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Strategic global supply chain configuration model

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Abstract (English)

Supply chain network design is still an evolving topic and lies at the heart of supply chain management, and involves many strategic decisions regarding the number, location, type and size of the facilities, the demand allocation to each facility, and supplier selection.

One of the critical decisions that companies should take is to design its supply chain and to choose the strategic locations of different supply chain components (i.e. the strategic location alternatives of sourcing, manufacturing and distribution)

A literature review on global supply chain configuration was done in order to understand the different possible configurations for the global supply chain and the main drivers which may influence this strategic location decision.

This study aims to develop a model to support mangers in taking the strategic decision of sourcing the materials and locating the manufacturing facilities. In particular, weather to have local or global strategic sourcing strategy and weather to locate the production sites locally or globally. The model should be able to suggest the best supply chain configuration for the company after entering the values of the related drivers.

The focus of this study is the FMCG (Fast Moving Consuming Goods) industry. So, data of 16 multinational FMCG companies were collected and analyzed in this paper in order to build and validate the model.

Keywords: Global supply chain configuration, Sourcing, Manufacturing, FMCG

Abstract (Italian)

Il design (la progettazione) del network della supply chain è ancora un argomento in evoluzione, coinvolto in pieno nell'amministrazione della supply chain, e che è coinvolto in molte decisioni strategiche riguardo a numeri, luoghi e grandezza delle infrastrutture , l'allocazione di domanda a ciascuna struttura, e la selezione dei fornitori.

Una delle decisioni chiave che le compagnie dovrebbero prendere è quella di progettare la propria supply chain e di scegliere le location strategiche dei differenti componenti della stessa. (cioè location strategiche di approvvigionamento alternative, manifattura e distribuzione).

Per capire le differenti possibilità di configurazione, e le guide linea che possono influenzare decisioni sul posizionamento strategico della supply chain, è stata studiata la letteratura globale sull'argomento.

Lo studio mira a sviluppare un modello che sia di supporto ai manager per prendere decisioni strategiche di approvvigionamento delle materie prime e di posizionamento delle strutture manifatturiere. In particolare decidere tra una strategia globale o locale per per l'approvvigionamento e dove localizzare la produzione. Il modello può suggerire la migliore configurazione per la supply chain della compagnia, dopo aver inserito i valori dei relativi fattori determinanti.

Lo studio si concentra sull'industria dei Fast Moving Consuming Goods (FMCG). I dati sono stati raccolti da 16 multinazionali operanti nel settore FMCG, e sono stati analizzati per costruire e validare il modello.

Parole chiave: Configurazione globale della Supply Chain, Approvvigionamento, Manifattura, FMCG

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At the end I would like to express my gladness to have this wonderful experience in Italy and Politecnico Di Milano which adds a great value to myself and hopefully will help me to build a flourishing future in both my career and personal life.

Amr Rabie

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Introduction

Supply chain network design is still an evolving topic and lies at the heart of supply chain management, and involves many strategic decisions regarding the number, location, type and size of the facilities, the demand allocation to each facility, and supplier selection.

One of the critical decisions is to design the strategic supply chain configuration indicating the strategic location decision of supply chain process (i.e. the strategic location alternatives of sourcing and manufacturing).So, the aim of this study is to develop a structured approach to help to design an optimal supply chain network. In particular, this study is concerned about support the strategic location decision of sourcing and manufacturing (Local Vs Global).

After analyzing the literature concerned about the design of global supply chain configuration, there is a gap found as there is no such a model which can support this strategic location decision of sourcing and manufacturing taking into consideration all the related drivers and analyzing its influence on the decision.

Objectives

The main objective of this work is to develop a decision making support model for the top management of multinational companies in FMCG industry (FMCG industry was selected as the main focus of this study) to be able to take the strategic decision to source the components locally or globally and also whether to produce in local production plants or in global ones.

And in order to achieve this main objective we have some sub-objectives:

1- Identify the drivers which can have an effect on the strategic location decision of sourcing and manufacturing.
2- Analyze the effect of the selected drivers on the different decision criteria.

3- Make case study analysis by collecting the actual data for the identified drivers for multinational companies operating in FMCG industry..
4- Use the data obtained from case studies in order to validate the model.

The research questions of this work can be summarized in 3 questions:

- **Q1:** What are the main drivers affecting the strategic sourcing and manufacturing decision (Local VS Global)?
- **Q2:** How these drivers can affect the strategic sourcing and manufacturing decision (What is the influence of each driver)?
- **Q3:** What is the relationship between the drivers and the supply chain configuration (How to develop the model)?

Methodology

The following graph shows the research methodology used in the study in order to achieve the previously mentioned objectives and to answer the mentioned research questions.

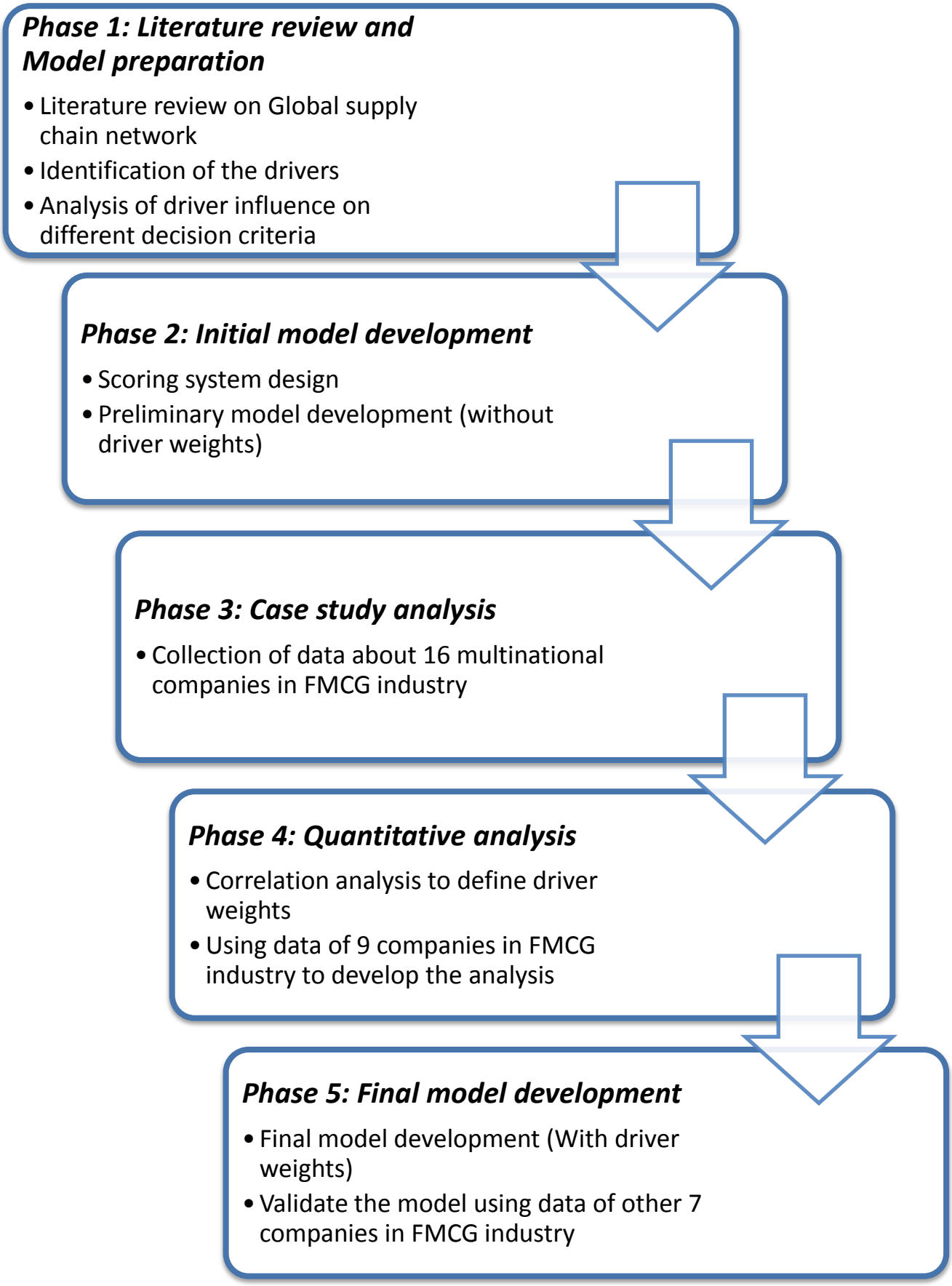


Figure 1 - Research methodology

Now, we are going to highlight briefly the main steps performed in each phase (See the following chapters for more details)

Phase 1: Literature review and Model preparation

First of all, a literature review on global supply chain networks was done to study the scientific paper and previous research done for this topic and then to analyze the gap of the literature and it is concluded that there is no such a model which is able to support taking the strategic location decision and can suggest the best supply chain configuration for the company.

Also in this phase, the drivers used in the model were identified and classified into 3 different categories:

1- **Common drivers**: Drivers which have influence on both sourcing and manufacturing strategic location decision.
2- **Sourcing drivers**: Drivers which can only have influence on the sourcing decision (Local Vs Global)
3- **Manufacturing drivers**: Drivers which can only have influence on the manufacturing decision (Local Vs Global)

Then, analysis of the influence of each driver was made in order to understand the influence of the drivers on the sourcing and manufacturing decision (Local Vs Global)

Phase 2: Initial model development

In this phase, the scoring system was designed based on Local Vs Global scale as explained below:

Each driver will have its unit of measure and according to its value in this measure; it will be given a score 0, L1, L2, G1&G2.

0 (Irrelevant) → The driver is irrelevant in taking the local VS global decision

L1 (Local advantage)→ Based on the value of this driver it is **recommended** to go for the local configuration.

L2 (Local superiority)→ Based on the value of this driver it is **strongly recommended** to go for the local configuration.

G1 (Global advantage)→ Based on the value of this driver it is **recommended** to go for the global configuration.

G2 (Global superiority)→ Based on the value of this driver it is **strongly recommended** to go for the global configuration.

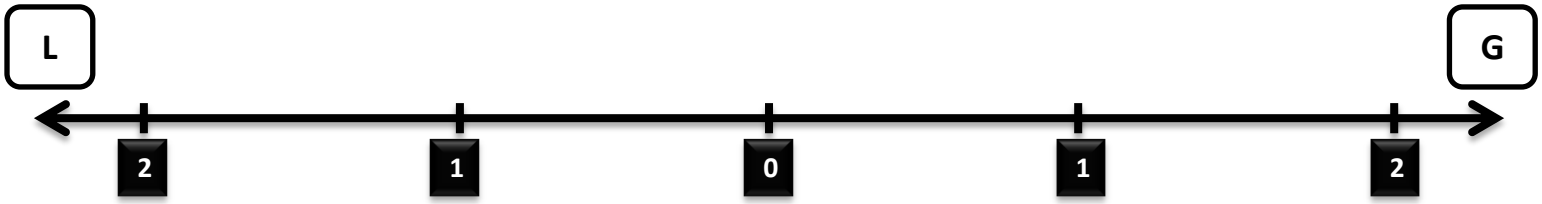


Figure 2 - Local Vs. Global scoring axis

Then based on the mentioned scoring concept, the initial model was developed.

Phase 3: Case study analysis

This phase is related to collection of the real data of multinational companies operating in FMCG industry. This data will be used later to develop the final version of the model and to validate it.

The companies under study are Nestlé S.A, Unilever Food, Barilla S.p.A., Colgate-Palmolive, Carlsberg Beer, Coca-Cola Beverage, Lindt & Sprüngli, Kellogg's Cereal, Absolut Vodka, Chicco Toys, Lego, Zara, BasicNet Group, Heineken NV, PepsiCo, H&M

Phase 4: Quantitative analysis

After building the model and completing the list of drivers and defining its influence on the sourcing or manufacturing strategic location decision, it was clear that not all the drivers have the same level of influence on taking the strategic location decision for sourcing and manufacturing.

So, the correlation analysis was used in this phase to define the weight for each driver in the model based on the actual data of 9 companies in the FMCG (Fast Moving Consuming Gooods) industry. (Nestlé S.A, Unilever Food, Barilla S.p.A., Colgate-Palmolive, Carlsberg Beer, Coca-Cola Beverage, Lindt & Sprüngli, Kellogg's Cereal, Absolut Vodka)

Phase 5: Final model development

In this last phase the final model was developed after adding the weights to each driver (Which is the result of correlation analysis) and was validated using the data of other 7 companies (Chicco Toys, Lego, Zara, BasicNet Group, Heineken NV, PepsiCo, H&M) in the same industry to have the final version of the model

Results

As a conclusion for the work, the below final model was developed using 28 different drivers (Common, Sourcing and Manufacturing drivers). Also, A weight (1,2,3 or 4) was assigned to each of the drivers according to the quantitative analysis performed.

Then the model was validated using the actual data of 16 companies in FMCG industry as shown in the below tables.

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
-				-		-						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Low	Local superiority	2	2	-	2	2	-	
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	1	2	-	1	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium (Cost based)	Global advantage	1	-	1	1	-	1	
	8	Import tariff	Official import tariff	High (>15%)	Local superiority	1	2	-	2	2	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect (COO)	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		15	16		18	13	
Sourcing	11	Local availability of purchased items	Qualitative	Medium-High	Local advantage	2	1	-				
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	1	-				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	Medium-High (40:50%)	Local advantage	1	1	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		8	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	Medium (30:40%)	Irrelevant				1	-	-	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Medium stability (70:80%)	Irrelevant				3	-	-	
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2	
	23	Labor quality	School enrollment, tertiary (% gross)	Medium-High (50:59%)	Local advantage				2	1	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	Medium-High (16:20 Cents / KWh)	Global advantage				2	-	1	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1	
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		18	11	

Conclusion					
		Sourcing		Manufacture	
Total points		23	16	36	24
Model suggestion		Local		Local	
Degree of certainity		Certainly		Certainly	
Actual configuration		Local		Global	

Table 1 - The final model "General"

	Sourcing		Manufacturing	
	Local	Global	Local	Global
1- Nestle				
Total points	18	19	29	30
Model suggestion	Global		Global	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
2- Unilever				
Total points	14	21	23	42
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
3- Barilla				
Total points	13	21	18	38
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
4- Colgate				
Total points	20	21	22	42
Model suggestion	Global		Global	
Degree of certainity	Possibly		Certainly	
Actual configuration	Global		Global	
5- Carlsberg				
Total points	21	21	25	43
Model suggestion	Equal		Global	
Degree of certainity	Equal		Certainly	
Actual configuration	Local		Global	
6- Coca-Cola				
Total points	22	21	33	34
Model suggestion	Local		Global	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
7- Lindt				
Total points	16	18	24	35
Model suggestion	Global		Global	
Degree of certainity	Possibly		Certainly	
Actual configuration	Global		Global	
8- Kellogg's				
Total points	20	18	32	30
Model suggestion	Local		Local	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
9- Absolut				
Total points	24	12	33	29
Model suggestion	Local		Local	
Degree of certainity	Certainly		Probably	
Actual configuration	Local		Local	

Table 2 - Results of the model 1/2

	Sourcing		Manufacturing	
	Local	Global	Local	Global
10- Chicco				
Total points	10	13	13	30
Model suggestion	Global		Global	
Degree of certainity	Probably		Certainly	
Actual configuration	Global		Global	
11- Lego				
Total points	11	22	19	39
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
12- Zara				
Total points	14	16	26	33
Model suggestion	Global		Global	
Degree of certainity	Possibly		Certainly	
Actual configuration	Global		Global	
13- BasicNet				
Total points	7	15	16	33
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
14- Heineken				
Total points	20	19	31	32
Model suggestion	Local		Global	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
15- PepsiCo				
Total points	20	24	32	33
Model suggestion	Global		Global	
Degree of certainity	Probably		Possibly	
Actual configuration	Local		Global	
16- H&M				
Total points	17	16	33	30
Model suggestion	Local		Local	
Degree of certainity	Possibly		Probably	
Actual configuration	Local		Global	

Table 3 - Results of the model 2/2

Chapter 1 - Introduction

Supply chain management has been studied since last decades. A supply chain can be defined as an integrated process in which various business entities work together in order to acquire raw materials, components, and sub-assemblies, transform them into specified final products, and deliver these final products to customers (Beamon, 1998). As a strategic issue, it is important for the companies because an optimal supply chain can achieve a high level of performance and allow the firm to compete successfully in the marketplace (Melnyk *et al.*, 2013).

Supply chain network design is still an evolving topic and lies at the heart of supply chain management, and involves many strategic decisions regarding the number, location, type and size of the facilities, the demand allocation to each facility, and supplier selection (Chopra and Meindl, 2004 Chopra, S. and Meindl, P (2004). In order to design an optimal supply chain network, a structured approach is required, which includes three phases (Rushton *et al.,* 1992; Mourits and Evers, 1996; Vila *et al*, 2006; Collin *et al*, 2009): i) identification and understanding of product-market characteristics, sourcing context and planning horizon, ii) definition of the potential supply chain configuration alternatives and preliminary assessment, and iii) quantitative assessment of the alternative configurations and detailed design. The purpose of the first and second phases is to identify the possible network configurations that answer three main strategic questions - where to source items, where to locate manufacturing facilities, and which markets to serve (Arntzen *et al.*, 1995; Vidal and Goetschalckx, 1997; Smith, 1999; Manzini and Bindi, 2009) - through a preliminary qualitative assessment based on contextual factors, such as product characteristics, supplier profiles, customer service requirements, and aspects of customer demand. In the global business environment, the supply chain network design becomes more complicated, because it is driven by a number of external factors such as economic and legislation issues, trade barriers to international trade, and environment

concern due to the increasing globalisation (Gunasekaran *et al.*, 2004 Gunasekaran, A., Patel, C. and McGaughey, R.E. 2004)The last phase of the design approach shifts the focus to quantitative analysis in order to identify the optimal configuration based on the constraints, and fine-tune the configurations by simulation technique sometimes.

