, extensively discussed in this research, are represented, as well as the "new ICT infrastructure", named ICT/E-commerce. The numbers represent the events and their logical order of occurrence. The explanation of each of the events is available below.

1: Introduction of a new sophisticated ICT infrastructure, allied to E-commerce. This would increase the amount of information that can be processed by the Flower Company. In addition to that, such an infrastructure is expected to enable information to be provided timely, accurately and with a high degree of visibility along the chain.

2: The event number 1 would lead logistics to be physically decoupled from information, i.e. information and transportation would flow separately, increasing the potential efficiency and responsiveness of the transportation process.

3: This event occurs concomitantly with event number 2 and it regards to the impact of the new information "profile". Better forecasts are enabled by more visible, accurate and up-to-date information. This would decrease inventory levels, as well as the amount of products wasted due to expiration date, therefore decreasing also costs related to this driver.

4: This event is subsequent to event number 2. Similarly to event number 3, event number 4 also would represent a decrease in inventory costs. With a physically decoupled logistics, fewer inventory would be held in the supply chain. At the same time, costs related to handling would also decrease.

5: The physically decoupled logistics is a very complex process to be implemented. The transportation process becomes extremely dependent on information exchange between the partners, since it would only take place after all the information about the order flowed between them. This means that information exchange will have to be faster, more accurate and integrated.

6: Thus for this process to be carried out, constant innovation and improvement in the ICT infrastructure would be demanded. In addition to that, a skilled staff to operate this system and carry out the important adaptations/innovations is needed. All of this requires extra investments.

The framework and its explanation propose changes in the supply chains drivers caused by the application of a more sophisticated ICT infrastructure. The feasibility of the different events and impacts are discussed in several articles and handbooks presented in the references of this research. Their occurrence is conditioned to several factors, which can change from situation to situation. However, this paper highlights, among this huge range of conditions, some of the clearly indispensable ones for the success of the implementation and some conditions that are "good to have". They are listed below.

Indispensable conditions:

- Investment in innovation to develop, implement and constantly improve such a sophisticated ICT infrastructure.
- Develop trustful relationship with all the partners in the chain.
- Increase the visibility of information along the whole chain.
- Skilled staff to design, apply and operate the system.

- All the important stakeholders cannot be worse off after the new ICT infrastructure is applied.

These conditions are strongly related to the characteristics that information must have, according to Chopra and Meindl (2001). Special attention should be taken to one of these characteristics: information must be shared. The visibility of information along the chain is indispensable because without it, other conditions cannot be present, like trust in the relationship with partners, for example, which was highlighted by Kambil and Van Heck (1998) as a critical aspect in trade operations. The high investment is notably the main barrier to apply ICT systems. The "staff" condition is supported by Heeks (2002), in which is described a failure of an aid-funded project in the Philippines due to the staff's lack of skills.

"Good to have" conditions:

- Increase cooperation and coordination along the chain by, for example, making use of cross-functional and cross-company planning teams.
- Information must be of the right kind. The idea is to process only the useful data. Valuable resources are sometimes wasted collecting meaningless data, while important data goes unrecorded.
- Enhance the ability to process and analyze data, producing outcomes out of it.

These conditions enhance the probability of the system to succeed. Fawcett *et al.* (2007) highlights the importance of coordination and cooperation along the chain. Chopra and Meindl (2001) supports that more information does not mean better information. Only useful data should be collected. Mr. Van Heck argued in his interview that auctions should enhance their ability to process and analyze data, producing outcomes from it.

Several other requirements could be listed, especially when assessing an individual situation, full of particularities.

Concluding, above it is presented what a "new ICT infrastructure", more sophisticated and capable of producing timely, accurate and visible information, would cause to the other supply chain drivers, based on all the literature, visits and interviews conducted in this research. The most indispensable requirements for this system to be successfully implemented and the "good to have" conditions are also listed. It is important to mention that the interviews and visits only constitute this framework and its explanation to define the "direction of the new ICT infrastructure", i.e. what was claimed by all the interviewed people to be beneficial in an ICT system, like visibility and integration of information and accurate forecasts. The "new ICT infrastructure" is, therefore, a hypothetical system that would produce the necessary outcomes, according to the literature, to achieve these benefits.

5.2. Recommendations to the Brazilian System

After describing the Brazilian supply chain of flowers and ornamental products using two of the most representative companies in this sector as a basis, it was proposed a small set of recommendations, using the Dutch supply chain of flowers and ornamental products as "the model to be followed", naturally due to its well known importance and trendsetting position in the world market. These recommendations were done by interpreting the results acquired in the research as whole, including

both empirical data and literature. The reference for this tiny benchmarking, the Dutch supply chain, was described using as a basis the visit done to the facilities of Flora Holland in Aalsmeer, the questionnaire answered by the Supply Chain Manager of this company via e-mail and information gathered from its website. This description is available in the Appendix of this thesis.

At least 3 recommendations could be listed after evaluating the results obtained in this research:

1) ***Time to focus internally, along with increasing the professionalization of the sector***

The Netherlands, due to a mix of different attributes, like pioneering, tradition and knowledge in this sector, infrastructure strongly supporting logistics, cutting-edge technologies – just to mention some of them – is the world's market place for flowers, having acquired over the years a coordinating position among international supply and demand chains. The Brazilian flower sector, on the other hand, is relatively new and with a low degree of professionalization, lacking enough standardization and quality certificates to compete in the international market. Therefore, it is advisable for the Brazilian flower companies to first enhance its position in the Brazilian internal market, not only increasing its market share, but also taking advantage of the economic situation of the country (with a growing middle class that can potentially start buying flowers, increasing the market itself). The professionalization of the sector should grow simultaneously, specially because the internal market tends to become more demanding. With this phase accomplished, the Brazilian sector may have a more competitive position to play in the international flower and ornamental plants market.

2) ***Developing strategies to encourage customers and growers to use e-commerce and ICT devices.***

A situation reported by both Floranet's General Director and Veiling Holambra's Supply Chain Manager was the low rate of accession by both growers and customers to the electronic systems developed by the companies to exchange information and to the e-commerce tools (the latter, only in Veiling Holambra's case)***.*** In Flora Holland, on the other hand, an increasing adoption of these devices, with e-commerce sales reaching 35% of the clocks' sales turnover is observed. In addition to this behavior identified in the Dutch company, this thesis presented several benefits related to the adoption of e-commerce and ICT systems to share information along the supply chain. Therefore, the second recommendation that can be made is that the Brazilian companies should build strategies to increase the popularity of these tools among their suppliers and their customers. As reported by the Supply Chain Manager of Veiling Holambra "the benefits of e-commerce and ICT systems are undeniable". Therefore, the companies, having in mind their influence in this chain, may have a "prompting role", inducing the other actors to adapt to these new situation. There are several means to do so: offering discounts to buyers who use the e-commerce channel, decreasing the rate of contribution of the growers who input their information properly in the systems, and other similar strategies. The main concern would be that all the actors in the chain were better off with than without it.

3) Decentralization: re-designing the distribution network

Flora Holland has 6 facilities spread along The Netherlands. Each of these facilities has a well defined distribution network, in which three of them are regional demand-driven and the other three have an exporting profile. Brazil is comparable, in size, to two European Unions (with all of its 27 members). Therefore, assessing this situation, a need to re-design the distribution network is recognizable. It is known that the strongest part of the internal market (and also the sales of the companies described) is located in the south east region, especially in metropolitan areas like São Paulo, Rio de Janeiro and Belo Horizonte. However, other regions of the country have a great potential as well, like the southern region, or even the north east of the country, but the large distances (over 1000 km) and poor infrastructure offered by the country by now, makes it unfeasible to transport goods from Holambra to these regions. An interesting way out for this obstacle would be to install “distribution hubs” in other regions of the country, gaining logistics efficiency and reaching not only other markets, but also other growers who will be willing to work with the respective company. Of course several other aspects have to be taken into account when defining whether or not to install the hub, like where installing, what kind of facility it would be, and so on. But the key is to understand that Brazil has continent dimensions, with bounding logistics, forcing the distribution networks to be as limited as possible.

6. Conclusions and Further Research

6.1. Conclusions

The presented thesis provided a detailed description of the Brazilian supply chain of flowers and ornamental plants (focused in Customers, Sales Channels, Transportation, Information and Inventory), based on two of the most representative companies in this sector in Brazil, Veiling Holambra and Floranet. The limitations of this description are explained by the short period of time in which the research was conducted, the narrow approach of the questionnaires applied and the amount of information provided by the companies.

Some trends for E-commerce and ICT and their corresponding impacts were also stated according to a range of interviews with the managers of the companies and an expert in this field, several scientific articles, newspapers' articles and handbooks. Some of these trends were listed in the interviews and their reliability was confirmed by different scientific articles, except for the "Bouquet assembling" as therapy, which constitutes only a trend observed by the General Director of Floranet, however it has no scientific evidence. Naturally, not all the trends and their corresponding impacts could be shown in this research, since the amount of companies and experts involved, as well as the literature consulted are restricted.

Insights about what a new and sophisticated ICT infrastructure would cause to the flower and ornamental plants' supply chains were stated, in order to serve as an input to **DaVinc^{3}i**'s project. The hypothetical ICT system was proposed taking into account the main outcomes cited as being beneficial to be provided from an ICT system by the interviewed and by the literature. Therefore, this research did not draw an ICT system, only proposed a hypothetical one that would provide the desired outcomes, and assessed the impact of these outcomes in the supply chain. Some of the most important requirements for this ICT system to be developed/implemented were also listed.

By means of benchmarking with the Dutch Flower Sector, using as a reference Flora Holland, some recommendations were made to the Brazilian situation, focusing in market positioning (more attention to the internal market), the use of their (Brazilian companies) influence in the whole chain to encourage e-commerce and ICT integration and re-designing the distribution network along the country.

6.2. Further Research

There are several suggestions for further research that can be pointed on this field of Supply Chain, E-commerce and ICT in the Flower Sector. Three of the most strategic "avenues" for further research are proposed below.

First, the other supply chain drivers proposed by Chopra and Meindl (2001) should be characterized. Facilities, Pricing and Sourcing were not approached in this thesis, but have a determinant role in these supply chains as well. In that sense, Facilities should be highlighted. It is opportune, for example, to research about the feasibility of setting "hubs" of flowers and ornamental plants' trade and distribution in other regions of Brazil, decentralizing the production, trading and distribution from Holambra region, the impacts, benefits and drawbacks of such a move.

Secondly, research should be done towards the changes that E-commerce may cause to the consumption patterns for flowers and ornamental products in Brazil. It is common knowledge that the starting point of any supply chain is the final consumer, who has a need that the supply chain aims to fulfill. Understanding how the consumers change their behavior due to this new tool is indispensable to better design, plan and operate the supply chains to offer the desired product more efficiently, maximizing the overall value generated.

Finally, and specifically to DaVinc^{3}i, it is advisable to go through further research on possible designs for the "hypothetical new ICT infrastructure" proposed in this thesis. We present such a hypothetical system that would generate the desired outcomes in terms of information, and we analyze the impact that it would cause in the supply chain drivers of Transportation, Inventory and Information. Further research is needed, in this case more applied to the Information Technology field, to convert the hypothetical in real.

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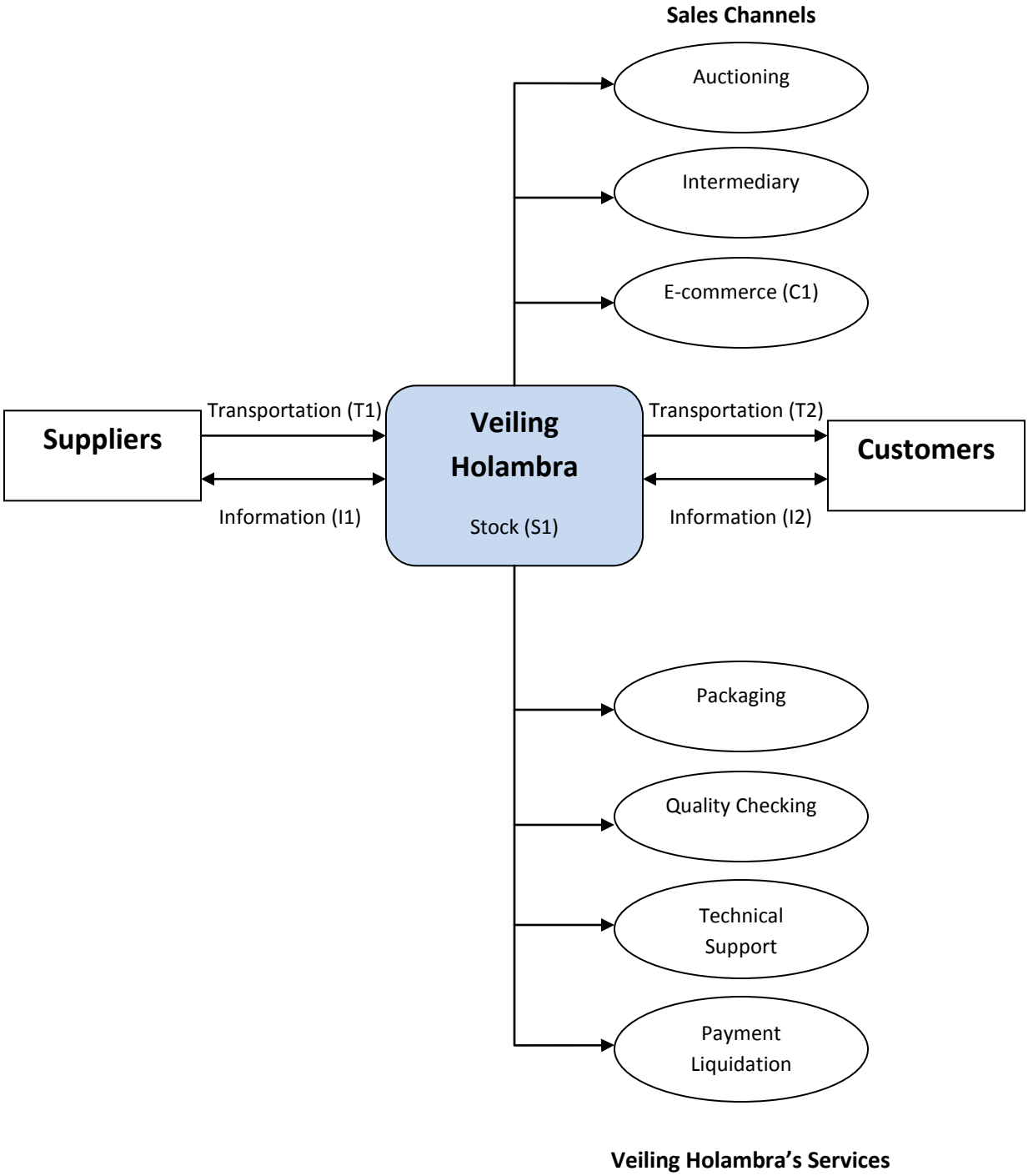
Appendix