With regard to the manufacturing firms, one of the critical decisions is to design the strategic supply chain configuration indicating the strategic location decision of supply chain process (i.e. the strategic location alternatives of sourcing, manufacturing, and distribution on the global or local scale), since it has long-term impacts and direct effects on procurement, manufacturing, inventory, and transportation costs and determines economic success or failure (Weiler *et al.,* 2011).

Chapter 2 - Literature review

Globalization became a phenomenon in the last decades. It affects our lives from many different aspects such as cultural, business level, political, economic and so on. The irrefutable effects of globalization, inevitably showed itself on companies' decisions affected by the market standardization, free trade areas, improvements in transportation and communication technology, created a big shift for companies to operate in global scale. The willing to expand to new emerging markets, availability to produce in low cost countries, free-trade areas, and the development of information and transportation technology are just some of the reasons of this shift. According to the research conducted by Monczka and Trent (2005), this globalization phenomena is persistently increasing that while the non-domestic expenditures of the companies were between 21 and 30 percent in the year 2000, it has increased to 31 to 40 percent in year 2005. Dormier (1998) explains the reasons of this growing attention on globalization as the managers seeking for other manufacturing sources in order to decrease in cost, increase in revenues and improvement in reliability.

With the best of our knowledge after a deep research in the literature, global supply chain is analyzed mainly by focusing on three different processes which are sourcing, manufacturing and distribution. Our focus area is forward supply chain therefore; the scope of the literature review does not comprise reverse supply chain. Although the components of the supply chain are strongly inter-related, there are a few studies handling the forward supply chain as a whole. Deducting from our research in literature, the reason of focusing on different parts of the chain is considered to be caused by being easier to adopt global sourcing and distribution activities rather than manufacturing whose impacts are enormous. Therefore, in real life situations, companies are also focusing on some parts of the chain instead of globalizing completely. It should not be understood as, there is no application for whole chain but many of them prefer to apply

in some parts of their activities in order to avoid tremendous risks. The main parts and focus areas of global supply chain are explained below:

Global Sourcing

Although global sourcing runs through the minds by lexical meaning as sourcing the goods from different and distant parts of the world, in practice, it represents more than just this definition. Over the last 20 years, global sourcing has evolved from international procurement which was concerning few aspects such as cost savings or availability; meanwhile global sourcing is done in order to gain competitive advantage (M. Kotabe & J. Y. Murray). The distinguished characteristics of global sourcing and international sourcing can be viewed more clearly by comparing two explanations from previous articles as the following: “the acquisition of raw materials, components and subassemblies from international sources for use in fabrication, assembly or for resale, regardless of whether the import source is internal or external to the company” (Kotabe and Omura, 1989). While global sourcing represents something more extensive: “integration and coordination of procurement requirements across worldwide business units, looking at common items, processes, technologies and suppliers” (Monczka and Trent, 2003).

Main motives for global sourcing is listed as: Offset requirements, currency restrictions, local content and counter-trade, lower-prices, quality, technology access, shorter product development and life cycles and comparative advantage (Cecil Bozarth, Robert Handfield, Ajay Das (1998)) However, there may be some drawbacks come with the global sourcing as well as the benefits such as, difficulties in contact with supplier, higher lead times, more complex maintenance of procurement.

Global Manufacturing

For an organization, the most crucial impact of strategically locating the production facilities in a foreign country is gaining comparative advantage against its competitors. According to Brian S. Fugate (2008), global manufacturing can be obtained in two ways: (1) establishing fully owned manufacturing subsidiary in a foreign location (i.e., offshore-insourcing), or (2) entering into a contractual arrangement with an independent manufacturer to create an extension of the firm into different geographic locations (i.e., offshore-outsourcing).

Moreover, the companies which are operating globally should adjust their business processes according to the norms established by the countries that they are manufacturing (Dunning, 2009). Therefore, we cannot simply take global manufacturing as the sum of the production in different nations. Companies should consider and overcome two complementary challenges which are adopting the business strategies to local conditions while managing the differences occurring within its supply chain linkages. (Brian S. Fugate, 2008). As Blasquez states (2003), global manufacturing world does not only sell products but also solutions.

When manufacturing is considered, managing the production facilities which are located in different regions, the logistic and planning activities for all becomes a highly complex but strategically important for efficiency and effectiveness (D. Aprile, A. C. Garavelli, I. Giannoccaro (2006)). Therefore, the main concerns in the literature for global manufacturing is mainly concentrated around locations and capacity, product mix and qualities that are assigned to each plant while considering the costs as expected

Global Distribution

Improvement in logistics systems and supply chain in global level has driven attention to the globalization of the distribution activities. Mainly, global distribution concerns physical distribution which refers to the range of activities which are involved in the

movement of products from points of manufacturing to final points of sale and consumption (McKinnon, 1988).

Distribution centers play an important role in global distribution. They are located considering the market trends which are accelerated information transfers, changing consumer preferences and rising competition. New structure of supply chain in global scale requires many parts to be integrated. For that reason, distribution centers should act as a bridge between global sourcing and regional distribution. The distribution center has become an interface between the geographies of manufacturing and retailing, so it handles the distribution scale and scope (M, Hesse, Jean-Paul Rodrigue, 2004).

Global supply chain network configuration

Supply chain network design determines the structure of the supply chain and the sequential links among components of the system with which supply chain can achieve high level of performance and satisfy customer demands (Truong and Azadivar, 2005). It involves many decision issues, such as the location of sourcing facilities, plants, distribution centers, stocking pints, and the inventory level, transportation modes and lanes, etc., and those revolve around the four major decision areas in supply chain management: 1) location, 2) manufacturing, 3) inventory, and 4) transportation (Tsiakis *et al.*, 2001). Location decisions have long term impact and direct effect on manufacturing, inventory, and transportation plan. Once the location decisions are determined, the possible paths through which the products flow to the customers can be established, and the supply chain structure is built as the result. Therefore, the ability of a firm to offer its products or services effectively is largely dependent on the location of the facilities (Jayaraman, 1998). The location issues serve as the focal problem, and other decision areas act as modifiers to the location strategy (Ballou, 1977). On the other hand, the four major decision areas include many decision issues on different level based on the scope, investment requirement, and the time horizon. Strategic decisions involve significant capital investment, requires approximate and aggregate data over a long period of time,

normally more than one year. Tactical level is characterized by moderate capital investment, deals with the medium term decisions that have planning period of several months based on an appropriate amount of data. Operational decisions are concerned with low capital and day-to-day routine operations based on transaction data (Perl and Sirisoponsilp, 1993; Vidal and Goetschalckx, 1997; Gilgen and Ozkarahan, 2004; Nasiri *et al.*, 2010). The strategic decisions have a large impact on performance measures such as profitability, customer service, flexibility and reliability (Harrison, 2001), because they are not only closely bound up the corporate strategy, but also guide supply chain policies from a design perspective (Ganeshan and Harrison, 1995). In general, the strategic location issues of supply chain design refer following decisions: 1) where to buy, 2) where to locate new facilities, 3) which markets to serve by which warehouses (Georgiadis *et al.*, 2011). Therefore, in this paper, the strategic supply chain configuration is described as the strategic location decision of the entire supply chain process – sourcing, manufacturing, and distribution (Huan *et al.*, 2004; Narasimhan and Mahapatra, 2004; Nasiri *et al.*, 2010) – on the global or local level, in order to answer three strategic questions based on the combinations between supply chain processes and geographic scales (i.e. global or local sourcing, global or local manufacturing, global or local distribution).

In the literature, despite lots of papers discussed the supply chain network design, only a small number of articles proposes and analyses the type of supply chain configurations based on the whole supply chain system on a global or local scale from a strategic perspective. In the limited literature resource, some articles considered the supply chain configurations based on sourcing and delivery stages, while the manufacturing is not involved. For example, Knudsen and Servais (2007) proposed 4 international supply chain configurations (i.e. local, global, international sources, and international sellers) based on an empirical study. Cagliano *et al.* (2008) also conducted empirical research to identify global supply chain configurations (i.e. local supply chain, global seller, global purchaser,

and global supply chain) based on data from a survey of manufacturing companies in more than 20 countries. In addition, Creazza *et al.* (2010) presented 5 configurations for international freight forwarding logistics (i.e. sourcing in the Far East, selling goods throughout Europe using regional warehouses) through company interviews. On the other hand, there are still some papers classified the supply chain configurations for the entire supply chain process. For example, Hong and Holweg (2002) proposed 6 global supply chain configurations (i.e. local manufacture, traditional export, international sourcing, global sourcing, offshoring, and global manufacturing) due to the development of sourcing strategy (i.e. global sourcing, international sourcing, and offshoring) that results in the changes on manufacturing strategy. Garavelli (2003) provided a framework in which 9 supply chain configurations were identified based on degree of manufacturing and distribution flexibility (i.e. no flexibility, limited flexibility and total flexibility). Finally, Caniato *et al.* (2013) identified 4 supply chain configurations (i.e. locals, shoppers, barons, and globals) based on an empirical study. These papers provide insights on the strategic global supply chain configuration. Whereas, there is not any contribution takes into account every possible combination based on two main areas: i) the operational processes of supply chain (i.e. sourcing, manufacturing, and distribution); ii) the scale of operational processes (i.e. local and global level). Therefore, according to the supply chain process and location scope, 8 strategic global supply chain configurations can be proposed (see Table I).

Configuration	**Sourcing**	**Manufacturing**	**Distribution**
1	Global	Local	global
2	Global	Global	global
3	Global	Global	local
4	Global	Local	local
5	Local	Local	local
6	Local	Global	local

7	Local	Global	global
8	Local	Local	global

Table 4 - Strategic global supply chain configuration

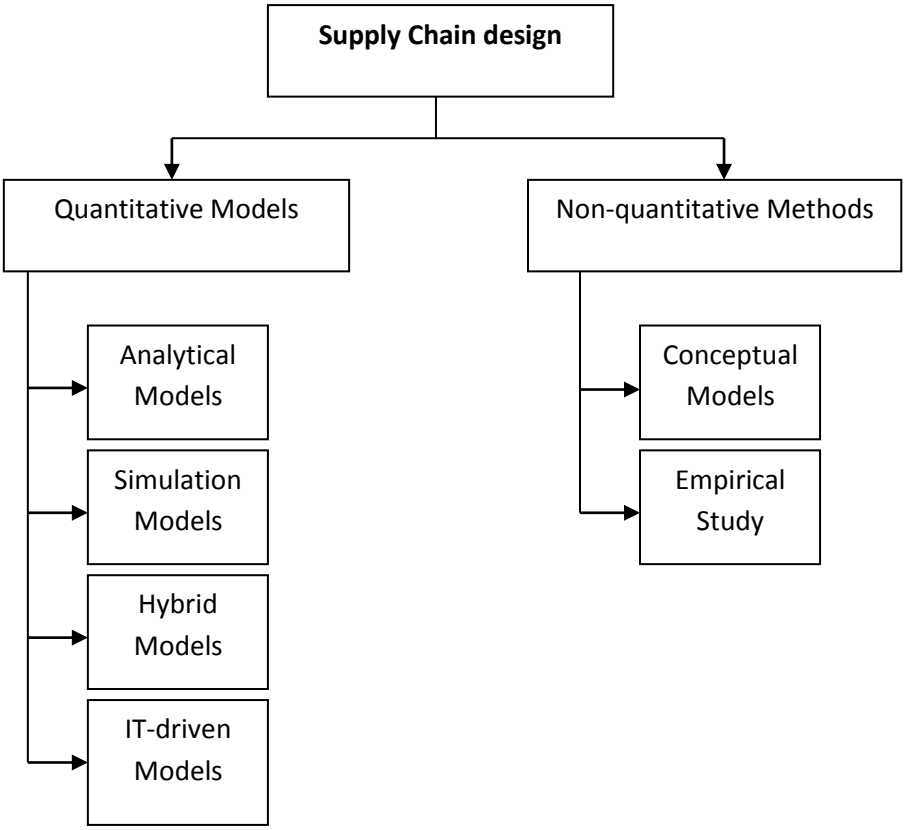


Figure 3 - Supply chain models categories

Global supply chain network design models

In the literature, the supply chain design problem has been widely studied by researchers using various methods, which usually fall into two categories based on the characteristics of main solutions: 1) quantitative models, and 2) non-quantitative methods (see Figure 1). The quantitative models indicate the supply chain is designed through mathematical models, whereas the second category implies that the main solution of supply chain design problem is conducted based on theoretical or empirical study.

Quantitative models

The analytical models are the one of most preferred modeling approach in supply chain network design, and classified into deterministic analytical models and stochastic analytical models. Deterministic models assume the variables are known and fixed with certainty, so that the modeling and computation can be implemented easily that results in many researchers studied supply chain design problem through this approach. For example, Cohen and Lee (1989) (M.A. Cohen and H.L. Lee (1989) developed an optimization model in which the variables are deterministic in order to solve demand allocation problem based on economic order quantity theory. Another example is given by Tzafestas and Kapsiotis (1994) who presented deterministic mathematical model to optimize a supply chain with the objective of cost minimization. However, the supply chain is operated under an increasingly competitive environment in reality. Many parameters are random and changed over the time, such as customer demand, exchange rate, lead time, etc. Therefore, in order to solve the uncertainty of the supply chain operations environment, an effective approach is considered as stochastic models in which at least one of the variables is not fixed and assumed follow a probability distribution (Beamon, 1998). Taking the examples, Cohen and Lee (1988) developed a stochastic mathematical model to determine the best inventory policy based on minimum cost objective under the respond time constraint. Lee and Billington (1993) proposed a heuristic stochastic model in order to manage the material flow in the decentralised supply chain with the objective of either determining stock level under a defined item fill rate or achieving service level subject to given stock levels. From the point of solution perspective, both the deterministic and stochastic modeling approaches can be realised base on various optimization-based solution methods. As the most popular technique for supply chain network design, mixed integer programming (MIP) can be broadly classified based on the pre-defined objectives (i.e. minimum cost, maximum service level, or others), capacity constraint (i.e. limited or unlimited capacity constraint), number of the stages of a supply chain system (i.e. single-stage or multi-stage supply chain network),

number of the products managed in supply chain (i.e. single product or multi-product), and length of planning horizon (i.e. single period or multi-period). For examples, as early as 1974, Geoffrion and Graves developed a multi-commodity single period logistics network MIP model in order to optimize product flows from plants to final customers through distribution facilities with the objective of minimum cost. Hodder and Dincer (1986) developed a large-scale MIP model to solve the international facility location problem under the consideration of single-product and single-stage in order to achieve the maximum profit. Cole (1995) presented an inventory location and allocation system in which a multi- commodity, multi-stage and single period MIP model is proposed in order to optimize a production-distribution system. Liu and Papageorgiou (2012) proposed a mixed integer linear programming model in order to address production, distribution and capacity planning for a global supply chain with the aim of minimizing both total costs and total transport lead time. In addition to addressing the optimization of supply chain network problem with the formulation of MIP models, a large number of literature deal with supply chain problems based on other optimization approaches no matter the variables are deterministic or stochastic. In particular, taking into account the development of global business after 1990's, more uncertain parameters have to be considered, such as tax rate, import tariff, transfer price, etc. Therefore, the algorithm techniques have been expanded in order to tackle the supply chain problems. For examples, Min and Melachrinodis (1999) (H. Min and E. Melachrinoudis (1999) developed an analytic hierarchy process model to determine the facility relocation problem based on case study. Zhang *et al.* (2009) presented a coloured Petri nets model to help companies select an appropriate supply chain to provide the most added values to customer order fulfilment. Vidal and Goetschalckx (2010) (C.J. Vidal and M. Goetschalckx (2001) proposed a non-convex optimisation model to deal with location and allocation problem in order to obtain the maximum after-tax profits with the consideration of transfer price in a multinational corporation. Liu and Cruz (2012) developed a variational inequality

equilibrium model to determine the optimal price, profits, and equity values of the firms in a specific supply chain subject to financial risks and economic uncertainty.

Simulation is another approach to tackle supply chain problems. Simulation models can be used to investigate quickly the effects of a complex system for different scenarios over a defined time horizon. For example, Zhao *et al.* (2001) presented a simulation model to evaluate the value of information sharing in a three-stage supply chain. Another example is given by Lim and Shiode (2011) who studied, through discrete event simulation, how changes in customer demand could affect both the cost and reliability of a distribution network in order to identify the appropriate network.

The hybrid models use more than one solution method. In general, this approach integrates analytic model and simulation model in order set a recycle optimization process. More in detailed, the potential decisions can be obtained based on optimization of analytical model first. Second, they are fed into the simulation model as input parameters to investigate the performances of the entire system on the second step. Lastly, the supply chain system is fine tuned by the analytic model again based on the simulation outputs. An example is given by Lee and Kim (2002), who proposed an integrated method combining analytic and simulation models to deal with production-distribution problems with the aim of cost minimization. In addition, some studies on supply chain network design are conducted based on hybrid models through two or more various decomposed mathematical models. For example, Jang *et al.* (2002) presented a supply chain management system consists of four modules, which are modeled based on several decomposed analytic mathematical models.

IT-driven models are a rising approach as the supply chain network is becoming global that results in the information sharing is a critical factor determining supply chain success. IT applications improve the quality of supply chain decisions, because those new technologies can collect real-time information, analyse the data rapidly, and share them

to partners. Therefore, the aim of IT-driven models is to integrate and coordinate the supply chain processes based on various real-time transaction information stemming from IT applications in order to facilitate collaboration between partners in a supply chain (Min and Zhou, 2002; Vakharia, 2002)

For examples, Camm *et al.* (1997) proposed an integrated model combining MIP model and Geographic Information System (GIS) to develop a Decision Support System (DSS) in order to tackle location and allocation problem. Talluri (2000) presented an optimization model used to select ERP system under the consideration of system acquisition and maintenance costs, flexibility, execution accuracy, and compatibility.