Appendix 1. Questionnaires

Questionnaire to be applied in Veiling Holambra – 01/06/2011

Framework used as a reference:



- ***Regarding the Current Flower System (Supply Chain):***

- CUSTOMERS

1) Who are the Veiling Holambra customers? Where are most of them located?
2) Are the Customers divided in categories? If so, what are the main requirements of each of these categories?
3) What are the main products with which Veiling Holambra works with? What's the average volume of sales (including batch size)? Is there any seasonality in the sales?

- SALES CHANNELS

4) What are the sales channels offered by the company? How frequently they are used (in terms of percentage of the sales, maybe)?
5) Is E-commerce enabling Veiling Holambra to access distant markets (including external)? Is there an specific niche of customers that uses E-commerce more often? Is E-commerce mainly B2B?

- TRANSPORTATION

6) What are the modals used in T1? And in T2? Who is responsible for this process? If it is the Veiling for any of them (T1 or T2), do you outsource or do you have your own fleet?
7) What is the average volume generally transported in one shipment for T1? And for T2?
8) What's the average distance from the producers to the Veiling?
9) Are the vehicles equipped with chilling systems?

- INVENTORY

10) What is the average time that a product is kept in stock?
11) Are there proper storage places, with controlled environment? What are the other quality keeping practices performed by the company?
12) What's the storage capacity? What's the average inventory? Is there a different inventory policy in the demand peaks?

- INFORMATION

13) What kind of I1 is provided to the growers? And what kind of I1 they provide to Veiling Holambra?
14) Is there a specific system for the I1 sharing? How does it work?
15) What kind of I2 is provided to the customers? And what kind of I2 they provide to the company?
16) Is there a specific system for the I2 sharing? How does it work?

- ***Regarding the trends for E-commerce and Information and Communication Technology:***

- E-COMMERCE

17) Is there a bigger trend for the e-commerce to play a more significant role in one of the existing sales channels (Auctioning or mediation, for example)?
18) Does the Veiling Holambra believe that e-commerce may represent the majority of its sales in the coming years?
19) Veiling offers a tool named "pre-offer", which enables customers that are physically distant from Holambra to bid in advance for a specific product in the auction, via internet. Is there a trend for the coming years for this tool to become an online participation in the auction, in real time? What are the barriers for this?
20) Several researches list as one of the main obstacles for the growth of e-commerce in Brazil the low trust of the customers in the websites, due to a lack of "direct contact" with the seller. Do

you see a change in this behavior in the coming years for the flower and ornamental plants e-commerce? How would the reliability be enhanced?

21) Is there a trend for the e-commerce of flowers and ornamental plants to grow also in the retail (low quantity buyers)?

- ICT

22) Is there a trend for I1 and I2 to become more visible for the three actors of the chain, that is, all the information provided to be integrated to such a point that they available to all the actors involved, in advance and full time?
23) What are the main improvements that should be done in the current systems?
24) What are the main trends in information sharing for flowers and ornamental plants chain?

- ***Regarding the impact of E-commerce and ICT in the sector:***

- TRANSPORTATION

25) Will the E-commerce and ICT trends have any impact in the efficiency of the transportation process, decreasing costs along the supply chain (by, for example, transporting directly from the growers to the buyers)? What kind of impact?
26) These trends for ICT and E-commerce can, somehow, increase the responsiveness of the transportation process (turning the lead time smaller, for instance)? How would this happen?
27) What is the main difference between a situation of E-commerce and a non-E-commerce, when talking about transportation?

- INVENTORY

28) How these trends for E-commerce and IT would affect the inventory policy for Veiling Holambra? Could they decrease the "average inventory" hold by the company (by, for example, a more accurate match between supply and demand)? What about the disposal due to the perishability, would they decrease as well?
29) What's the main difference between a situation of e-commerce and a non-e-commerce, from the inventory perspective?

- INFORMATION

30) The trends for e-commerce and ICT will increase de complexity of managing information?
31) With the influence of these trends for ICT and E-commerce, will the transparency and access to information in the whole chain increase to such a point that information will be available to all members of the chain faster, decreasing the lead time of the whole supply chain, costs and facilitating the buying process? Or at least any of these outcomes will be verified?
32) What is the main the difference, regarding information sharing, of an E-commerce situation and a non-E-commerce situation?

- CONSUMER BEHAVIOR

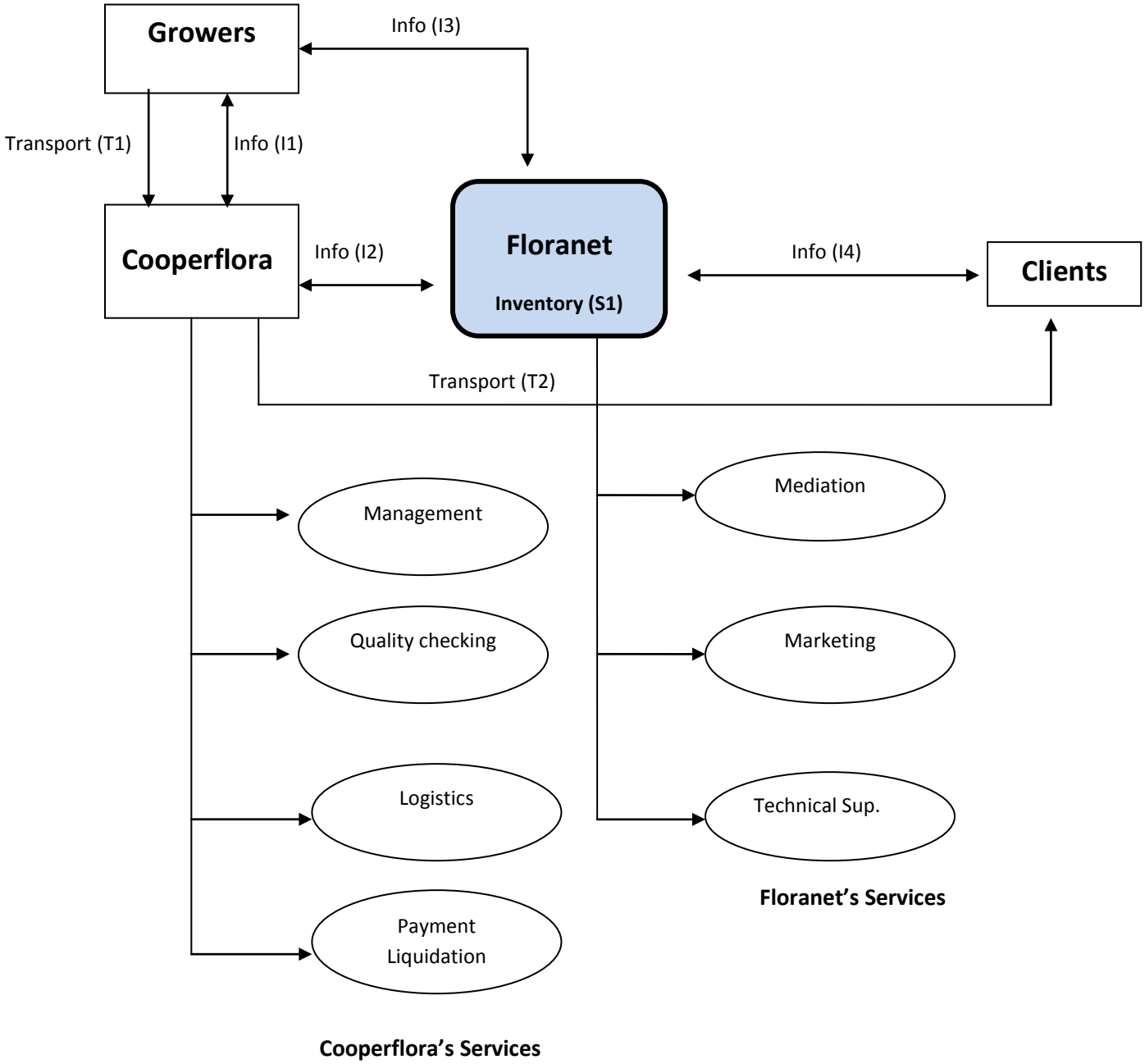
33) Will the E-commerce play a role in the marketing for flowers and ornamental plants, changing, for instance, the strong existent correlation between buying flower and commemorative dates (Such as mothers' and valentines' day) in Brazil? How would this happen?
34) Brazil's economy is experimenting a very good moment. With that, the average income of the population is also growing and, added to this, the access of the population to the internet is increasing, having reached almost 40% of the total population in 2009. The e-commerce has an average growth of more than 30% in the last 3 years. With all these factors, does a trend exist

for the sales of flowers and ornamental plants to shift from the “traditional sales channels” to the internet? Only B2B or also B2C?

35) What are the main challenges for the Brazilian Flower Sector for the future?

Questionnaire to be applied in Floranet – 01/06/2011

Framework used as a reference:



- ***Regarding the Current Flower System (Supply Chain):***

- CUSTOMERS

1) Who are the Floranet customers? Where are most of them located?
2) Are the Customers divided in categories? If so, what are the main requirements of each of these categories?
3) What are the main products with which Floranet works with? What's the average volume of sales (including batch size)? Is there any seasonality in the sales?
4) Does Floranet also operate in the retail?

- SALES CHANNELS

5) What are the sales channels offered by the company? How frequently they are used (in terms of percentage of the sales, maybe)?
6) Is E-commerce enabling Floranet to access distant markets (including external)? Is there a specific niche of customers that uses E-commerce more often? Is E-commerce mainly B2B?

- TRANSPORTATION

7) What are the modals used in T1? And in T2? Who is responsible for this process? If it is the Veiling for any of them (T1 or T2), do you outsource or do you have your own fleet?
8) What is the average volume generally transported in one shipment for T1? And for T2?
9) What's the average distance from the producers to the Veiling?
10) Are the vehicles equipped with chilling systems?

- INVENTORY

11) What is the average time that a product is kept in stock?
12) Are there proper storage places, with controlled environment? What are the other quality keeping practices performed by the company?
13) What's the storage capacity? What's the average inventory? Is there a different inventory policy in the demand peaks?

- INFORMATION

14) What kind of I2 is provided to the Cooperflora? And what kind of I2 they provide to Floranet?
15) Is there a specific system for the I1 sharing? How does it work?
16) What kind of I4 is provided to the customers? And what kind of I4 they provide to the company?
17) Is there a specific system for the I2 sharing? How does it work?
18) What kind of I3 is provided to the growers? And what kind of I3 they provide to Floranet?
19) Is there a specific system for this process? How does it work?

- ***Regarding the trends for E-commerce and Information and Communication Technology:***

- E-COMMERCE

20) Does the Floranet believe that e-commerce may represent the majority of its sales in the coming years?
21) Several researches list as one of the main obstacles for the growth of e-commerce in Brazil the low trust of the customers in the websites, due to a lack of "direct contact" with the seller. Do you see a change in this behavior in the coming years for the flower and ornamental plants e-commerce? How would the reliability be enhanced?
22) Is there a trend for the e-commerce of flowers and ornamental plants to grow also in the retail (low quantity buyers)?

- ICT

23) Is there a trend for I1 and I2 to become more visible for the three actors of the chain, that is, all the information provided to be integrated to such a point that they available to all the actors involved, in advance and full time?
24) What are the main improvements that should be done in the current systems?
25) What are the main trends in information sharing for flowers and ornamental plants chain?