Non-quantitative models

Despite most of the supply chain network design models are quantitative-based in literature, quantitative model is not still a perfect approach, because there are still drawbacks. First, taking into account the uncertainty of many parameters, the mathematical models are usually restricted by assumptions that influence the accuracy of the solution. Second, the quantitative models may be not enough to optimize the supply chain system due to the deficiency of variables. In particular, the qualitative variables (e.g. political stability, environment concern, labor's quality, etc.) are hard to be measured in a quantitative method, whereas those parameters generate much influence on supply chain network design. Last but not least, the nature of mathematical models is another drawback, because it is difficult to understand the rationale of the formulations so that the users are confused on the models. Therefore, other than the quantitative approach, the conceptual and empirical models are developed by many researchers to design supply chain network in order to overcome the drawbacks of the quantitative models.

The conceptual study aims to propose holistic conceptual model in which a guideline is provided for designing a supply chain network. For examples, Berry and Towill (1992) proposed a methodology to design an electronic products supply chain in terms of order

flow, material flow, and business processes throughout the supply chain. Smith (1999) presented a framework for making decisions about vendor location (both abroad and locally) based on six criteria (i.e. product specification, product technology, quality and process technology, logistics and availability, demand volatility and item criticality, and costs). A third example is given by Kirytopoulos *et al.* (2008) that proposed a comprehensive approach considering both tangible and intangible criteria for evaluating and selecting suppliers. Furthermore, Collin *et al.* (2009) presented a four-step approach for designing the supply chain according to the alignment of customer demand and product characteristics.

Empirical study indicates the research is conducted when interview, case study, survey research are the primary approach, whereas the quantitative methods (e.g. statistical models) are the subsidiary tool. Those papers aim at proposing matrices or models to support supply chain design decisions. There is a brief sample of this literature. Randall and Ulrich (2001) examined the relationships between product variety, supply chain structure, and firm performance based on case studies in order to identify the supply chain structure that better matches the type of product variety.

Stratton and Warburton (2006) proposed a model based on three case studies with the aim of investigating the trade-off between responsiveness and costs. Creazza *et al.* (2010) identified five main international freight logistics network structures based on interview, and presented a framework for selecting the most suitable logistics network configuration. Kumar *et al.* (2011), through company interview, presented a selection matrix to determine which supplier has the qualities to become a long-term and key partner based on interviews in the food industry.

The above description presents the various modelling approaches used in literature and their characteristics. However, there are two main limitations that should be addressed. On the one hand, the supply chain system studies in the most of the models are

incomplete. The main focus of them is partial supply chain system (e.g. production-distribution stages) or individual phase of a supply chain (e.g. supply, or production, or distribution) rather than the entire supply chain system (i.e. from origin of sourcing to final market). On the other hand, despite the models tackle the strategic problems of supply chain network design (e.g. location/allocation, location/routing, inventory/transportation, and supplier selection/inventory control, etc.), whereas the location problem addressed are concentrated on detailed design based on the constraints in a specific region rather than illustrating the method of how to select location strategy (i.e. global or local).

Although, the literature is quite limited in presenting the configurations, a few authors focused their attention on it by analyzing the affecting factors to build a supply chain configuration. After reviewing all the existing models which classify the global supply chain configurations, we developed our own model to demonstrate the possible configurations on local and global scales.

The literature lacks clear evidence in terms of explaining the evaluation of global supply chain configurations adopted by manufacturing firms over time. Despite Meixell and Gargeya (2005) made a literature review on supply chain design focusing on the globalization topic, they did not cite any research adopting an evolutionary approach on the topic. Moreover, Power (2005) found only one contribution by Stuart (1997), who adopted a longitudinal perspective in his work. Recently, there have been made more contributions regarding the evaluation of global supply chain trend. Most of the authors (Webb et al. (2006), Kim and Shin (2002), Magnani and Prentice (2003)) pointed out the effect of globalization on supply chain designs especially in manufacturing companies with different approaches.

Companies are looking for the solution to the questions of, where to source the raw materials or where to do assemblies, where to locate the facilities and which markets to serve. In order to be able to answer these questions, supply chain managers and top

management should do decision making considering the design of the supply chain configuration adopted or will be adopted in the future. However, there is a limited research performed to analyze the interdependencies of the steps of whole supply chain therefore in literature decision making processes are investigated separately regarding to sourcing, manufacturing and distribution, respectively.

As it has been discussed in the scope of analysis, steps of global supply chain are defined as global sourcing, global manufacturing and global distribution respectively. In defining the configurations of the global supply chain, strategic location selection of the facilities regarding these three supply chain steps, plays the most important role, because it decides the level of globalization of the facilities of whole supply chain.

Global sourcing can be defined as " the acquisition of raw materials, components and subassemblies from international sources for use in fabrication, assembly or for resale, regardless of whether the import source in internal or external to the company" (Kotabe and Omura, 1989). According to this definition it can be extracted that, it is crucial to schedule, coordinate and synchronize the goods and information flows from the source to the target destination. From those points of view, logistics and transportation play an important role for the strategic redesign of the supply chains. Global sourcing requires an efficient plan of logistics networks and intercontinental transportation. Kruger (2002) stated that, geographical distances are not only increasing the transportation cost, but also they also creates difficulty for solving the trade-off between inventory and physical distribution costs. Low-cost off-shore sourcing strategies can end up as high-cost supply chain outcomes (Christopher et al., 2006). Therefore, the choice of transport mode and logistics networks configuration should be arranged or changed in order to obtain the best supply chain outcome.

Practitioners and authors have made their research about configurations on the basis of three main subcategories: strategic alignment of the supply chain, coordination of the

players operating in the global supply chain and design of the global logistics network (A. Creazza et al., 2010).

Strategic alignment of the supply chain focuses on the facility location selection strategies and vertical integration issues. Depending on the level of vertical integration, there can be different supply chain configurations (Hong and Holweg, 2002). In order to be responsive and agile towards to the market demand fluctuations, strategies about production facility location and distance from the final markets should be selected carefully.

The second research area focus on the management side of the global supply chain which is more complicated compared to the local ones. The difficulty of the management of global supply chain stems from the differences in cultures, languages, habits and practices since they are the obstacles in doing accurate demand forecasting and material/production planning. To deal with the problems in demand planning or production-distribution, various mathematical models have been introduced. The most sophisticated ones take into account price/exchange rate and risk effect (Cohen and Huchzermeier, 1996).

The last research stream deals with the configuration of global logistics networks considering the most appropriate international transport mode (ocean container, shipping, airfreight, etc.), the design of infrastructure for freight consolidation and for serving end markets and the definition of the number of echelons composing the logistics network (Kruger, 2002). Previously, the analyses of global logistics network were subdivided into two perspectives: from global carriers' point of view or manufacturers' point of view. (A. Creazza et al., 2010) First one deals with the use of transport infrastructures or logistics models like hub and spoke, whereas the other one pays little attention to the structure of the transport service and to the relative implications on the

entire supply chain, because manufacturers consider the transportation system just as an origin-destination process (e.g. Cohen and Lee, 1989).

In the literature, some studies about the redesign of logistics network on global scale have been developed but generally they do not give a generalization of the results (Arntzen et al., 1995; Bhatnagar and Viswanathan, 2000; Chung et al., 2004). However, it is seen that, recent studies have started to do a deeper analysis on the possible configurations for the logistics networks. As an example to one of the most recent studies, Cheong el al. (2007) evaluated a configuration, which refers to the adoption of consolidation facilities in Asian sourcing countries which are required to collect shipments coming from several suppliers. They also considered the delivery of the consolidated shipments to the manufacturing plants located worldwide. In addition to the studies made on this research area, there are also case studies about logistics configurations discussed in the literature which can be used as a guideline for choosing the potential options for designing a global supply chains.

Regarding possible configurations for the logistics networks, A. Creazza et. al. (2010) proposed five configurations which considers direct shipment, one echelon and two echelon logistics networks that defined as the following: (Figure 2.1)

Configuration 1- Direct Shipment with full container load: A single supplier (S) ships a FCL to a regional warehouse (RW) located in another region. Transportation is provided first from supplier to a loading port (LP) from which haulage made via ocean shipping, then from the unloading port (UP) to the warehouse.

Configuration 2 – Direct shipment with groupage container: First transportation of the goods are done by road haulage as LCL to the loading port where the containers are consolidated to carry it via ocean shipping, then after reaching unloading port, the containers are deconsolidated and carried as LCL to one or more regional warehouses.

Configuration 3 – One-echelon logistics network with consolidation hub (upstream): By road haulage goods are carried with LCL to the consolidation hub of the company in

which goods are both consolidated and stored. Later the goods are shipped by FCL from LP to the regional warehouses.

Configuration 4 – One-echelon logistics network with central warehouse (downstream): There are many suppliers in one region which performs shipping with FCL to a single UP in another region close to the CW. After the deconsolidation of the containers in CW, the goods are shipped to the final destinations.

Configuration 5 – Two-echelon logistics network with consolidation hub and central warehouse: Goods are shipped with LCL to the consolidation hubs via road transportation. In the hub, containers are consolidated and shipped from LP via ocean shipping to UP close to the CW. After the deconsolidation in CW, the goods are shipped to the final destinations.

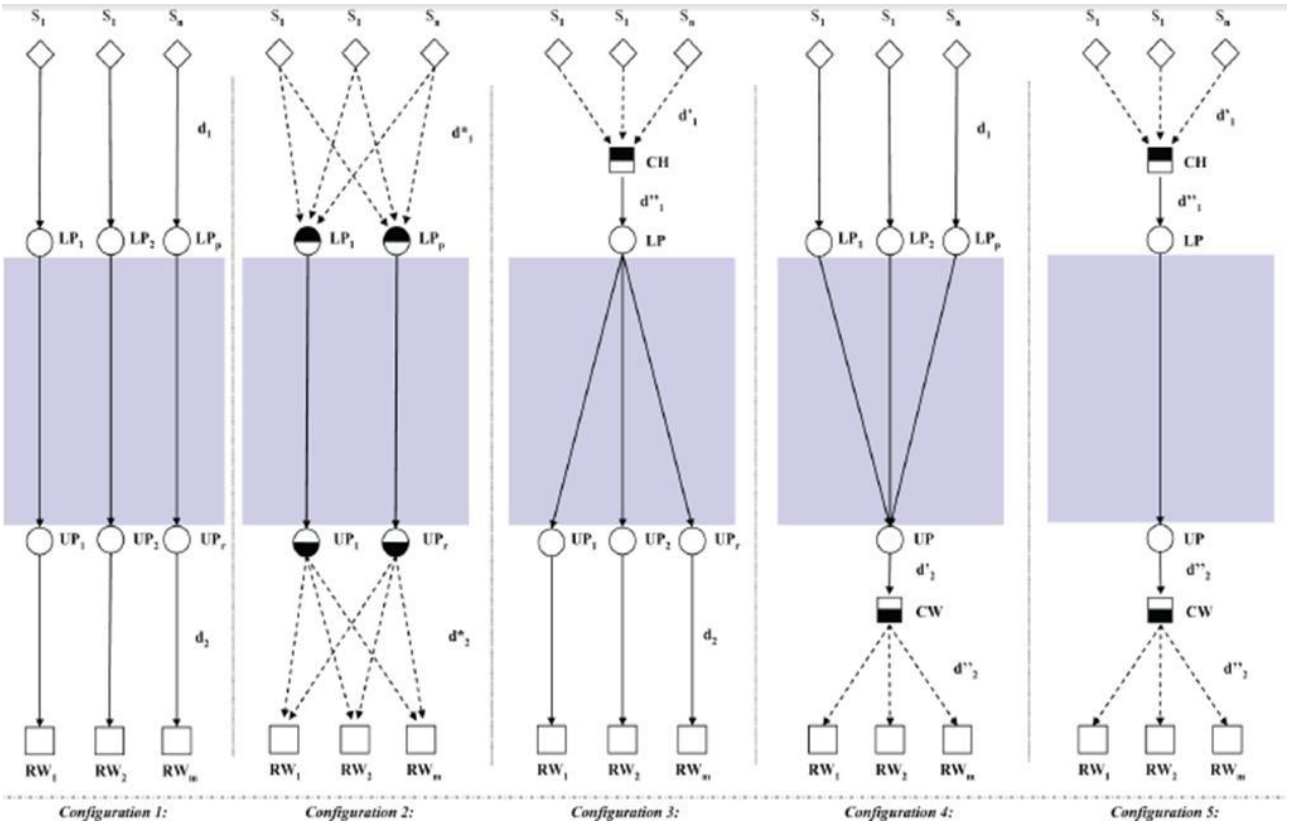


Figure 4 - Configurations for logistics network proposed by Creazza et. al., 2010

These five proposed configurations are different from each other in terms of cost structure, supply lead times, risk of delay and operational complexity, i.e. the intensity of the effort necessary for logistics network planning and control (A. Creazza et. al., 2010).

Regarding to the cost structure, configurations are differ from each other in terms of transportation cost, handling cost and inventory cost and order preparing cost.

Transportation cost must be evaluated by considering not only the distances between the facilities but also considering if the configuration is based of FCL or LCL rates. In terms of handling activities, the existence of CW and CH is important. In configuration 1 and 2, the handling activities take place in RW, whereas the other configurations also deal with the handling activities in CW or CH additionally. Also, there is the issue of safety stock which is held only in RWs. However, C. Ballou (2001) stated that the different amount of safety stocks in the RWs, related to demand and lead time distribution, therefore it is accepted that order processing cost is just the function of each RWs and it is independent from the configurations.

One of the most important decision factors to select the suitable configuration for companies is lead time which stands for the time difference between replenishment order by a RW and receiving of the goods ordered from a supplier. Therefore, regarding to supply lead time, configuration 1 has the lowest mean lead time among the others, whereas configuration 2 and 5 have the longest mean lead times. If the numbers of transit nodes are increased, then the mean lead time for configuration 3 and 4 also gets longer. Likewise, as the number of nodes increased also the risk of delay and operational complexity increase from configuration 1 to configuration 5.

According to the business environment and the strategy adopted, the companies should analyze and select which configuration is more suitable for their supply chain. Generally, most of the companies chose configuration 1 because of its low operational complexity and transportation cost, even though it is not the most cost-effective configuration.

In order to evaluate the cost-effectiveness of the configurations, A. Creazza et. al. (2010) used the framework derived from Zeng and Rosetti (2003) which consists of three main steps: (1) defining the input parameters to calculate OLC (overall logistic cost) , (2) Making the simulation of physical logistics flows for a given time horizon and calculating the related OLC, (3) applying a sensitivity analysis to observe the effect of key parameters on OLC.

Besides evaluating the most cost-effective configuration by the help of the framework mentioned above, there is also a need to taxonomy for the selection of the most suitable global logistics network configurations. In literature, there have been developed some classification schemes in order to guide the selection process (Fisher, 1997; Christopher et al, 2006, Lovel et al., 2005). In addition to their classification methods, A. Creazza et al. (2010) proposed a two-dimensional classification whose dimensions are such as:

(1) Overall annual demand (low-high): sourced volume by RWs from a specific geographical area

(2) Demand between suppliers and RWs (low-high): each RW's yearly demand sourced from a single supplier

The matrix of the taxonomy with the proposed configurations is drawn as it is seen on Figure 2.1 below.

According to the taxonomy, in case of shortage in purchases from international suppliers, i.e. the sourced volume is low, it is better to rely on LCL services which implies to the configuration 2. On the other hand, if the overall annual demand increases, companies can adopt configuration 3 or 4 which suggest owning a central warehouse or central hub. The decision of adopting CW or CH depends on the suppliers' dispersion, and percentage difference between handling cost in sourcing and in destination countries. In case of low suppliers' dispersion and high percentage of handling cost difference leads the

companies to adopt CH and choose configuration 3, otherwise, it is more appropriate to adopt a CW which is close to the end market by choosing configuration 4. If the demand between supplier and RW in each linkage in terms of sourcing volume is high, no matter if the overall annual demand is low or high, it is more suitable to use configuration 1 which suggest using FCL.

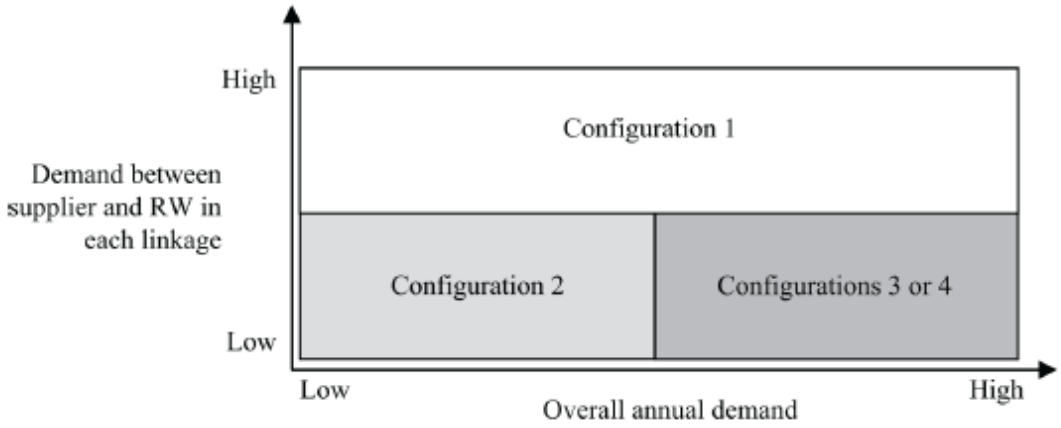


Figure 5 - Taxonomy for the logistics network configurations by A. Creazza et al., 2010

Analysis of Supply Chain Configurations Presented in the Contemporary Literature

In this chapter of our research, we identified the global supply chain configurations that found in the contemporary literature. Although, the literature is quite limited in presenting the configurations, a few authors focused their attention on it by analyzing the affecting factors to build a supply chain configuration. After reviewing all the existing models which classify the global supply chain configurations, we developed our own model to demonstrate the possible configurations on local and global scales.