- ***Regarding the impact of E-commerce and ICT in the sector:***

- TRANSPORTATION

26) Will the E-commerce and ICT trends have any impact in the efficiency of the transportation process, decreasing costs along the supply chain (by, for example, transporting directly from the growers to the buyers)? What kind of impact?
27) These trends for ICT and E-commerce can, somehow, increase the responsiveness of the transportation process (turning the lead time smaller, for instance)? How would this happen?
28) What is the main difference between a situation of E-commerce and a non-E-commerce, when talking about transportation?

- INVENTORY

29) How these trends for E-commerce and IT would affect the inventory policy for Floranet? Could they decrease the "average inventory" hold by the company (by, for example, a more accurate match between supply and demand)? What about the disposal due to the perishability, would they decrease as well?
30) What's the main difference between a situation of e-commerce and a non-e-commerce, from the inventory perspective?

- INFORMATION

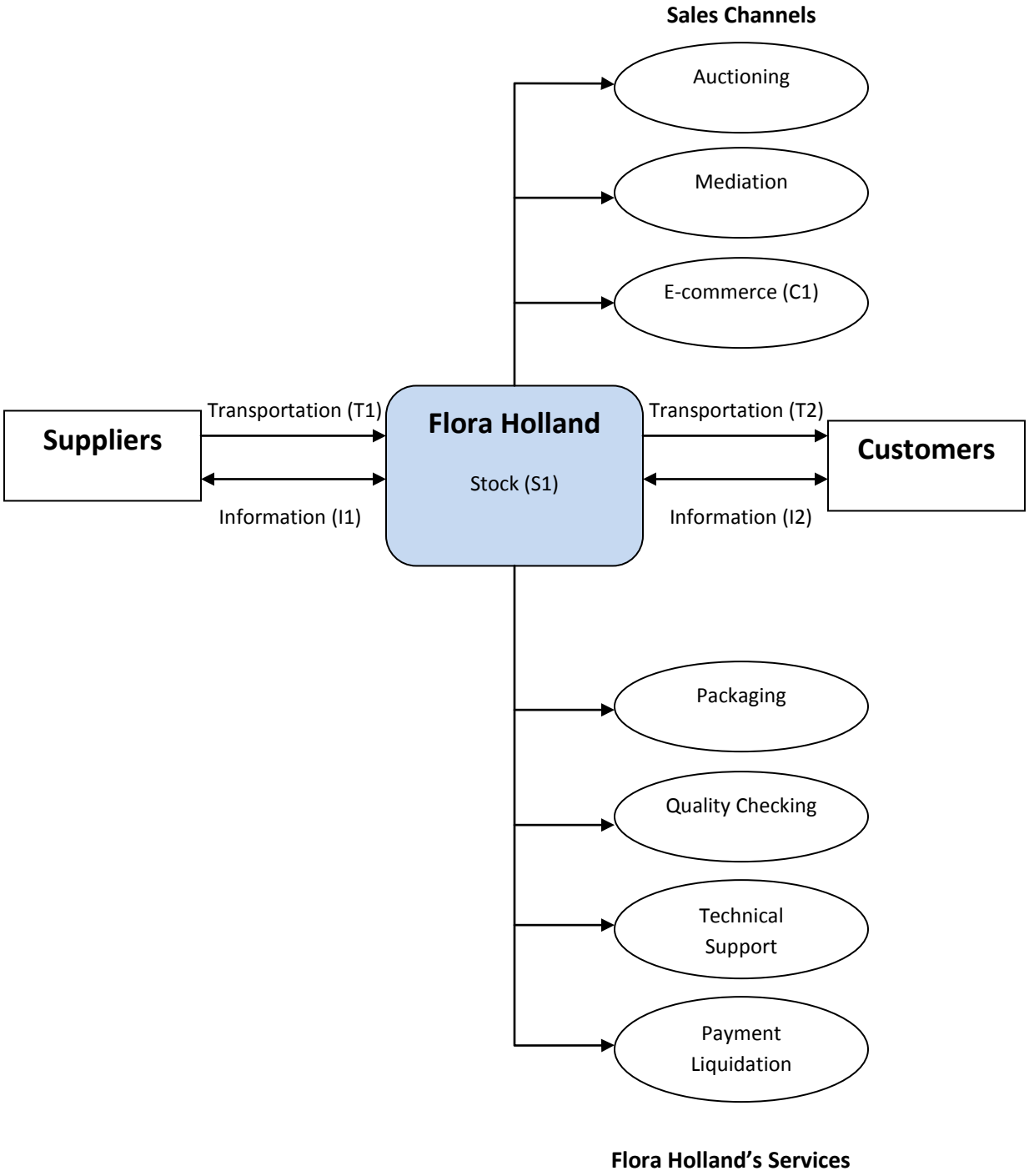
31) The trends for e-commerce and ICT will increase de complexity of managing information (I1, I2, I3 and I4)?
32) With the influence of these trends for ICT and E-commerce, will the transparency and access to information in the whole chain increase to such a point that information will be available to all members of the chain faster, decreasing the lead time of the whole supply chain, costs and facilitating the buying process? Or at least any of these outcomes will be verified?
33) What is the main the difference, regarding information sharing, of an E-commerce situation and a non-E-commerce situation?

- CONSUMER BEHAVIOR

34) Will the E-commerce play a role in the marketing for flowers and ornamental plants, changing, for instance, the strong existent correlation between buying flower and commemorative dates (Such as mothers' and valentines' day) in Brazil? How would this happen?
35) Brazil's economy is experimenting a very good moment. With that, the average income of the population is also growing and, added to this, the access of the population to the internet is increasing, having reached almost 40% of the total population in 2009. The e-commerce has an average growth of more than 30% in the last 3 years. With all these factors, does a trend exist for the sales of flowers and ornamental plants to shift from the "traditional sales channels" to the internet? Only B2B or also B2C?
36) What are the main challenges for the Brazilian Flower Sector for the future?

Questionnaire to be applied in Flora Holland – 13/06/2011

Framework used as a reference:



- ***Regarding the Current Flower System (Supply Chain):***

- CUSTOMERS

1) Are the Customers divided in categories (Wholesalers; Exporters; etc)? If so, what are the main requirements of each of these categories?
2) What's the average volume of sales (including batch size)? Are there any seasonality in the sales?

- SALES CHANNELS

3) What are the sales channels offered by the company (Auction, Mediation, E-commerce)? How frequently they are used (in terms of percentage of the sales, maybe)?
4) Is E-commerce enabling Flora Holland to access distant markets? Is there a specific niche of customers that uses E-commerce more often? Is E-commerce mainly B2B?
5) Does Flora Holland perform all the services mentioned in the framework? Does it provide any other services?

- TRANSPORTATION

6) What are the modalities used in T1? And in T2? Who is responsible for these processes? If it is Flora Holland for any of them (T1 or T2), do you outsource or do you have your own fleet?
7) What is the average volume generally transported in one shipment for T1? And for T2?
8) Are the airplanes/vehicles/trains equipped with chilling systems?