Literature review on supply chain configuration

As far as globalization and increasing competition have induced a significant shift in manufacturing and supply chain strategies, the trend towards offshoring (locating parts of supply chain outside their home country) has been widely discussed. The companies

have paid more attention to the management of their supply chain on global orientation. Therefore, the main operational processes, i.e. sourcing, production, and distribution, have not only been operated at the local level, but also been performed on the global scale. In this study, the local scale is explained as the material flow taken place within one country or one region; the global level is interpreted as the material flow conducted across the regions. More detailed, local sourcing indicates the raw materials, components and sub-assemblies are transported from suppliers to plants within the borders of a country or a region. Instead, that is global sourcing when purchased items are sent across regions. With regard to manufacturing process, the local manufacturing represents the production facilities are established in a country or a region. Global manufacturing means the facilities are located in different regions worldwide. Local distribution describes a market is served by its local plants, while global distribution indicates a market is fed by the plants located in different regions through international transportation.

With regard to the operational processes, sourcing is related to the management of supplier relationships (upstream) and involves the following decisions to make: which vendors to use, what is the volume of flows and transfer of materials across plants. Moreover, it stipulates an integration of procurement activities across worldwide business units, coordination and synchronization of the high variety of material and information flows. Manufacturing stands for the management of manufacturing activities. The design problems involve the number, location, technologies and capacities of production facilities and the identification of the optimal degree of vertical integration, while the material flow management aims at identifying which products to produce, which technological processes to use, which distribution facilities to supply, and how. Distribution deals with the problems how the companies manage sales and distribution channels (downstream). Besides the location and capacity of distribution sites (number of echelons and their width), distribution also aims to identify which products to ship from

vendors to distribution centers and how, which markets to serve, what is the preferable transportation mode and required frequencies, transshipments across distribution centers and secondary transportation.

In general, a company seeks the solutions for the following questions when it develops its global supply chain strategy: where to source raw materials, components, and sub-assemblies, where to locate its manufacturing facilities and which markets to serve. Each decision has its own implication for the design of the supply chain configuration. However, as the literature review shows, these decisions are analyzed in the literature separately and limited research is performed regarding the interrelation of the different components in the entire supply chain system and the configurations adopted in the management of supply chain at the global level.

Panos Kouvelis and Ping Su (2007) stated that different global supply chain designs can be explained through a two-dimensional matrix. The matrix (Figure 1) addresses the concept of facility orientation reflecting two product characteristics: supply system complexity and market demand requirements complexity. Supply complexity identifies the difficulty of the production processes of the various components and assemblies, which is based on a range of factors, e.g. physical characteristics of the product, the number of technological steps, environmental requirements, etc. Market complexity defines the specifications and requirements the distribution and sales functions face in executing the delivery and corresponding customer service (e.g. customization) in various markets.

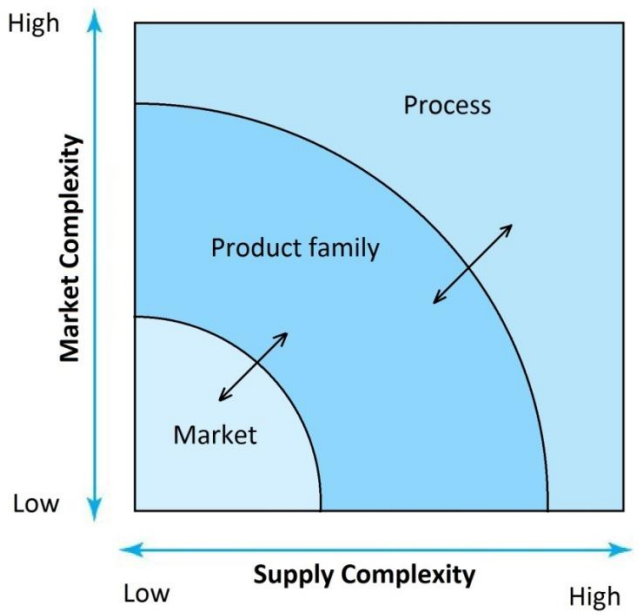


Figure 6 - Two-dimensional Classification of Strategic Choices

The matrix above allows distinguishing three strategic priorities for the company while designing the global supply chain: focus on the market, on the product family or on the process.

With *Focus on the market* the company duplicates segments of its supply chain (various nodes) in different geographical markets. This approach is suitable for low supply and market complexity, as it is convenient to serve customers when one facility or the whole regional supply chain is responsible for the entire product. In this case the networks of suppliers, production facilities and the distribution channels are local focused, so that each supply chain produces the entire product line for its regional market and each market is treated separately. The driving force behind location decisions is proximity to markets in order to ensure the service and quality provided to the customers.

Focus on the production family means that the company locates segments of its supply chain in different regions driven by the production economies of scale. This approach is suitable for middle supply and market complexity, or in the environment when the market complexity is low company may decide to work on the supply complexity by means of standardization and automation of the supply process. Typically the supply

and production side is centralized, while the company has to distribute different products to different markets from the same set of facilities. In this case facilities specialize in specific product families with similar technological process, materials and components, technical requirements, order profiles etc.

As the supply complexity increases, the company must specialize their supply and production facilities into specific activities (tasks), e.g. metal components, assembly facilities, plastic molding, large container transportation, high volume distribution facilities, etc. Therefore, *Focus on the process* means that the company locates facilities in different geographical regions, but each facility specializes in specific steps of the supply/production/distribution process. In this case, the supply and demand sides are centralized in order to coordinate and control the activities performed in different markets and to bring them together. The driving force behind location decisions is quality differentiation, which becomes a critical element for the company`s strategy; together with economies of scale it secures the company`s competitive advantage.

In connection with the above statement, Cagliano et al. (2008) analyzed the operating processes adopted by manufacturing firms around the world and identified a set of supply chain configurations with the main focus on globalization of sourcing and distribution. The research was focused on how manufacturing companies use global supply chains and the evolution of their behavior within time; it was based on longitudinal data collected for a sample of 59 companies carried out in 2001 and 2005. By means of the cluster analysis four main configurations (clusters) were identified:

- Local Supply Chain: these companies adopt both global sourcing and global distribution to an extremely limited extent; in this case they focus on their local supply chain and avoid internalization of the supply chain outside of their region (continent).

- Global Seller: in this cluster, those companies that have invested mainly in the mono-directional strategy - global distribution towards their final customers, thus serving customers all around the world, while they source mainly locally.
- Global Purchaser: opposite to the global sellers, these companies have developed their sourcing chain globally in order to serve primarily their local market.
- Global Supply Chain: this cluster represents those companies that integrate globally both strategies - sourcing and distribution, thus they can be really considered as managing truly global supply chains.

According to the methodology used, each cluster represents a different global supply chain configuration due to different levels of global sourcing and distribution that characterize it. Moreover, there is a connection between the location of production and the location of sourcing and distribution. The majority of local sourcers (Local Supply Chain and Global Seller) have local production, while global sourcers (Global Purchaser and Global Supply Chain) have global production (Cagliano et al., 2008). However, distribution can be performed on the global base even without global manufacturing base (examples of Porsche and Ferrari in automotive industry; Gucci and Hugo Boss in the apparel).

Eui Hong and Matthias Holweg (2002) in their research paper analyzed the full supply chain length and identified six distinct network configurations depending on the level of vertical integration. The classification presented in Table 1 is based on three key variables: the locus of the manufacturer, the locus of the suppliers and the locus of the market served by the manufacturer.

In that research, the authors highlighted the difference between international sourcing, global sourcing and offshoring. They emphasized that what is commonly referred as *global sourcing* is in fact represented as a continuum of a wide range of strategies from sourcing components abroad to establishing globally distributed manufacturing

networks. More specifically, a manufacturer can either locally source (by using suppliers in the same country or region), source internationally (from suppliers located outside of the region) or source globally (by having the same supplier supplying each manufacturing facility regardless its location).

configuration	short description	location of manufacturing	location of supply	location of demand
local manufacturing	products are made locally from local materials in order to satisfy local demand	domestic	domestic	domestic
traditional export	products are exported to another region (regardless the origin of sourcing)	domestic	domestic or abroad	abroad
international sourcing	products are made locally from materials sourced from abroad with procurement based on specific needs in order to	domestic	abroad (based on specific needs)	domestic and abroad

	meet local and foreign demand			
global sourcing	products are made from parts sourced from abroad as part of a global procurement strategy, to satisfy local and foreign demand	domestic or abroad	abroad (due to global procurement strategy)	domestic and abroad
offshoring	products are made abroad (regardless the origin of sourcing) and then are re-imported to satisfy domestic demand	abroad	domestic or abroad	domestic
global manufacturing	products are made abroad to meet demand in the respective foreign market	abroad	domestic or abroad	abroad

Table 5 - Supply Chain Network Configurations (E. Hong and M. Holweg)

A Model for Classification of Global Supply Chain Configurations

The performed literature review revealed that the supply chain configurations have been proposed from different points of view, despite the number of the related literature is quite a few, and there is a research gap in the design and classification of the configurations considering the whole length of the supply chain at global scale. Furthermore, the literature review on contemporary models used for defining and classifying global supply chain configurations allowed identifying opportunities for further development. Consequently, in this chapter, we would like to develop a model for distinguishing and classifying global supply chain configurations that will include the whole length of the supply chain on the basis of the methodologies presented by the prior literature.

As it was identified earlier, developing its global supply chain strategies a company seeks for the solution of the following critical questions: where to source raw materials and components, where to locate its manufacturing facilities and which markets to serve. According to those three strategic questions, the supply chain configuration can be described by two aspects, i.e. operational process and location selection. The operational process is distinguished into (1) sourcing; (2) manufacturing; and (3) distribution. The location selection includes two options: (1) local; and (2) global. Therefore, the proposed model as shown in the following Figure that takes the location selection and operational processes as the basis. This model presents the existing configurations as general scheme. Each pie of the model stands for different configuration whose characteristics can be easily read from the corresponding location type and operational processes. The model can be applied to any company regardless of the industries and point of origins. To investigate and understand each configuration more deeply, we have explained them separately depending on the integration and centralization strategy of the supply chain of company.

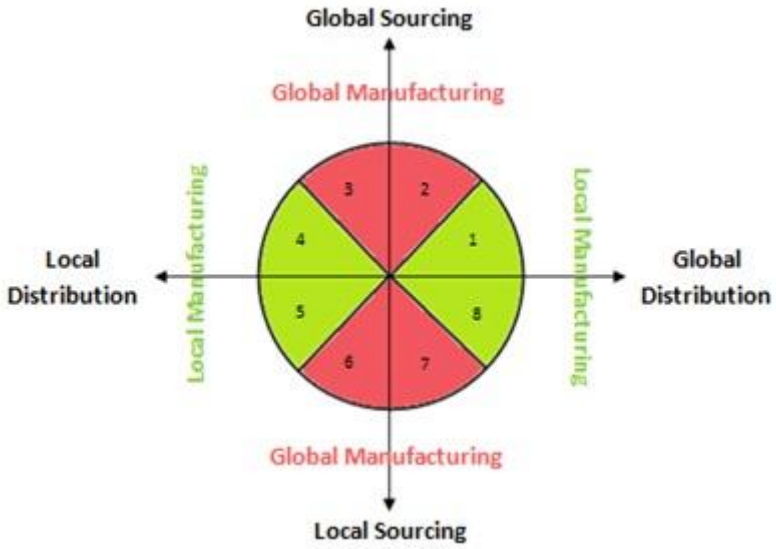


Figure 7 - Supply chain configuration scheme

The following parts explain the detailed strategy for the different supply chain configurations.

Configuration 1

This part of the model is in the area of **global sourcing, local manufacturing and global distribution** which is implemented by the global brands that makes huge investments on research and development. After the deployment of sourcing globally, the raw materials are sent to the focalized manufacturing facilities which are specifically designed to produce the complex and sophisticated products. After the production, distribution is made in global scale in order to provide the pay back of the investments.

Region	Supply	Manufacturing	Distribution
Region 1			
Region 2			

Region 3			

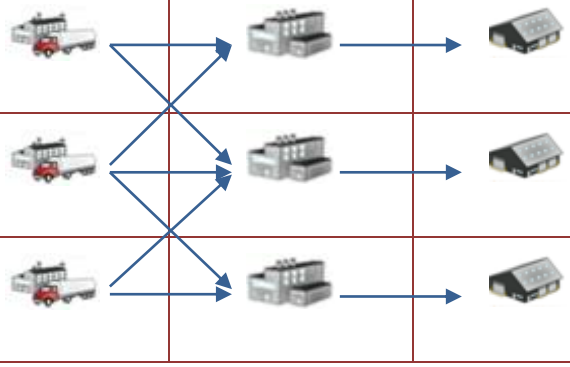
Configuration 2

This configuration represents the **truly global supply chain** where the sourcing is made worldwide, plants are located in replenished in different regions, and the distribution is performed by using multi-echelon logistics network from one region to another. This configuration is also called as "hybrid" or "mixed" and it is characterized by the highest level of complexity in terms of organization, management, planning and coordination. It is generally adopted by global and large scale companies.

Region	Supply	Manufacturing	Distribution
Region 1			
Region 2			
Region 3			

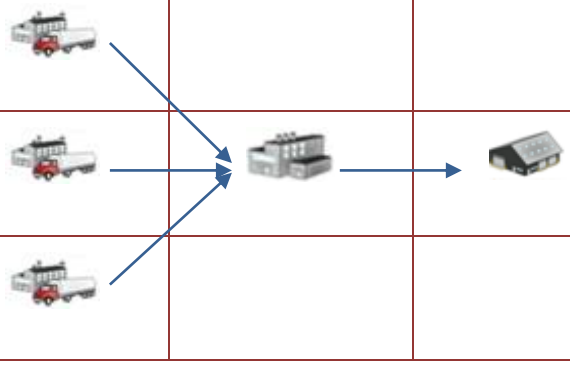
Configuration 3

The pie of the cake is in the area of **global sourcing, global manufacturing and local distribution**. This configuration is adopted by the companies which develop their sourcing and manufacturing globally in order to be able to serve to the local market in a best possible way possible. In this case, sourcing "abroad" becomes an inevitable part of the procurement strategy that is aimed at developing optimal suppliers` capabilities and as a result the company exploits significant performance gains. On the other hand, profitability of this configuration is doubtful since it requires large volume in local market to be served in order to be able to pay back investments on it.

Region	Supply	Manufacturing	Distribution
Region 1			
Region 2			
Region 3			

Configuration 4

It is in the area of **global sourcing, local manufacturing and local distribution** which stands for the purely global sourcing. The companies which adopt this configuration do shopping around the world and the downstream operations (production and distribution) are performed in local scale. The reason laying behind this configuration is benefitting from the cost, quality and availability advantage of foreign sources in order to be able to get superiority in the competitive business environment and to serve to the local market in best way possible.

Region	Supply	Manufacturing	Distribution
Region 1			
Region 2			
Region 3			

Configuration 5

This part of the model stands for the **truly local supply chain**. The most important point of this configuration is that the company operates the business only in one region, and

the operational processes are located within border of country or region. This configuration is generally adopted by the companies which have rigid manufacturing facilities, high inventory cost and high transportation cost which does not enable the high-volume cross-border flows. For this reason, companies focus their strategy as being close to the local market which is shorter and simpler than foreign markets. The local market size also should be big enough for the company to benefit from the economies of scale. The supply chain in this case has low complexity and internalizes cost efficiency strategy in its operations. It is necessary to know that a supply chain that goes through the boundaries of several countries within the same region is still considered local by definition.

Region	Supply	Manufacturing	Distribution
Region 1			

Configuration 6

This configuration is characterized by **local sourcing, global manufacturing, local distribution** which is a sort of replication of truly local supply chain structure. Companies locate their production facilities worldwide and in order to meet their local demand respectively. Production facilities source the raw materials and components from their local suppliers and each plant works almost interdependently from each other. Locating production plants worldwide provide company comparative advantage in terms of low labor cost, low taxes, better environmental norms and regulations, etc.

Region	Supply	Manufacturing	Distribution
Region 1			

Region 2			
Region 3			

Configuration 7

At this configuration, despite from the **localization of sourcing, production facilities are located worldwide and distribution activities are done at global scale**. Each plant works with a limited or almost no dependency to each other. This configuration is adopted when the global brands needs a unique source of raw materials or parts which can only be obtained from a single region and accepted as value –added because of its uniqueness. Configuration suggests adopting global distribution to be close to the foreign markets. This configuration is appropriate for the companies which produce different product families around the world and which has the capability to serve worldwide in order to get competitive advantage.

Region	Supply	Manufacturing	Distribution
Region 1			
Region 2			
Region 3			

Configuration 8

This configuration is characterized by **local sourcing and local manufacturing whereas it takes advantage of global distribution** in order to maintain the proximity to the customers all around the world. This type of configuration is adopted by strong global

brands which creates the value by their local roots. The aim of the company is to create the perception of uniqueness by the customers. However, in real life, due to the complexity in operations and high cost, it is tough to maintain this advantage.

Region	Supply	Manufacturing	Distribution
Region 1			
Region 2			
Region 3			

Drivers Matrix and Drivers Descriptions

Thorough literature analysis allowed to identify 36 drivers that effect company`s strategic decisions upon the design of global supply chain network. The set of drivers (identified and described below) can be clustered in 5 categories: product, service, demand, supply and environment. The objective of the first part of this chapter is to provide the descriptions of each driver and it`s implication and impact on supply chain design decisions on a global level.

Drivers effecting Global Supply Chain Design

With the light of literature analysis, 32 drivers are identified which have impact on strategic supply chain decisions regarding location selection. The collected drivers are clustered in five different groups, categorized by means of the features of the impact: product, service, demand, supply and environment features. Each driver is described and the impacts on supply chain decisions in global level are explained below. Furthermore, for each driver, a measurement proposal is made in order to quantify the weight of the

factor for the company. In the latter section, a table is proposed (Table 3.5) which indicates the effects of those drivers in terms of costs, global supply chain stage and the risks to be occur if the related enabler is not managed properly. Moreover, table also summarizes the suggested decisions to be taken in the existence of proposed driver.

1. **Product Features**

Product variety is described as the amount of different product attributes and characteristics in the complete portfolio of the company. Product variety has different effects on different stages of the global supply chain. Firstly, having high variety, leads supplying wider range of raw materials and components which increases the number of the suppliers, more dispersed both locally and globally in order to provide increased number and diversity of supply needs. Furthermore, it has considerable effects on manufacturing by increasing replenishment lead time, which will end up with cost increase (Thonemann, Bradley (2001)). Therefore, centralization is a preferable option for the companies producing high variety of goods in order to decrease the amount of duplication. Finally, transportation cost will be higher for both supply and distribution stages because of the fact that higher number of suppliers dispersed globally will be worked with and there will be more products to be managed to deliver.

Product value is the assessment of the worth for a good or service. It may be also measured by the price on shelf. With the increase in product value, an increase in inventory carrying cost is observed correspondingly due to keeping more valuable goods in stocks. Moreover, if the “opportunity cost” is also taken into account, effect on inventory carrying cost is considered to be more significant. Therefore, in order to decrease this cost, duplication of the resources should be avoided by centralization and lead times should be decreased.

Product value density(PVD) is defined as the ratio of product value divided by chargeable weight. To compare, products having low value densities such as cement, are usually distributed close to market to many local catchment areas; while high value density products such as precious stones, perfumes or microchips are manufactured and distributed from few large scale facilities (Cooper, 1993). The reason behind it is the raise in holding cost of inventory going in parallel with PVD. By centralizing, benefits such as stock reductions and risk pooling are targeted to be realized. With the centralization option, although transportation cost is increased because of moving away from market, minimizing the holding cost and avoiding duplication and risks overweighs it. On the other hand, as PVD decreases, a more decentralized approach becomes preferable in order to be closer to market to avoid high transportation costs caused by high weight/volume.

Product density is measured with the ratio of mass per unit volume. High density is aimed to be reached in order to achieve high utilization of transportation and storage facilities. Therefore, high product density products present a more efficient transportation and storage cost performance while low density products occupy a big place although it cannot reach the weight limit causing inefficient area usage. As density decreases, facilities should be closer to market in order to minimize the cost occurred due to inefficient utilization of transport modes. Moreover, product density has also an effect on warehousing cost. The higher density, the more weight can fit into an area of warehouse space. Therefore, storage area can be used in a more efficient way. In their study, Langley, Gibson and Novack (2008) indicates how transportation and warehousing cost is influenced as it is shown in Figure 3.1.

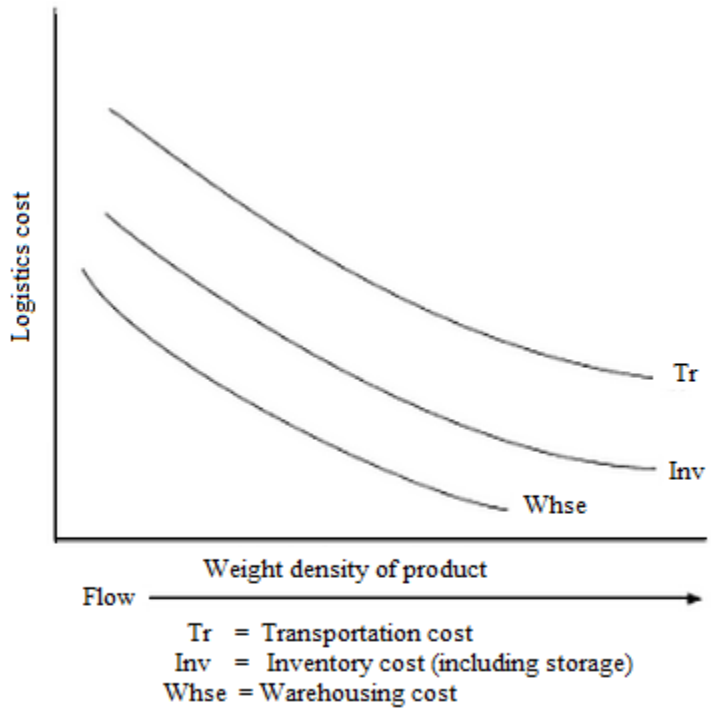


Figure 8 - The general relationship of product density to logistics costs

Obsolescence concerns the life cycle of a process, product or technology until become outdated, and no longer competitive in market place. The main products which are affected significantly from obsolescence risk are mostly technology based products impacted by fast change of the technology and customer requirements correspondingly. This risk can affect revenues and potential earnings dramatically. Main mitigation for obsolescence is to reduce lead time by this means cutting down the time in transportation and launch the product to market in the least possible time. Furthermore, Chopra and Sodhi (2004) discuss in their paper that, for high rate of obsolescence, a preferable strategy may be using redundant suppliers in order to prepare company for disruptions without building up fast-depreciating inventory.

Shelf life refers the period during which a stored commodity, as food, drugs or chemicals remains effective, useful, or suitable for consumption. Similarly to obsolent products, shelf life has an important impact on the selection of most suitable supply chain

configuration due to the time constraint they present. Products with short shelf life would require networks that holds low levels of inventory and utilize faster transport modes (A. Lovell et al., 2005). Therefore, a local distribution should be employed in order to decrease lead time to be in market.

Handling Characteristics refers different requirements of tackles, gadgets and equipment while maintaining the material handling in safe and economical means. It has a strong impact on selecting the most appropriate solution because different material and handling characteristics may lead extra costs on supply chain. For instance, differences in the weight of the product, temperature constraints or the level of safety requirements of the vehicle can establish global supply chain network barriers (Rushton et al., 2000). As in global supply chain, the distances and therefore lead times are longer compared to local; this factor forms a significant constraint for selecting storing and transporting mode of the product. Furthermore, damages and losses are likely to occur as the requirements cannot be met.

Technology level is described with the relation between the products' innovation level. In his study Marshall L. Fisher (1997) defined the bottom and top level of technology level with functional and innovative products. The bottom point of technology level is the functional products which satisfies the basic needs which are relatively stable and predictable with demand and having long life cycles such as grocery and gas station. However, innovative products offer additional services in order to give a reason to customers to choose their brand/company as it widely preferred in fashion or technology sector. As all the outcomes of operating in high technology level is considered (unstable demand, higher margins, shorter life cycle), flexibility and responsiveness become the priority than cost considerations. Therefore, reduction in lead time gains importance with increasing level of technology (Huang (2003). Moreover, the firms offering high

technology level, prefer to manufacture within national borders in order to protect its technology, skills and intelligent property.

Contribution margin is a relation between the production cost and the price of the product sold and is expressed in percentage. Lost sales will affect company more if the contribution margin is high. In order to prevent this situation, the products with higher contribution margins, are preferred to deliver with faster transportation modes or produced close to market in order to avoid lost sale (Fisher (1997)). Moreover, in the same way that contribution margin has effects on supply chain; choice of supply chain configuration may have effects on contribution margin as well. By supplying raw materials and components globally which will decrease the cost significantly, correspondingly it will increase the contribution margin of the same product which is highly desirable for the company.

2. **Service Requirements**

Lead time is defined as a time bucket from the moment of arrival of customer order till the moment of receipt of the goods by the customer. Lead time has a direct effect on responsiveness by means of being able to adapt to changes quickly or to be fast in new product launching (E. Hong and M. Holweg, 2002). In order to keep lead time in the minimum level, locating plants near to market would be an appropriate solution by means of increased respond for variations and change production plan immediately (A. Harrison and R. van Hoek, 2008). From distribution point of view, keeping distribution as local rather than global will also decrease lead times and improve responsiveness because of shortening the distance considerably(M. Christopher and D. Towill, 2001).

 Measurement: Duration between customer order and service completion (days)

Completeness (item fill rate) refers the probability of having a product in stock when an order arrives. Due to the characteristics of demands which is very volatile and unpredictable, selecting the most appropriate supply chain structure is a challenge for

firms, because this driver affects the overall delivery reliability within the network (Lovell, Saw and Stimson, 2005). In order to increase this level, centralization can be used among inventories in order to pool the risk and increase reliability.

Delivery reliability refers to the capability of a firm for making the deliveries without any errors in term of regarding time, place, price, quantity and/or quality. It has a direct effect on customer satisfaction level. Whole supply chain has an effect on reliability. From supply point of view, supplier selection plays an important role on delivery reliability (Vonderembse, Tracey, 1999). Global supply would increase the lead time and decrease flexibility by means of quantity and time. Next, location of manufacturing and inventory facilities has an important effect on delivery punctuality. In general, overall configuration of global supply chain by means of number of echelons and length of chain, determines the reliability. A longer chain leads more uncertainties and mistakes which causes more cost and less accuracy correspondingly due to increased handling activities and transportation time.

Accepted and ordered quantity ratio is selected as a measurement although it seems it is related only with the right quantity and it ignores the other factors to make a reliable delivery. However, a delivery with less quality level than promised, or an unacceptable time delay will cause reject of the delivery which will reflect the outcome of the measurement.

Delivery frequency is defined as the amount of deliveries performed in the certain time unit (week, month, and year). As Kraemer (2010) stated in her paper, deliveries with high frequency is attractive to customers because it keeps inventory holding costs low. On the other hand, it will entail higher transportation costs (frequency effect). If the reverse scenario is considered which is low frequency, it will lead an increase in the number of

products to deliver which gives the opportunity to exploit the benefits of full container shipment as being more economical. Moreover low delivery frequency will bring less transportation cost which is favorable in global supply chains where distances are long. Therefore, in order to operate in most efficient and economical way is to prefer local distribution for frequent deliveries to be close to market and decrease the transportation distance.

3. **Demand Features**

Size of orders defines the average quantity of orders. It is an important factor for determination of supply chain configuration. As the transport unit is filled up with the order size, by benefiting from the increased efficiency, longer distances and direct delivery can be adopted. By this way, both economies of scale and extra costs caused by unnecessary handling and inventory costs would be avoided. However, if the saturation cannot be reached, placing intermediary facilities would help to decrease local distribution costs. This solution will put additional inventory costs but on the other hand, transportation cost of the upstream stages will decrease dramatically. Van Ryzin (2001) emphasizes that size of orders has also an effect on procurement and manufacturing cost due to potentiality of achieving significant supplier volume discounts or decreesed manufacturing set-up costs creating similar economies of scale.

Demand predictability is a measurement of the error in the demand forecast. Schnaars (1997) discussed many factors effecting demand forecast accuracy in his paper. Among them, 3 factors are specifically related with the supply chain characteristics which are time horizon, product type and level of aggregation. First of all, level of globalization increases, distances and correspondingly lead time increases. Most authors agree on that, the longer the time horizon, the less accurate the forecast. Locating the facilitations closer will increase the accuracy by shortening the time horizon of forecast. Second,

product type has a significant effect on prediction accuracy as Fisher (1997) stated in his paper that the average margin error for functional products is around 10% while it rises dramatically (between 60% to 100%) for innovative products. Finally, level of aggregation has an impact by pooling the demand variations from different areas. Therefore, an appropriate solution for unpredictable demands would be locating the distribution facilities closer to market although it will increase the inventory level.

Demand variability defines how the amount of demand varies over time. It represents how demand pattern is in relation with average demand. High variability increases cost, because high levels of safety stock and additional pipeline is required in order to cope with this fluctuation. Demand volatility is highly correlated with product type. According to Fisher (1997), innovative products have higher demand variability; therefore, it requires more responsive and agile supply chain. On the other hand, demand volatility is one of the key factors for centralized configuration due to relatively decreasing the impacts of variation by pooling. Demand volatility should be watched out and possible negative outcomes especially bullwhip effect should be avoided. As globalism level of a firm increases, the influences of demand variation is observed more because of long lead times increasing the risk of stock out and significant reductions in service level.

Market size refers to the penetration rate for the specific category of the product. A global company can exploit economies of scale more because of the potential market size for globally generic products. However, to compete with local firms, it has to be responsive to local customer needs, too (Cohen and Mallik, 2009). As the dimension of market increases, global sourcing and manufacturing takes more place due to reduced purchasing and operating costs.

Domestic market strength identifies the ratio between the demand level in domestic market and the global demand of a firm. Delocalize production processes depends not only on production and trade costs but also on the potential size of the domestic/regional market (Nicita, Ognivtsev, Shitotori (2011). As domestic market strength increases, domination in homeland increases as well compared to worldwide activities. On the other hand, if the company operates in a global level without any dominance in domestic market, facilities should be located overseas in order to be closer to the foreign market.

4. **Supply Features**

Endowment of purchased items defines the availability of resources. From resources point of view, some countries/regions have geographical, technological or underground sources advantages and availability, while some of them face with scarcity and risk of "running out". In this case, manufacturing facilities should be located overseas near suppliers in order to have easier and cheaper access to the sources. According to Alonso, Field, Gregory & Kirchain, there are three different possible actions against material unavailability which are related to technological, geographic and operational outcomes that are explained below:

1. Technological: Supply chain stakeholders may redesign their products to use less or substitute materials.
2. Geographic: The upstream supply chain may reconfigure to tap into new sources
3. Operational: Downstream firms may alter inventory practices or work to recover alternative materials streams.

When it is not possible to redesign the product which is not so unlikely such as food products (e.g. coffee, cacao), only option is to source from other regions where the material is available.

Sources quality is a similar driver with endowment of purchased items since low quality (such like low availability) directs firms to seek out foreign locations aiming to reach higher quality supplies. Quality standards became one of the key elements in value chain. With increasing product differentiation, ensuring quality became a critical element of market success (Gerrefi and Lee (2012)). The quality of products obtained from the domestic market may not meet the requirements of buyers. The quality of domestic goods may not be sufficient for the manufacturers to sell their products to international markets where higher standards may apply. In addition to the quality of the goods themselves, maybe the supplier cannot provide satisfactory warranties or after-sales services to the manufacturers. (Jiang, Tian (2010). Moreover, cost factor can support this choice as well if the same or higher quality is available for a better cost in foreign regions. Therefore, a company chooses to source globally from foreign sources when domestic resources are not satisfying the quality standards of the firm or if there is any better option offering the same quality level with more appropriate price which will be still cheaper when transportation costs are included.

Competition of suppliers is an instance that influences the purchasing cost since the competition level is highly affecting factor of the price. As Jiang & Wang (2010) suggest in their article, in a supply channel, there are three main competitive forces interact with one another to affect the price and quality which are (1) the direct competition that is each supplier produces the same component, (2) the indirect competition among the suppliers producing the set of complementary components needed for assembling the final product, and (3) the vertical interaction between the assembler and the component suppliers. In their study, it is shown that in a supply chain, the independent suppliers face with those competitive forces which results in taking decisions and improvements regarding price, quality and performance. Since, measuring the price and assessing it if it is fair in terms of the quality and availability of it is difficult, evaluation of competition of

domestic suppliers can be the driver in order to estimate the economic performance of the purchased items. Therefore, as the competition level increases within domestic suppliers, sourcing should be in favor of them particularly if the price is the main driver.

5. **Environment Features**

Exchange rate can be defined as the price of one country's currency expressed in another country's currency which is taken as American dollar in most of the financial papers. It is uncontrollable and has significant effect on companies' profitability. Zsidisin (2003) states that currency fluctuations carry a big supply risk because of having an important effect on Earnings Before Interest and Taxes (EBIT). It is one of the reasons for preferring operating globally in order not to be dependent on one country's exchange rate trend and decrease the risk by distributing it. Concerning this, hedging is one of the solutions to eliminate or at least mitigate the risk of currency fluctuation. Berger (2004) proposes dual sourcing against the risk, however, warning that this strategy will require more investment than single sourcing. Moreover, hedging will require assuring same quality and servicing level across multiple facilities and supplying chain partners. In brief, global supply will require higher investments while offering a great benefit which allows companies to control the situation when an unexpected change happened in exchange rate.

Beside the fluctuation risk of currency, strength of an exchange rate is also a strong factor affecting the decision to make supply, manufacturing or distribution operations in that country. A weak currency might offer much cheaper offers in terms of supplies and manufacturing than the domestic market offers as well as it may decrease the labor cost for manufacturing.

Labor quality refers to how skilled the workforce is. Skilled workers are characterized by a higher level of education, having often been through specializing courses in order to

perform more complex activities. These are the workers which effectively create economic value for the organization, especially for their ability to develop and produce innovative goods, and thus are particularly important for companies working with non-commodity products. Therefore, organizations must assess whether there is availability of skilled workforce in their homeland according to their needs. Alternatively, they must consider bringing the adequate workers from abroad or even establishing facilities in other countries where the offer of skilled workers is more abundant.

Labor cost refers to the average expenditures with workforce, which is straightly connected to the availability of workers in the market. The higher the offer of workforce, fewer workers will be willing to receive to work, and thus the less labor costs organizations will face. Labor cost is considered as one of the most significant enablers to operate on global level. Labor costs compose a relatively high share in manufacturing, handling and order processing costs and depend on the productivity, whereas the latter is generally inversely related to labor costs (E. Hong and M. Holweg, 2002). Therefore, consisting of mostly companies operating in labor intensive industries, can gain drastic cost savings by moving their production to countries with low labor cost.