- INVENTORY

9) What is the average time that a product is kept in stock?
10) Besides the storage places, with controlled environment, are there other quality keeping practices performed by the company?
11) What's the storage capacity? What's the average inventory? Is there a different inventory policy in the demand peaks?

- INFORMATION

12) What kind of I1 is provided to the growers? And what kind of I1 they provide to Flora Holland?
13) Is there a specific system for the I1 sharing? How does it work?
14) What kind of I2 is provided to the customers? And what kind of I2 they provide to the company?
15) Is there a specific system for the I2 sharing? How does it work?

- ***Regarding the trends for E-commerce and Information and Communication Technology:***

- E-COMMERCE

16) Is there a bigger trend for the e-commerce to play a more significant role in one of the existing sales channels (Auctioning or mediation, for example)?
17) Are the traditional sales channels going to disappear in the coming years? Or will trust and the "direct contact" between Flora Holland and its customers still have a determinant role in the sales?
18) Is there a trend for the e-commerce of flowers and ornamental plants to grow also in the retail? For instance, instead of going to a supermarket to buy flowers, the customer orders it via internet and has it delivered in his/her house?

- ICT

19) Is there a trend for the flower auctions to become a "supply chain competitor", that is, acting not only in the trading process and information sharing of the supply chain, but also in the

transportation? Or the flower auctions tend to play a role of "Chain Integrator", enhancing its position in information sharing (using more complex ICT techniques) and trader?

20) Is there a trend for the ICT along the chain to increase its integration to such a point that the flowers and ornamental plants logistics become physically decoupled, that is, the products flowing directly from the growers to the customers (or even to the customers' customers)? What are the main barriers to this?
21) What are the main trends in information sharing for flowers and ornamental plants chain?

- ***E-commerce and ICT's influence in Consumer Behavior in Brazil (Your insights about the Brazilian consumer patterns)***

22) Can the E-commerce play a role in the marketing for flowers and ornamental plants, changing, for instance, the strong existent correlation between buying flower and commemorative dates (Such as mothers' and valentines' day) in Brazil? How would this happen?
23) Brazil's economy is experimenting a very good moment (7.5% GDP growth in 2010). With that, the average income of the population is also growing and, added to this, the access of the population to the internet is increasing, having reached almost 40% of the total population in 2009. The e-commerce has an average growth of more than 30% in the last 3 years. With all these factors, does a trend exist for the sales of flowers and ornamental plants to shift from the "traditional sales channels" to the internet? Would the demand increase with this easier access to flowers? What is your personal opinion about it?
24) The percentage presented in the article for exports of Brazilian flowers in Brazil hasn't changed much. Actually, our exports have decreased (In percentage, reaching only 1.8% of the total production, in 2009) due to a less profitable external market (explained by the valuation of our currency, to have an idea, by the end of 2003 € 1 was worth R$ 3.62, and today is worth R$ 2.28) and to the financial crisis. According to HORTICA Consultancy, the Brazilian exporting profile is more related to vegetative propagation products, like ornamental plants' seedlings (and not fresh cut flowers, like other south-American countries). With all that, does Brazil have real opportunities to export flowers and ornamental plants?
25) There is a considerable pressure for sustainability along the flower chain today. With that, there is a wide discussion about whether the chains should continue being "international" or if they will become more local, due to the "carbon" steps related to transportation. As already shown in question 30, Brazil has a promising internal market. Would be a trend for the Brazilian auction to focus more in its internal market than in enhancing its exporting position? And what happens to the Netherlands regarding that? Do you have any other means to decrease the chain emissions?

Questionnaire to be applied with Prof. van Heck – 01/06/2011

- ***Local adaptations of generic application systems: the case of Veiling Holambra in Brazil***

1) The delivery in this case is from the supplier to the Veiling? The customer inspection takes place only after the sale in the auction is done, right?
2) In Holambra, the buyers (Exporters, Wholesalers) are not located inside the facility, like it happens in Flora Holland – Aalsmeer, are they? What would be the benefits in terms of logistics and information sharing of having them close by?
3) By that time, was it one of their goals to improve this system to a "real-time" online bidding? From an ICT point of view, would it dramatically increase the complexity of the system?
4) In the extranet system for producers and buyers, only information about the suppliers was available? Was it possible for the purchasers to provide the systems with information about their future demand? Is that a trend to increase the accuracy of supply-demand forecast?

- ***Veiling Holambra – Trading Brazilian Flowers in the International Market Enabled by IT***

5) The percentage presented in the article for exports of Brazilian flowers in Brazil hasn't changed much. Actually, our exports have decreased (In percentage, reaching only 1.8% of the total production, in 2009) due to a less profitable external market (explained by the valuation of our currency, to have an idea, by the end of 2003 € 1 was worth R$ 3.62, and today is worth R$ 2.28) and to the financial crisis. According to HORTICA Consultancy, the Brazilian exporting profile is more related to vegetative propagation products, like ornamental plants' seedlings (and not fresh cut flowers, like other south-American countries). With all that, does Brazil have real opportunities to export flowers and ornamental plants? What were the barriers at that time?
6) Do they pack the flowers in the farms in the NL? And in BR? Why not, then, improving the ICT to such a point that the transportation would be done from the grower to the customers? Wouldn't be a trend to the Cooperatives like Veiling Holambra or Flora Holland to manage the transportation processes?
7) Japan holds the eleventh position in the World's HDI list and the eighteenth in the GPD per capita, and even with that their average expenditure in flowers was, in 1998, "only" US$ 44. When compared with countries of similar development and quality of like, like The Netherlands and Germany, for example, it is low, since they presented, at that time, respectively US$ 77 and US$ 94. Is the consumption of flowers and ornamental plants "on a daily basis" so linked to the culture? Would that be the case also in Brazil (at about US$ 13 today) or do you believe our low expenditure is due to our lower average income?
8) Today, can you tell what was observed in this respect (the article ended with a question: Will the demand-driver (mediation) have a more important role than the supply-driver (Auction) in the future?)?

- ***General trends for the market***

9) Brazil's economy is experimenting a very good moment (7.5% GDP growth in 2010). With that, the average income of the population is also growing and, added to this, the access of the population to the internet is increasing, having reached almost 40% of the total population in

2009. The e-commerce has an average growth of more than 30% in the last 3 years. With all these factors, does a trend exist for the sales of flowers and ornamental plants to shift from the "traditional sales channels" to the internet?

10) What are the main challenges and trends for this sector, from an ICT perspective?