Import tariff and quotas: Import tariff is the tax imposed on imported goods or services and quotas are the restrictions the quantity of imports. It is worth to note tariff rate quotas (TRQ) as well, which are two level tariffs, with a limited volume of imports permitted at the lower “in quota” tariff and all subsequent imports charged the (often much) higher “out of quota” tariff (Ingco 1996, OECD 2001). These tools are established in order to shape trade policy of a country. Tariff and quotas are imposed by governments in order to either raise revenue from trade or to protect domestic production from foreign competitors. A high tariff or a low quota put a barrier against foreign producer to export its goods. Therefore, this obstacle is achieved by moving the

facility within the borders and by this way being excluded from those barriers. These two drivers are the factors affect the companies' globality level of their operations.
Within an empirical study conducted by Helpman, Melitz & Yeaple (2003), firms which are serving foreign markets are analyzed in order to relate the company and sector feature with the selection of produce in the market or export to the market. The result is that the most productive firms in the group choose to invest in foreign markets while the less productive firms choose to export. As a result, it predicts that foreign markets are served more by exports relative to FDI sales when trade frictions are lower. We can conclude that, companies operating in big scale will prefer operate in global level in order not to be restricted by those additional costs.
Moreover, free trade areas such as EU and NAFTA which eliminates or reduces the tariff, quotas other restrictions between the signatories, might be the key factor to move facilities and change configuration in the direction of more globalized level in order to take the advantages of possible benefits.

Duty drawback rate is used in order to reduce or eliminate the duties paid on imported intermediaries or raw materials that are used production of exports (O. Cadot et al., 2003). They are used in highly protected, developing economies in order to provide exporters with imported inputs at world prices, while still protecting the final good producers from the worldwide competition (Ianchovichina, 2004). Companies should protect themselves against this factor by allocating the part of the manufacturing activities abroad. By this way, they can import and re-export the goods so as to reduce cost of duty refund.

Tax incentives states a deduction, exclusion or exemption from a tax liability, offered in order to encourage or support specific courses of action such as investment in capital goods for a given time period. Regarding that tax rates has an important effect on after

tax profit, by establishing the global facilities and therefore the operations in the countries with lower tax rate or having advantageous incentives for investments drives a company to operate there in order to enjoy higher net profit. In order to exemplify, it is not a coincidence that in 1985–94 foreign direct investment grew in the Caribbean and South Pacific which were tax heavens and Ireland's tax incentives have been recognized as key in attracting international investors over the past two decades (Morisset, 2003). Moreover, the effectiveness of tax policy and incentives depend on the companies' activity level and its motivations for investing abroad. For example, tax incentives seem to be a crucial factor for mobile firms or firms that operate in multiple markets because they can exploit better the different tax regimes across countries (Morisset et al. (2000)).

Political stability has critical importance on the decision of operating in the given country. Political instability is likely to shorten decision makers' horizons, moreover, it may lead to more frequent switch of policies which creates volatility (Zouhaier & Kefi, 2012). Therefore politically instable countries can lead loss or reduction of production which may cause huge loss in profit which is less attractive and more costly to operate in those particular countries. Furthermore, security concerns and changes in regulatory environment or regime, may affect firms long term plans unfavorably and even cause big troubles, which makes companies to avoid investing or operating in unstable countries due to possible undesirable outcomes.

Existing Infrastructure is an important factor for supply chain design decisions. It is evaluated with from two perspectives. First one is transportation infrastructure, transport modes availability and reliability such as level of development of roads, interchanges and junctions and the availability of loading ports and storage facilities, etc. Second one is the level of telecommunication development and market penetration.

Concerning the first parameter, operating in global level, requires higher lead times and higher costs depending upon higher distances that leads utilizing more than one transport mode. Selecting the most efficient and cost saving mode is an important determinant for companies among those possible combinations of road, ocean and air. Moreover, poor infrastructure of the country will require more investment and will be more costly to maintain operations and transportation activities compared to countries with more developed infrastructure. E. Hong and M. Holweg (2002) states that nowadays there is little reason for production cites to be near natural resources or transport hubs for being easily supplied with goods, therefore the possible effect of the transport infrastructure development is the densification of firms in the vicinity of the infrastructure.

Transfer price is the price of a purchase of product or service from another business unit or subsidiary of the same company. These prices are intra-company charges and are not transparent for the information of outsider firms then the company itself. It is an important factor due to influencing the income tax paid, and the variations in transfer prices may affect the after tax profitability of a company due to different tax policies in different countries and this situation's impact on transactions within each other

Environmental concerns and regulation refers the degree of the environmental concerns to conform. Different countries have different levels of regulations which shape both the design and operational decisions of a supply chain in order to conform to emission quotas, sewage purification and wastes recycling requirements. According to Xing and Kolstad (1998), strong regulations leads; (1) drive up in production costs by requiring certain equipment; (2) decrease waste disposal capacity; (3) prohibit certain factor inputs or outputs; that in all of the cases, the bottom line of production cases are increased. It will obviously have strong influence on firms' decisions of facility location.

Fame of the manufactured country: Some countries are famous with specific features, such as Italy and France with fashion, Switzerland with chocolate and United States with technology. Producing goods in those related countries add value to the product, because of increasing reliability of the design/production/creativity quality of the products. It provides an identity to the brand, therefore, it is generally preferred by exclusive brands. Hence, companies trying to increase their brand perception by customers may stay local in terms of production in order to enjoy the benefits of its label written “Made in … “.

Chapter 3 - Objectives & Methodology

3.1 Objectives and research questions

The main objective of this work is to develop a decision making support model to help the top management of multinational companies in FMCG industry order to be able to take the strategic decision to source the components locally or globally and also whether to produce in local production plants or in global ones.

And in order to achieve these main objectives we have some sub objectives:

1- Identify the drivers which can have an effect on the strategic location decision of sourcing and manufacturing.
2- Analyze the effect of the selected drivers on the different decision criteria.
3- Make case study analysis by collecting the actual data for the identified drivers for multinational companies operating in FMCG industry..
4- Use the data obtained from case studies in order to validate the model.

Research questions:

- **Q1:** What are the main drivers affecting the strategic sourcing and manufacturing decision (Local VS Global)?
- **Q2:** How these drivers can affect the strategic sourcing and manufacturing decision (What is the influence of each driver)?
- **Q3:** What is the relationship between the drivers and the supply chain configuration (How to develop the model)?

3.2 Research methodology:

Phase 1: Model preparation

In this phase, the drivers used in the model were identified and classified into 3 different categories:

1- **Common drivers**: Drivers which have influence on both sourcing and manufacturing strategic location decision.
2- **Sourcing drivers**: Drivers which can only have influence on the sourcing decision (Local Vs Global)
3- **Manufacturing drivers**: Drivers which can only have influence on the manufacturing decision (Local Vs Global)

Then, analysis of the influence of each driver was made in order to understand the influence of the drivers on the sourcing and manufacturing decision (Local Vs Global)

Phase 2: Initial model development

In this phase, the scoring system was designed based on Local Vs Global scale as explained below:

Each driver will have its unit of measure and according to its value in this measure; it will be given a score 0, L1, L2, G1&G2.

0 (Irrelevant) → The driver is irrelevant in taking the local VS global decision

L1 (Local advantage)→ Based on the value of this driver it is **recommended** to go for the local configuration.

L2 (Local superiority)→ Based on the value of this driver it is **strongly recommended** to go for the local configuration.

G1 (Global advantage)→ Based on the value of this driver it is **recommended** to go for the global configuration.

G2 (Global superiority)→ Based on the value of this driver it is **strongly recommended** to go for the global configuration.

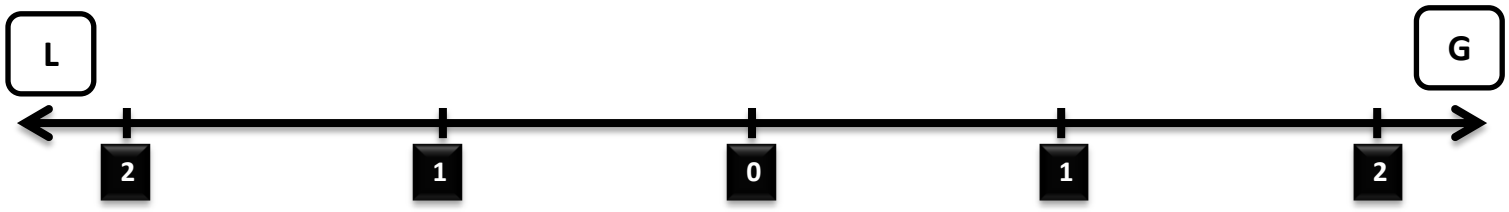


Figure 9 - Local Vs Global scoring axis

Then based on the mentioned scoring concept, the initial model was developed.

Phase 3: Case study analysis

This phase is related to collection of the real data of multinational companies operating in FMCG industry. This data will be used later to develop the final version of the model and to validate it.

The companies under study are Nestlé S.A, Unilever Food, Barilla S.p.A., Colgate-Palmolive, Carlsberg Beer, Coca-Cola Beverage, Lindt & Sprüngli, Kellogg's Cereal, Absolut Vodka, Chicco Toys, Lego, Zara, BasicNet Group, Heineken NV, PepsiCo, H&M

Phase 4: Quantitative analysis

After building the model and completing the list of drivers and defining its influence on the sourcing or manufacturing strategic location decision, it was clear that not all the drivers have the same level of influence on taking the strategic location decision for sourcing and manufacturing.

So, the correlation analysis was used in this phase to define the weight for each driver in the model based on the actual data of 9 companies in the FMCG (Fast Moving Consuming Gooods) industry. (Nestlé S.A, Unilever Food, Barilla S.p.A., Colgate-Palmolive, Carlsberg Beer, Coca-Cola Beverage, Lindt & Sprüngli, Kellogg's Cereal, Absolut Vodka)

Phase 5: Final model development

In this last phase the final model was developed after adding the weights to each driver (Which is the result of correlation analysis) and was validated using the data of other 7 companies (Chicco Toys, Lego, Zara, BasicNet Group, Heineken NV, PepsiCo, H&M) in the same industry to have the final version of the model

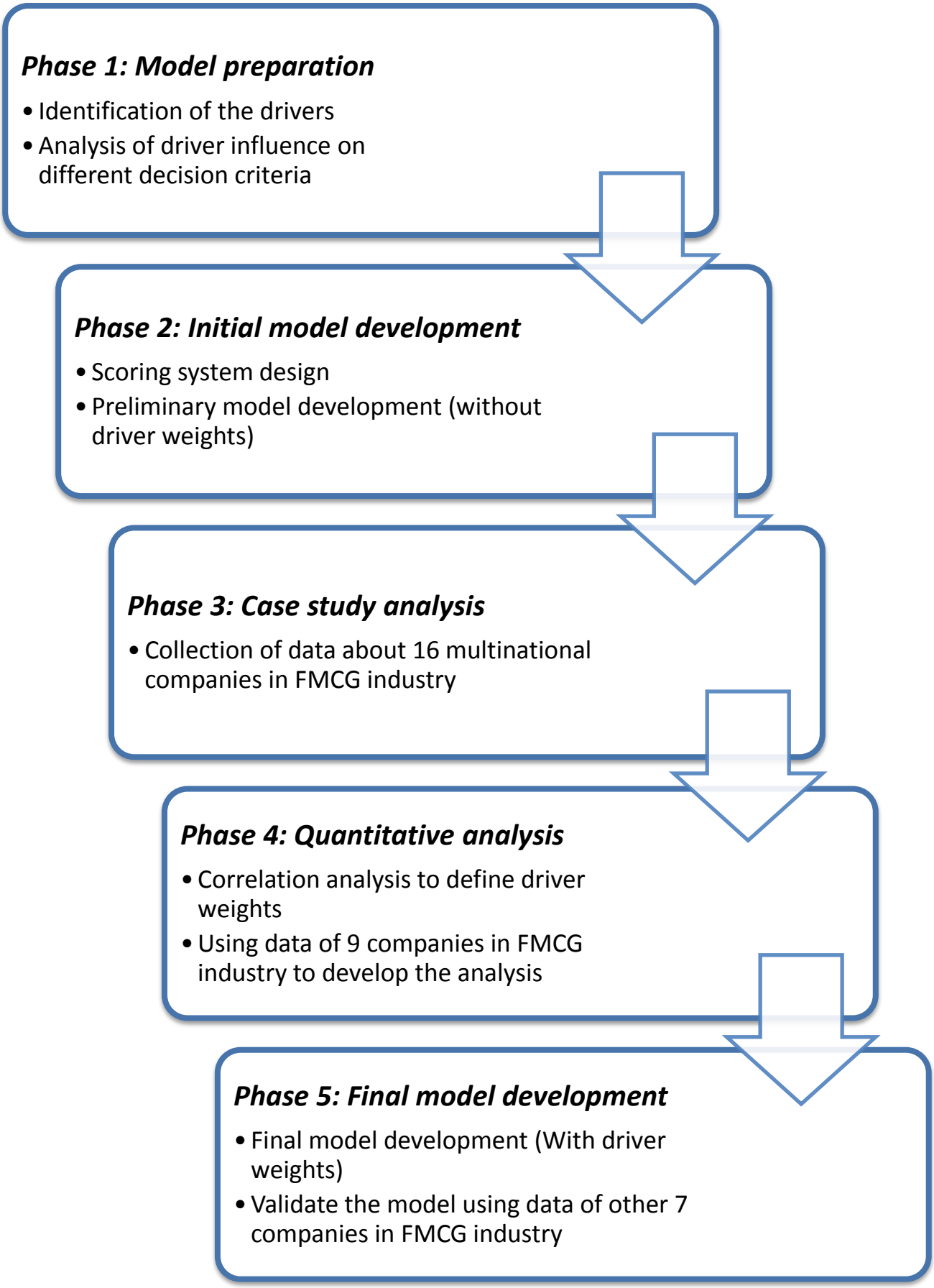


Figure 10 - Research methodology

Chapter 4 - Model description

4.1 Definitions

Local sourcing: local sourcing indicates the raw materials, components and sub-assemblies are transported from suppliers to plants within the borders of a country or a region.

Global sourcing: global sourcing is when the purchased items are sent from suppliers to manufacturing sites across different geographical regions.

Local manufacturing: the local manufacturing represents the production facilities are established in a country or a region. (Usually the country where the headquarters is located)

Global manufacturing: means that the production facilities are located in different geographical regions worldwide.

So, in this work I am aiming at building a strategic general model which links between different drivers and different configuration decisions (Sourcing and Manufacturing) and it suggests a recommended supply chain configuration based on the values of the related drivers.

4.2 Scoring system

Each driver is going to have its indicator and unit of measure (as it will be explained later with more details) and according to the value of the driver in this measure; it will be given a score 0, L1, L2, G1&G2.

0 (Irrelevant) → The driver is irrelevant in taking the local VS global decision

L1 (Local advantage)→ Based on the value of this driver it is **recommended** to go for the local configuration.

L2 (Local superiority)→ Based on the value of this driver it is **strongly recommended** to go for the local configuration.

G1 (Global advantage)→ Based on the value of this driver it is **recommended** to go for the global configuration.

G2 (Global superiority)→ Based on the value of this driver it is **strongly recommended** to go for the global configuration.

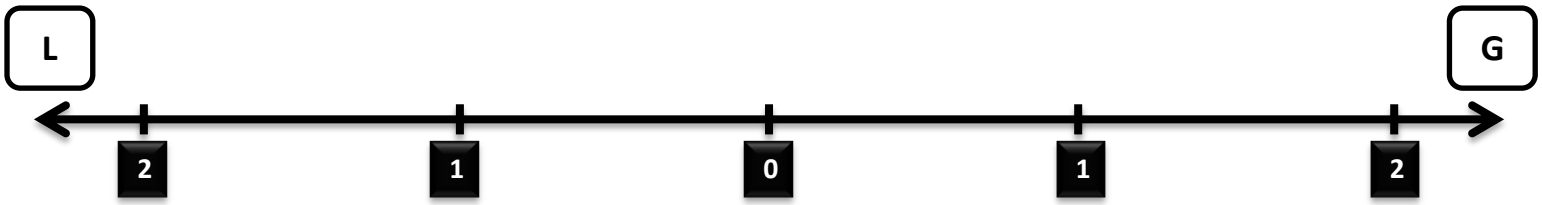


Figure 11 - Local Vs Global scoring axis

In the following graph we can see a virtual example about a possible distribution of the sourcing drivers across the horizontal axis of Local sourcing Vs Global sourcing

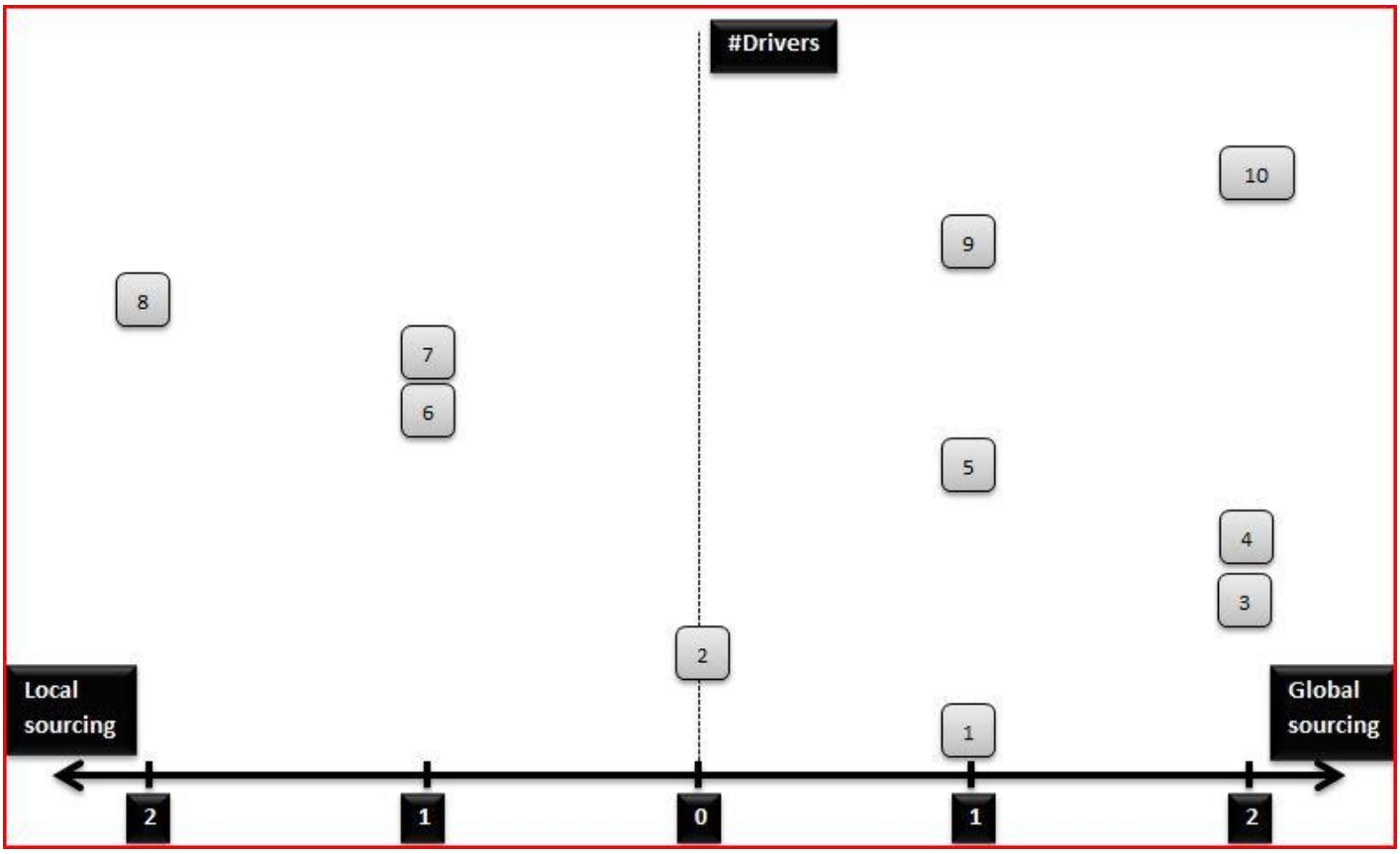


Figure 12 - Example of scoring system for sourcing drivers

4.3 Drivers' classification

In the model, 28 drivers affecting the strategic configuration of the entire supply chain system have been identified and classified into three categories based on the influence of the driver on the supply chain configuration into 3 categories:

1- **Common drivers**: Drivers which have influence on both sourcing and manufacturing strategic location decision.

2- **Sourcing drivers**: Drivers which can only have influence on the sourcing location decision (Local Vs Global)

3- **Manufacturing drivers**: Drivers which can only have influence on the manufacturing location decision (Local Vs Global)

4.4 Common drivers

1- Product variety

Indicates the amount of product codes that a company has. A company is more likely to purchase the items from other regions when the domestic suppliers are only able to provide part of them, because the large number of product codes may need more diversified raw materials, components and sub-assemblies (J. R. Smith, 1999). With regard to the distribution stage, the global transportation cost could be higher than local transportation, since a wide range of products implies a higher level of stocks and then a higher maintenance cost (S. Chopra, 2003).

Driver influence

The product variety has the effects on the globalization of sourcing stage. An increasing in the variety of the products offered leads to a company has to face the risk of lack of required raw materials in domestic suppliers, and causes an increase in the total supply chain costs due to more expense on inventory carrying cost and material handling cost. Therefore and theoretically, the criticality value of the driver rises under the case of great product variety.

Driver measurement

Number of product codes in company portfolio

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Product variety	Number of product codes in company portfolio	High (>1000)	Global superiority	-	2	-	2
		Medium-High (700:1000)	Global advantage	-	1	-	1
		Medium (400:700)	Irrelevant	-	-	-	-
		Medium-Low (100:400)	Local advanatage	1	-	1	-
		Low (<100)	Local superiority	2	-	2	-

Table 6 - "Product variety" summary table

2- Technology level

Indicates the innovation level of the products that could be classified into functional and innovative goods (M. L. Fisher, 1997). The innovative products, in particular the digital equipment, can adopt global sourcing in order to take advantage of the technology endowment of different countries to obtain the components and sub-assemblies (B. C. Amtzen et al., 1995).

Driver influence

Technology level affects the globalization of the supply chain structure. An increasing in technology level could lead to the increase in supply chain costs. The innovational products require the high quality, even scarce materials that could be sourced abroad in general nevertheless the high procurement cost. Moreover, the production should be operated by skilled labors that are charged higher than ordinary workers. In addition, in order to shorten the time to market and decrease the risk of obsolescence, the fast transportation mode need to be adopted even if the cost would be high.

Driver measurement

The technology level is measured in a subjective way by taking into account the competition level of the whole industry sector a firm is involved and the market position of the firm.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Technology level	Subjectively	High (Innovative)	Global superiority	-	2	-	2
		Medium-High	Global advanatage	-	1	-	1
		Medium (Hybrid)	Irrelevant	-	-	-	-
		Medium-Low	Local advantage	1	-	1	-
		Low (Functional)	Local superiority	2	-	2	-

Table 7 - "Technology level" summary table

3- Order cycle time

Is defined as a time bucket from the moment of arrival of customer order till the moment of receipt of the goods by the customer. With regard to the manufacturing, locating the plants closer to the market is able to allow the manufacturer to respond the local variations and change the production planning immediately in order to reduce the total cycle time (A. Harrison and R. van Hoek, 2008). Moreover, taking into account the direct impact of cycle time on the distribution stage, local distribution can reduce the cycle time significantly compare to the global transportation due to the shorter distance from plants to market (M. Christopher and D. Towill, 2001).

Driver influence

Cycle time affects the localization of sourcing and manufacturing in a supply chain structure. The short delivery cycle time is able to improve the customer's satisfaction, therefore operating the production close to the market and local distribution is an effective way to reach this target. The longer the cycle lasts, the lower supply chain cost afforded. When the cycle time increases it is obtained a reduction in transportation costs, because a company does not need to choose fast transportation mode that are costly.

Driver measurement

Time duration between receiving customer order and completing delivery

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Order cycle time	Time duration between receiving customer order and completing delivery	Short (< 3 Days)	Local superiority	2	-	2	-
		Medium-Short (3:6 Days)	Local advantage	1	-	1	-
		Medium (7:10 Days)	Irrelevant	-	-	-	-
		Medium-Long (11:14 Days)	Global advanatage	-	1	-	1
		long (> 14 Days)	Global superiority	-	2	-	2

Table 8 - "Order cycle time" summary table

4- Demand predictability

Represents the average margin of error in the demand forecast. The effect of demand predictability on supply chain design is widely discussed. With regard to the sourcing and distribution stages, the long supply chain suffers the heavier loss stemming from the forecasting errors than the compressed pipeline that moves the different facilities closer (M. Christopher and D. Towill, 2001).

Driver influence

Demand predictability has impacts on globalization of sourcing and manufacturing, since the advanced ability on demand predict can mitigate the risks on these two stages. A company spends less on supply chain cost in case the demand predictability is high. If the demand cannot be predicted in a correct way, additional unexpected deliveries have to be done in order to avoid stock out, and with an increasing in transportation costs. Likewise, the inventory costs would increase if a high level of uncertainty of future demand is presented, because inventory level tends to increase in order to cope with the unexpected demand.

Driver measurement

This driver should be measured on the basis of the average margin of error in demand forecast, but there is trouble on data collection as this method. Therefore, this variable is measured in a subjective way by considering the seasonality of the demand and the adoption of integrated information system in a company.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Demand predictability	Subjectively measured	High	Global superiority	-	2	-	2
		Medium-High	Global advanatage	-	1	-	1
		Medium	Irrelevant	-	-	-	-
		Medium-Low	Local advantage	1	-	1	-
		Low	Local superiority	2	-	2	-

Table 9 - "Demand predictability" summary table

5- Demand volatility

Is a measure of overall demand variability. It gives a representation of how variable the demand pattern is in relation to the average demand. By taking into consideration the bullwhip effect on the entire supply chain, the slight demand change of finished products leads to the significant variability for the procurement. Therefore, the demand volatility does not only affect the sourcing process, but also influence distribution stage, since a great volatility shows significant reductions in service level and requires the shorter delivery cycle time (A. Harrison and R. van Hoek, 2008; R. H. Ballou, 1993).

Driver influence

Demand volatility influences the decision of localized supply chain structure, in particular on the sourcing and distribution processes. The products with high demand variability prefers the local procurement in order to mitigate the risk of late supply stemming from global sourcing whose delivery distance is quite long. Likewise, the manufacturing facilities should be located near to the distribution region to reduce the transportation time needed.

An increasing in demand volatility results in the increase in supply chain costs. Firstly, the high demand volatility could bring the additional transportation costs due to the unexpected deliveries. Secondly, the inventory costs would be high because a company has to increase the inventory level in order to mitigate the risk of stock out.

Driver measurement

Variance of the demand in unit time (year)

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Demand volatility	Variance of the demand in unit time (year)	High (>20%)	Local superiority	2	-	2	-
		Medium-High (16:20%)	Local advantage	1	-	1	-
		Medium (11:15%)	Irrelevant	-	-	-	-

		Medium-Low (6:10%)	Global advanatage	-	1	-	1
		Low (<5%)	Global superiority	-	2	-	2

Table 10 - "Demand volatility" summary table

6- Dimension of the market

Indicates level of products penetration around the world. In order to overcome the competitive pressure, many firms have developed both domestic and foreign markets. On the other hand, the companies often select the suppliers and set up the operations in some places where the firms sell the products in order to reduce the total purchasing and operating costs. In this case, the global sourcing and global manufacturing are significant mutual related. Therefore, the dimension of the market is a critical motivator for the global sourcing and manufacturing (B. L. MacCarthy and W. Atthirawong, 2003).

Driver influence

Dimension of market motivates the globalization of sourcing and manufacturing. The supply chain structure becomes more complex when the dimension of market increases, because a company has to improve the management and control on the abroad suppliers and plants. Therefore, the supply chain costs increases with the augment of market dimension.

Driver measurement

Number of countries that sell the company's products.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Dimension of market	Number of countries that sell the company's products.	Local (only in home country)	Local superiority	2	-	2	-
		Regional (Countries in same region)	Local advantage	1	-	1	-
		Continental (One continent)	Irrelevant	-	-	-	-

		Global presence (<100 country)	Global advanatage	-	1	-	1
		Global presence (>100 country)	Global superiority	-	2	-	2

Table 11 - "Dimension of the market" summary table

7- Competition level

Describes both the competitiveness of the industry sector that a company involves, and the competitive advantages a company has. The overall competition level in a specific industry sector is affected by multiple factors, such as the number of competitors, the innovation rate, and the customers demand level, and so on. On the other hand, a firm can provide more diversified products with better service, lower price and higher quality level for improving the competitive position. In order to reach this objective, a company could adopt global sourcing to reduce the purchasing cost, or locate the operations across the regional borders in order to reduce total operations cost and better access to the foreign markets (J. Cho and J. Kang, 2001).

Driver influence

Competition level affects the whole supply chain system, and facilitates the globalized supply chain structure. A company intends to source the materials and operates the production abroad in order to lower the product's price. On the other hand, in order to attract and maintain more customers, a company has to adopt fast transportation mode to deliver the products aiming at improving the service level. Therefore, considering the management could be more complex under the case of globalized sourcing and manufacturing, and higher cost has to be afforded by company, we consider that an increasing in competition level a firm is facing causes the increase in supply chain costs.

Driver measurement

Subjective measure by considering the competition level of the industry sector and the market position of a company.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Competition level	Subjectively measured	High	Global superiority	-	2	-	2
		Medium-High	Global advanatage	-	1	-	1
		Medium	Irrelevant	-	-	-	-
		Medium-Low	Local advantage	1	-	1	-
		Low	Local superiority	2	-	2	-

Table 12 - "Competition level" summary table

8- Import tariff

Is the tax or duty that imposed on certain imported goods or services to the firm when a product is imported into a nation (B. C. Amtzen, et al., 1995). The import duty is used to increase government revenue and protect domestic industries from foreign competition. Whereas, regarding to the global sourcing, the charged import duty is a barrier because the purchasing cost is increased due to the tariff.

Driver influence

The import tariff affects the localization of the sourcing and manufacturing processes. A company prefers the local strategy along with the increasing of import tariff charged by domestic government, because such strategy can avoid the addition cost stemming from the import of raw materials and finished products. Therefore, an increasing in import tariff brings the augment of supply chain costs.

Driver measurement

The import tariff is launched by government, and can be checked on national customs website.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Import tariff	Official governmental tariff	No tariff	Global superiority	-	2	-	2
		Low (<5%)	Global advanatage	-	1	-	1

		Medium (5:10%)	Irrelevant	-	-	-	-
		Medium-High (11:15%)	Local advantage	1	-	1	-
		High (>15%)	Local superiority	2	-	2	-

Table 13 - "Import tariff" summary table

9- Quality of infrastructure (Home country)

Includes the two parameters: 1) transportation infrastructure, transport modes availability and reliability, e.g. level of development of roads, interchanges and junctions, availability of loading ports and storage facilities, etc.; 2) level of telecommunication development (B. L. MacCarthy and W. Atthirawong, 2003). If the infrastructure is poor, the firm has to invest more on that in order to support the operating activities, or move the operations to other countries with better infrastructure.

Driver influence

Quality of domestic infrastructure affects the localization of manufacturing. A firm is likely to conduct production in a country whose infrastructure is advanced. The local manufacturing could be adopted in case the quality of domestic infrastructure is high. Otherwise, the production site has to be moved abroad. In general, the investment on infrastructure is provided by government, while the cost of production movement should be afforded by the company. Therefore, the high quality of domestic infrastructure causes the decrease of total supply chain costs. Also, the logistics infrastructure is very important to choose the best sourcing locations

Driver measurement

Quality of overall infrastructure index – World Economic forum.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Quality of	Quality of	High (>5)	Local superiority	2	-	2	-

infrastructure	overall infrastructure index	Medium-High (4.6 : 5)	Local advantage	1	-	1	-
		Medium (3.6 : 4.5)	Irrelevant	-	-	-	-
		Medium-Low (3 : 3.5)	Global advanatage	-	1	-	1
		Low (<3)	Global superiority	-	2	-	2

Table 14 - "Quality of infrastructure" summary table

10- Country of origin effect

Nowadays, in this modern and competitive era, in which global marketing is growing day by day, country of origin, as a significant parameter, has been studied in much research, and it is shown that this factor influences consumer behaviour and also their purchasing. The other point that studies demonstrate is that people care about which country products come from and where they are made and consider these factors when evaluating the quality of products, (Parkvithee & Miranda, 2012). (Rezvani et al, 2012)

A few examples of such product–country images are Columbian coffee, Swiss watches, US appliances, Japanese electronics and German automobiles. Because of the product–country images consumers hold, and their sensitivity to COO, COO is believed to be one way of enhancing brand equity. (Keller, 1993; Shocker et al., 1994)

Sensitivity to country of origin varies by product category. It is strongest for durable goods and luxury goods and weakest for "low involvement" product categories such as shampoo and candy.

For some product categories the Country Of Origin effect is extremely important like in the case of luxury products. In this sector, the internationalization of business is inseparable from its economic development in recent years. In this context, brands (especially Italian and French) conventionally use the argument of COO in their international communication strategies. (Godey et al., 2012)

Driver influence

A good starting point to take into account consumers' perspective is to investigate how decisions regarding various sourcing locations would affect consumers' product percep-tions and attitudes. This is because sourcing locations as indicated earlier represent important decisions in global sourcing and the country of origin (COO) researches has demonstrated that "Made in" labels affect consumers' product evaluations and purchase. (Li et al)

It should be taken into consideration that multiple sourcing location countries has transformed COO into a multifaceted construct (Nebenzahl, Jaffe, and Lampert, 1997; Ozsomer and Cavusgil, 1991; Samiee, 1994). That is, the COO construct may now manifest itself through multiple facets such as "COO of design (COD)" (e.g., Designed in Japan), "COO of assembly (COA)" (e.g., Assembled in Mexico), and "COO of the corporation (COC)" (e.g., IBM known as a U.S. firm) as well as "COO of parts and components (e.g., Parts Supplied from China)."

For example, a Sony television may now be designed in Japan, have parts and components supplied from China, and be assembled in Malaysia. Pontiac LaMans is designed in Europe, manufactured in South Korea, and sold in the U.S. as a GM car.

Driver measurement

It is difficult to measure the COO effect in a quantitative way using numbers. However it can be classified subjectively based on the scale of Low, Medium-low, Medium, Medium-high, High based on the product category of the company and the behavior of the target customer's segment.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Country of origin effect	Industry sector (Subjective)	High	Local superiority	2	-	2	-
		Medium-High	Local advantage	1	-	1	-
		Medium	Irrelevant	-	-	-	-
		Medium-Low	Global advanatage	-	1	-	1
		Low	Global superiority	-	2	-	2

Table 15 - "Country of origin effect" summary table

4.5 Sourcing drivers

11- Local availability of purchased items

Indicates the availability of the required materials, components and sub-assemblies in the home country of the company. Sometimes, the needed items could be scarce in the homeland. Likewise, as a result of the technology advantage and/or nature resource advantage, some items may only be provided in the specific countries or regions. In the two cases, a firm has to ask the overseas suppliers to obtain the specific items (J. M. Smith, 1999).

Driver influence

The availability of purchased in home country of the focal company affects the localization of sourcing. A company has to conduct procurement abroad if the required items are not available in home country, even if the procurement costs could be high due to the increase in transportation costs. Therefore, the increase in availability of purchased items in home country causes decrease in supply chain costs.

Driver measurement

This variable is measured subjectively on the basis of the endowment of the domestic suppliers to the main purchased raw materials, and the company's documents involving the risk of procurement.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Local availability of purchased items	Subjectively measured	High	Local superiority	2	-	2	-
		Medium-High	Local advantage	1	-	1	-
		Medium	Irrelevant	-	-	-	-
		Medium-Low	Global advanatage	-	1	-	1
		Low	Global superiority	-	2	-	2

Table 16 - "Local availability of purchased items" summary table

12- Competition of domestic suppliers

Represents a proxy of the overall domestic purchasing costs, since the competition is closely related to the price. In fact, the low item price is a very frequently considered criterion affecting a firm to select global suppliers (F. T. S. Chan et al., 2008; J. M. Smith, 1999). Since the price is a factor hard to be measured (due to the wide range of purchased items in a firm), the competition of domestic suppliers can replace it. The competition of domestic suppliers could affect the strategic sourcing decision when a company selects overseas suppliers due to the price advantage.