Appendix 2. Flora Holland

Brief Description of the Infrastructure

Flora Holland is the largest trade and knowledge center in flowers and ornamental plants in the world. It is composed of six auctions spread of the Netherlands, precisely in Aalsmeer, Naaldwijk, Rijnsburg (these three have a very strong exporting profile), Venlo, Bleiswijk and Eelde (these are considered regional market-places). Aalsmer is the biggest auction in the world, with 1 287 800 m^2. The overview of its plant is available in Figure 1. The respective areas of each of the auctions are available in Table 1.

Figure 1. Overview of Flora Holland's Aalsmeer plant. Source: www.floraholland.com

Table 1. Areas of the six Flora Holland's auctions

Auction	Total Area
Aalsmeer	1 287 800 m2
Naaldwijk	721 000 m2
Rijnsburg	400 000m2
Venlo	108 100 m2
Bleiswijk	123 000 m2
Eelde	45 900 m2

The visit took place in Aalsmeer, in the June 16th of 2011. It was a fast visit, during about 2 hours, in which it was possible to visit the facilities of Flora Holland and ask questions about general features of the company. This auction has access to global market, it is located very close to Schipol Airport and concentrates a large amount of trading organizations (exporters, wholesalers, etc).

The company has several docks for shipping, where its clients are located. The “reception and distribution area” is where the products are unloaded to follow either to the clients or the auction rooms has also controlled environment in order to maintain the quality of the products. This area can be seen in Figure 2. As a company, Flora Holland has 240 000m^2 of cold storage area. An example of a cold storage room in Aalsmeer can be observed in Figure 3. A “show-room” is also available for the clients to check the trends and innovations of the flower sector. There is also a room where quality tests are constantly done to rate the quality of the products provided by each grower.

Figure 2. Flora Holland's Aaslmeer plant cold storage room. Source: www.floraholland.com

Figure 3. Flora Holland's Aalsmeer distribution area. Source: www.floraholland.com

Supply Chain Structure

To describe the Supply Chain Structure of Flora Holland a framework was drawn, based on Chopra and Meindl "Supply Chain Decision-Making Framework", and applied to the company. The framework can be observed in Figure 4.

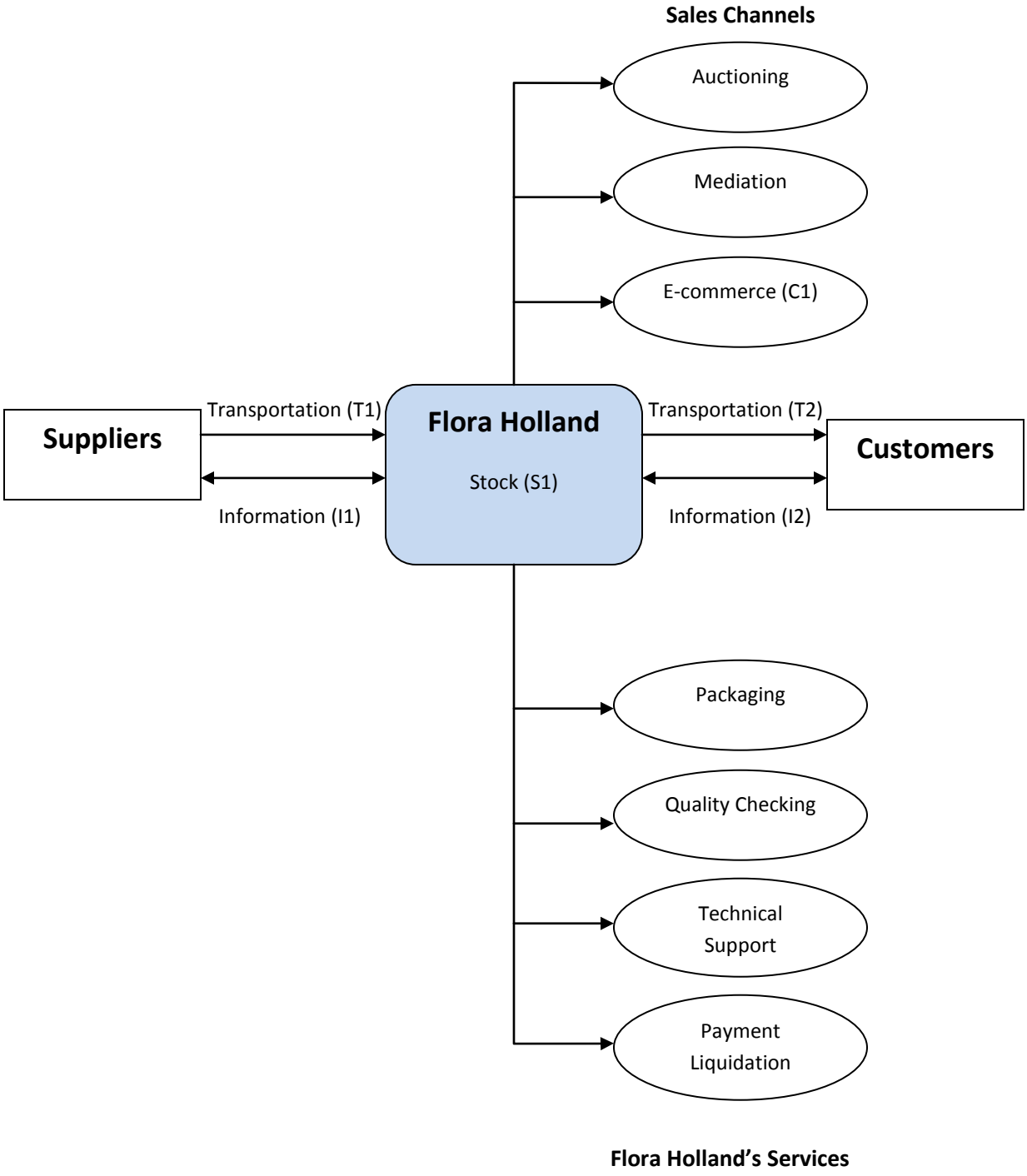


Figure 4. Flora Holland's Supply Chain Framework. Source: Adapted from Chopra and Meindl (2001)

Customers: Flora Holland had, in the beginning of 2010, 3000 customers, mainly exporters and wholesalers. The most common destinies of Flora Holland growers' products are Germany, UK and France. Together they represented about 57% of all exports of Flora Holland growers' flowers and ornamental plants. Moreover, Flora Holland includes as its customers all the actors that use its services to sell their products. Therefore, we have 2 types of customers: the ones who buy at Flora Holland and the ones who sell via Flora Holland's market-places. Below it is presented a more detailed description.

- Customers who buy at Flora Holland

1) Wholesalers: This category includes customers who buy large amounts and sell them to the retailers.
2) Exporters: This category is composed buy clients who buy large amounts of products in Flora Holland, and export them to other countries. The products of Flora Holland are exported to almost 140 countries.
3) Importers: This category includes actors who import products via Flora Holland market-places and sell them afterwards, generally to exporters. They can be considered competitors of the local growers. The most common sources of products imported are: Kenya, Ethiopia and Israel, totalizing 64.1% of all the turnover of imports.
4) Retailers: Big retailers (supermarkets, for example) who buy flower to sell directly to the final consumers.
5) Specialist Channel: Stores/shops specialized in selling flowers who sell directly to the end consumer.

- Customers who sell at Flora Holland's market-places

1) Breeders: Category which includes breeders who sell their products to the growers, via Flora Holland.
2) Growers: Grow the products, and sell, via Flora Holland, to all the customers who buy at the cooperative.

Sales Channels: One of the aims of Flora Holland is to maximize sales turnover. To make this possible, the company offers 3 sales channels to its customers:

1) Auction: This sales channel represents 65% of all the flowers' sales and 30% of all the ornamental plats' sales. The products are transported through the auction room, while all the information regarding this lot is available in the computerized auction clock. The auctioneer puts an initial price per unit that would be considered very expensive. The auction starts, and the price starts decreasing until someone pushes the button or clicks its mouse in its computer, indicating that he/she will take the product at that price. This process lasts 2.0 seconds, in average. The buyers can either buy the entire lot or only part of the lot, and the leftover is auctioned again.
   Flora Holland has 42 clocks working simultaneously in all of its 6 facilities. On a daily basis, more than 120 000 clock transactions take place. It offers a broader and deep variety of products, trading more than 20 000 different articles.
   Flora Holland has innovative systems for the auctioning channel. For example, it has started recently with the Image auctioning, in which the plants are anymore shown physically in front of

the clocks, only their images are available in screens placed beside the clocks. This facilitates the internal logistical process, but, as reported by the Supply Chain Manager of the company, this practice is not extensively applied yet, having been used only for routinely traded flowers, of low value.

2) Mediation: This sales channel represents 35% of all flowers' sales and 70% of all ornamental plants' sales. The process can be done via telephone, internet or personally. There is a unique department called Flora Holland Connect for these operations. It is geared towards direct sales to wholesalers and retail suppliers. It provides customized services and its focus is on increasing selling power of growers-suppliers with favorable pricing. They guide the growers-suppliers in their trades via advisory services. Some of the services provided are risk management, sales & marketing services, customized logistical services, among others.
3) E-commerce: The e-commerce supports the other sales channels, acting as an extra tool for them. According to Flora Holland, e-commerce gives access to new customers and markets, and increases the efficiency of operations, since the information goes automatically from one party to another. Two examples of this tools are presented below:
    - PlantConnect.nl is an online catalogue and webshop designed by Flora Holland Connect, to be used as an online sales channel. Suppliers, properly registered in the system, market their products online and the consumers, also registered in the system, can check what is available and when. The orders and all the information exchange are done online. This system prevents errors and provides up-to-date information about supply to the customers.
    - KOA (remote buying) is a tool to support clock transactions, providing the possibility to participate in the auction online, in real time. In 2009 KOA represented 35% of the total clock turnover and connected to the auction buyers from 27 countries. It is extensively used not only by clients that cannot participate in the auction process due to distance reasons, but also buyers who are located in one of the auctions and want to buy in the other auctions as well. They are able to compare the prices that have been offered in the other Flora Holland's auctions and guide their bids by that. The exporters that buy at Flora Holland offer this tool to their customers, making them able to buy directly from the clocks.

Transportation (T1 and T2): The transportation of the products is a very important process in the ornamental plants and flowers chain. It has a huge impact on the quality of the products and on the responsiveness of the chain. This process can be divided in two phases:

T1: This process applies to the transportation from the growers to the Flora Holland's facilities. Since Flora Holland has an international supply chain, with sourcing coming from not only different countries in Europe, but also from other continents like Africa and South-America, the modalities of transportation used in T1 include Aircargo, Trucks, Vessels and even Barges (which is still in pilot phase of application). As reported by the Supply Chain Manager of Flora Holland, the company has limited responsibilities in T1. Flora Holland has a freight group in Kenya and a strategic alliance with TransFresh, a subsidiary of Chiquita, under the name of Fresh Flowers Solutions, to transport flowers by sea in refeer containers. However, the main flows are organized by the supply chain parties themselves. Flora Holland

does not have its own fleet for T1, being everything the company does in T1 outsourced. All the modalities used are equipped with chilling system. The airplanes have conditioned zones, and all the trucks and containers are refrigerated. Regarding the volumes, it was difficult to state, but the Manager reported that, only coming from Kenya, there are 100 000 tons a year.

T2: This process consists of moving finished products from Flora Holland to its customers. The modalities used in T2 are roads (trucks), trains and short sea. All the vehicles involved in this process are equipped with chilling systems. The same situation found in T1, in terms of responsibility for the process, applies for T2. To give an impression about the volumes transported in this process, Flora Holland distributes weekly 13 500 full truck loads, only in Europe.

Information (I1 and I2): Chopra and Meindl defined Information as the "glue" of the supply chain. It is potentially the biggest driver of a supply chain because it directly affects each of the other drivers. Information support managerial decisions, and in this sector is especially important in the forecasting process, due to the fact that flowers and ornamental plants are highly perishable. For Flora Holland, we can divide in I1 and I2:

I1: Applies for the kind of information that is shared between the Cooperative and the growers. Flora Holland has developed its own systems to do it that, according to the Supply Chain Manager, work via standard protocols defined to these systems. The growers provide information about their shipments, the nature of this information is well known, being it variety, quantity, quality and day of the delivery. Flora Holland provides general commercial information to its growers. A system that uses this kind of approach was already described in the sales channels section, more precisely in the online catalogue Plantconnect.nl.

I2: It is basically the information shared between Flora Holland and its clients. The Supply Chain Manager of Flora Holland reported that they also have developed their own systems to deal with this information exchange. Customers are provided with information about the products, both on the clock and in the mediation. The nature of this information is the same as the information provided in I1 from the growers to Flora Holland, along with commercial and financial information about the transactions. The clients have to be registered to purchase in Flora Holland, so all kinds of information regarding their business are also required.

Inventory (S1): The inventory, also known as stock, is generally the result of a mismatch between supply and demand. It can also be the case that inventory is held due to a difference in timing between the emergence of demand and lead time of supply. In the case of Flora Holland, the same logic applied to the Brazilian companies is used. That is, inventory has to be kept as short as possible. Dutch products have a maximum time of 12 hours kept in stock. For imported products, this is longer, spending at least 1 day stocked. The company has, in total, 240 000 m^2 of cold storage rooms. Decision can be made, in peak demand periods, to optimize the stocking process, keeping products that do not have an urgent need for cooling rooms outside of them.