Driver influence

The level of domestic suppliers' competition has impact on the localization of material procurement. The fierce competition indicates the suppliers have to decrease the price in order to attract the buyers. Instead, if the number of suppliers is quite small that means the buyers would lose the power of bargain, and a company may search the abroad suppliers who can provide the purchased items with lower price. Therefore, an increasing in competition of domestic suppliers leads to the decrease of procurement costs and localized sourcing strategy.

Driver measurement

This driver should be measured based on the number of domestic suppliers that can provide items to focal company. However, it is hard to investigate the exact suppliers' quantity. Therefore, we use the five levels, from low to high, to indicate the number of domestic suppliers from small to large.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Competition of domestic supplier	Subjectively measured	High	Local superiority	2	-	2	-
		Medium-High	Local advantage	1	-	1	-
		Medium	Irrelevant	-	-	-	-

		Medium-Low	Global advanatage	-	1	-	1
		Low	Global superiority	-	2	-	2

Table 17 - "Competition of domestic suppliers" summary table

13- Quality of domestic sources

Is a critical variable affecting the sourcing decision, since the competitive pressure from the market forces the firms to improve the quality of their products and lower the cost (J. Cho and J. Kang, 2001). Acquiring high quality items by means of international purchasing can bring the competitive advantage to a firm, in particular in a mature market (J. M. Smith, 1999). A company is likely to pursue the foreign sources when the quality of the domestic resource is not able to reach the defined quality level.

Driver influence

Quality of domestic sources has impact on localization of sourcing. The buyers would like to adopt local sourcing strategy in case the domestic suppliers provide high quality items. Instead, global sourcing has to be implemented despite higher procurement cost due to the increase in transportation costs. Therefore, an increasing in quality of domestic source causes the decrease in supply chain costs.

Driver measurement

This driver is measured subjectively on the basis of the company's financial report and other documents. The majority of the investigated companies can receive the required items with high quality in home country mainly results from those firms are headquartered in advanced countries that possess the advanced technology in different industry sectors.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Quality of domestic resources	Subjectively measured	High	Local superiority	2	-	2	-
		Medium-High	Local advantage	1	-	1	-
		Medium	Irrelevant	-	-	-	-
		Medium-Low	Global advanatage	-	1	-	1
		Low	Global superiority	-	2	-	2

Table 18 - "Quality of domestic sources" summary table

14- Profit margin

Is a relation between the production cost and the price of the product sold and is expressed in percentage. In general, one of the benefits of global sourcing is to obtain the cheaper purchased items from overseas suppliers, despite the transportation cost could be higher, but the lower procurement cost can cover the loss of transportation cost. Therefore, global sourcing is a way to reduce the total supply chain cost and to generate higher profit margin or to ensure the company to obtain the pre-defined profit target.

Driver influence

Profit margin has impacts on the entire supply chain system, i.e. from scouring, manufacturing to distribution. More specifically, profit margin facilitates the globalized procurement and manufacturing, since the globalization is an efficient way to reduce the procurement costs and production costs in order to reach the targeted profit margin, whereas it encourages the localization of distribution stage, particularly for the high profit products, because the fast transportation mode and short delivery cycle time can restrain the cost of lost sale. In general, it is reasonable to say that the increase of profit margin causes an increasing in supply chain costs.

Driver measurement

$$\frac{Price\ of\ the\ product - Cost\ of\ the\ product}{Price\ of\ the\ product}$$

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Profit margin	Price of the product – cost of the product / price of the product	High (>50%)	Local superiority	2	-	2	-
		Medium-High (40:50%)	Local advantage	1	-	1	-
		Medium (30:40%)	Irrelevant	-	-	-	-
		Medium-Low (20:30%)	Global advanatage	-	1	-	1
		Low (<20%)	Global superiority	-	2	-	2

Table 19 - "Profit margin" summary table

15- Effect of existing SC network (Sourcing)

This driver in order to be more practical in applying the model as usually when deciding the supply chain configuration for a new product/plant the current supply chain network effect must be taken into consideration. (For example the long term agreements with the current global suppliers network may influence the model result towards the global option of sourcing)

However, this driver will be irrelevant for the Greenfield supply chain network design.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Effect of existing supply network	Company strategy	Local based	Local superiority	2	-	2	-
		Green field	Irrelevant	-	-	-	-
		Global based	Global superiority	-	2	-	2

Table 20 - "Effect of existing SC network" summary table

4.6 Manufacturing drivers

16-Risk of obsolescence

Represents a product's specific life cycle that can be measured in days, weeks, months, etc. The risk of obsolescence can be considered either as perishability, or as

the period of time that a product can be offered to a market. The global transportation pipeline requires extended delivery lead time, which increases the product's obsolescence risk (A. Harrison and R. van Hoek, 2008). With regard to the products with high risk of obsolescence, the cycle time of the entire distribution stage should be short in order to launch the products to market as quickly as possible.

Driver influence

The obsolescence period of product affects the localization of sourcing and manufacturing process. A high risk of obsolescence of products implies an increase in the supply chain costs. A product with short obsolescence period requires faster transportation mode in order to complete the distribution as soon as possible.

Driver measurement

Expected life time for a product to be demanded in market

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Risk of obsolescence	Expected life time for a product to be demanded in market	High (< 3 Months)	Local superiority	2	-	2	-
		Medium-High (3:6 Months)	Local advantage	1	-	1	-
		Medium (6:9 Months)	Irrelevant	-	-	-	-
		Medium-Low (9:12 Months)	Global advanatage	-	1	-	1
		Low (> 1 year)	Global superiority	-	2	-	2

Table 21 - "Risk of obsolescence" summary table

17-Completeness (IFR%)

Or item fill rate indicates the probability of having a product in stock when a customer's order arrives. Completeness is a challenge in the industries that the customer demand is very volatile and unpredictable, and a very crucial variable affecting the selection of the most appropriate supply chain structure, because it determines the overall delivery reliability within the network (A. Lovell et al., 2005). In order to maintain a satisfied item fill rate in the warehouse, or to replenish the stock

timely, the firm can locate the manufacturing facilities close to the market and adopt local distribution strategy.

Driver influence

Completeness (item fill rate) has the impacts on localization of sourcing and manufacturing processes. When this performance increases, the supply chain costs would decrease. The transportation costs increases in case the completeness is reduced, since the level of saturation of the transportation mean cannot be fulfilled. What is more, with an increase in the completeness, the cost of lost sale is decreased.

Driver measurement

(Number of orders - number of stock out)/ (number of orders)

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Completeness	(number of orders - number of stock out) / (number of orders)	High (98:100%)	Local superiority	2	-	2	-
		Medium-High (96:97%)	Local advantage	1	-	1	-
		Medium (92:95%)	Irrelevant	-	-	-	-
		Medium-Low (90:91%)	Global advanatage	-	1	-	1
		Low (<90%)	Global superiority	-	2	-	2

Table 22 - "Completeness " summary table

18- Corporate taxation schemes

Can be considered as the total domestic commercial tax rate that measures the percentage of a corporation's earning. Taking into consideration the tax rate has a direct effect on the after-tax profit (M. L. Fisher, 1997), the firm can pursue the higher net profit when set up the global operations in the countries with lower total tax rate.

Driver influence

Tax incentives and benefits indicate the total commercial tax rate in the home country of a company. This measure has impact on the globalization of manufacturing. The high tax rate compels a company to operate the business abroad in order to increase

the after-tax profit. Therefore, an increasing in total commercial tax rate causes the increase in supply chain costs.

Driver measurement

Total commercial tax rate - World Bank indicator

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Corporate taxation schemes	Total commercial tax rate	High (>50%)	Global superiority	-	2	-	2
		Medium-High (40:50%)	Global advanatage	-	1	-	1
		Medium (30:40%)	Irrelevant	-	-	-	-
		Medium-Low (20:30%)	Local advantage	1	-	1	-
		Low (<20%)	Local superiority	2	-	2	-

Table 23 - "Corporate taxation schemes" summary table

19- Political stability

Is a typical factor while making an assessment of international operating opportunities (B. L. MacCarthy and W. Atthirawong, 2003; S. Prasad and J. Sounderpandian, 2003). Companies are searching for regions with favorable investment climate and stable economic conditions, which are strongly supported by regulative and normative elements. Moreover, this driver also includes security concerns and regulations that are ensured on the national level. Changes in the regulatory environment and political regime are highly undesirable and unacceptable in the long-term perspective. Therefore, the government and political issues affect the firm to make the decision about operating abroad or local.

Driver influence

The domestic political environment affects a firm to make decision about manufacturing in home country or abroad. The stable political environment is a motivator for local manufacturing. Otherwise, political instability increases the risks and costs for a company, and compels the firm to operate business abroad in order to avoid the unsatisfied domestic political issues.

Driver measurement

Political stability index

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Political stability	Political stability index	High (7.5 : 10)	Local superiority	2	-	2	-
		Medium-High (6 : 7.5)	Local advantage	1	-	1	-
		Medium (4 : 6)	Irrelevant	-	-	-	-
		Medium-Low (2.5 : 4)	Global advanatage	-	1	-	1
		Low (0 : 2.5)	Global superiority	-	2	-	2

Table 24 - "Political stability" summary table

20- Stability of domestic currency

Can be defined as exchange rate against US dollar. This variable has been widely discussed on the topics of global supply chain and international operations because its large effect on the total operating cost (B. C. Amtzen, et al., 1995; B. L. MacCarthy and W. Atthirawong, 2003; M. L. Fisher, 1997). One of the aims of manufacturing is to reduce the total supply chain cost, which could be influenced by the exchange rate.

Driver influence

The strength of currency against the value of US dollar affects the globalization of manufacturing. By taken into account the US dollar is the most widely used currency in the global business nowadays, a company can mitigate the risk stemming from the loss of fluctuation on domestic currency that mean the unstable domestic currency value increases the financial loss in the global business. Instead, the stable currency's value can mitigate the loss, and decrease the supply chain costs. What is more, the stable currency facilitates a company to operate business abroad in order to pursue the low operation cost due to the less financial loss.

Driver measurement

$$\frac{\text{Minimum value of domestic currency against US dollar (In one year)}}{\text{Maximum value of domestic currency against US dollar (In one year)}}$$

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Stability of domestic currency	Minimum currency value / maximum currency value	Very Stable (>90%)	Global superiority	-	2	-	2
		Stable (80:90%)	Global advanatage	-	1	-	1
		Medium stability (70:80%)	Irrelevant	-	-	-	-
		Unstable (60:70%)	Local advantage	1	-	1	-
		Very unstable (<60%)	Local superiority	2	-	2	-

Table 25 - "Stability of domestic currency" summary table

21- Environmental regulations

Indicates the extent that how much the environment issue is considered. This driver affects the decision of global manufacturing (B. L. MacCarthy and W. Atthirawong, 2003). More specifically, different countries reshape both how supply chains are structured and how companies will seek efficient solutions in order to conform to emission quotas, sewage purification and wastes recycling requirements, e.g. energy efficient manufacturing and transportation solutions, waste treatment plants, etc. If the related legislation about the environmental issues and quality of life is severe in the homeland, the firm has to invest more in order to maintain the public relation or afford the potential fine, unless the firm moves the operations abroad.

Driver influence

Environment concern and regulation has direct impact on the strategic location decision about manufacturing. A company could afford less cost, and locate the manufacturing site in homeland if the domestic government provides moderate environment policy. Instead, a company has to invest more on the environment protection or move the manufacturing to the countries with weak requirements of

environment issues. Therefore, an increasing in environment concern and regulation causes higher supply chain costs, mainly on the operations cost.

Driver measurement

Environment Performance Index (EPI) – World bank

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Environmental regulations	Environment performance index (EPI)	High (>75)	Global superiority	-	2	-	2
		Medium-High (61:75)	Global advanatage	-	1	-	1
		Medium (46:60)	Irrelevant	-	-	-	-
		Medium-Low (30:45)	Local advantage	1	-	1	-
		Low (<30)	Local superiority	2	-	2	-

Table 26 - "Environmental regulations" summary table

22- Labor cost (Home country)

Indicates the affect of the labor's cost on a company. The importance is strongly related to the product characteristics and the company's strategy. This driver is one of the most motivators for the strategic manufacturing decision (B. L. MacCarthy and W. Atthirawong, 2003; S. Prasad and J. Sounderpandian, 2003). The large number of available work force could moderate the labor cost, and then reduce the cost of production. Otherwise, the higher labor cost has to be paid.

Driver influence

Labor's cost heavily affects the strategic manufacturing decision. A company prefers to operate the manufacturing in the country with low labor's cost. Global manufacturing could be conducted if the labor's cost is high in homeland. It is difficult to say if the importance of labor's cost stimulates an increasing in supply chain costs, whereas the total operating costs would be high in case the domestics labor's cost is high and the number of available labors is small, since a firm has to carry out the production abroad despite the high investment.

Driver measurement

Monthly Average wage in Purchase Power Parity (PPP) (US$/Month)

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Labor cost (Home country)	Monthly Average wage in Purchase Power Parity (PPP) (US$)	High (>3000 $/M)	Global superiority	-	2	-	2
		Medium-High (2500:3000 $/M)	Global advanatage	-	1	-	1
		Medium (1500:2500 $/M)	Irrelevant	-	-	-	-
		Medium-Low (1000:1500 $/M)	Local advantage	1	-	1	-
		Low (<1000 $/M)	Local superiority	2	-	2	-

Table 27 - "Labor cost" summary table

23- Labor quality (Home country)

Indicates the skill level of labor. This is a major motivation for manufacturing outside national borders (B. L. MacCarthy and W. Atthirawong, 2003). Skilled labor is the specialized part of labor force with advanced education, and they can create significant economic value, particularly for the innovative products, through the work performed. Therefore, with regard to the firms providing non-commodity products, it is more important to pursue well-qualified workers. In this way, if the skilled labor is not available in the homeland, the firm has to establish the facility abroad in order to access the high quality labor force.

Driver influence

Importance of labor's quality affects the globalization of manufacturing. A company has to afford higher cost for the high qualified labors in order to manufacture the innovational production with high quality if they are available in homeland. Otherwise, the manufacturing has to be implemented in other countries where the skilled labors are available, but the firm needs to afford higher investment for the overseas operation. Therefore, the supply chain costs are increased along with an increasing on importance of labor's quality.

Driver measurement

School enrollment, tertiary (% gross) - World Bank

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Labor quality (Home country)	School enrollment, tertiary (% gross) - World Bank	High (>60%)	Local superiority	2	-	2	-
		Medium-High (50:59%)	Local advantage	1	-	1	-
		Medium (40:49%)	Irrelevant	-	-	-	-
		Medium-Low (30:39%)	Global advanatage	-	1	-	1
		Low (<30%)	Global superiority	-	2	-	2

Table 28 - "Labor quality" summary table

24- Energy cost (Home country)

The cost of energy (Mainly focused on electricity) is an important driver to decide the best location for production as it may have a significant effect on the total cost of production.

Driver influence

In today's economy it's extremely important to monitor and control all production related costs especially when you have a lot of global competitors. So, moving production to the location where company can pay less money for energy can have effect on reducing the total product cost and hence to have a competitive price.

Driver measurement

Electricity pricing list published by wikipedia - by various sources

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Energy cost (Electricity)	Electricity pricing	High (>20 Cents / KWh)	Global superiority	-	2	-	2
		Medium-High (16:20 Cents / KWh)	Global advanatage	-	1	-	1
		Medium (11:15 Cents / KWh)	Irrelevant	-	-	-	-

		Medium-Low (6:10 Cents / KWh)	Local advantage	1	-	1	-
		Low (<5 Cents / KWh)	Local superiority	2	-	2	-

Table 29 - "Energy cost " summary table

25- Technology readiness (Home country)

It is important as well to measure the readiness of a country to facilitate the production and logistics activities by using the most updated technologies.

Internet, Mobile communication and other related services should be taken into consideration.

Driver influence

The availability of the required technology is necessary to complete the production process. So, the company must study carefully the technology readiness for the country suggested to host the production activities.

Driver measurement

Networked readiness index – World Economic Forum

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Technology readiness	Networked readiness index	High (>5)	Local superiority	2	-	2	-
		Medium-High (4.51 : 5)	Local advantage	1	-	1	-
		Medium (3.51 : 4.5)	Irrelevant	-	-	-	-
		Medium-Low (3 : 3.5)	Global advanatage	-	1	-	1
		Low (<3)	Global superiority	-	2	-	2

Table 30 - "Technology readiness" summary table

26- Strength of domestic demand

Describes the ratio between the demand level in domestic market and the overall demand worldwide in a firm. This variable determines the relative size of the domestic market (S. Prasad and J. Sounderpandian, 2003). A large value indicates that homeland is the dominant market. On the contrary, the overseas market is the critical target if the ratio is small. In fact, many multinational firms establish the overseas manufacturing facilities in order to have closer access to foreign market because of the large demand. Therefore, the firm inclines to select global manufacturing strategy when the overseas market overwhelms domestic market in order to provide better service due to that it is closer to the customers.

Driver influence

The strength of domestic demand has impact on the globalization of manufacturing. A company would like to operate abroad production if the demand of domestic market is weak while the overseas market is the main source of revenue. A company needs to improve the management and control when the production sites are located abroad in order to access the foreign market, and has to face the risk of loss of control, less skilled labors, the lack of staff training and so on. Therefore, the supply chain costs could be high if the domestic demand is weak, because a firm invests more on the global operation.

Driver measurement

Domestic sales / Total sales

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Strength of domestic demand	Domestic sales / Total sales	High (>80%)	Local superiority	2	-	2	-
		Medium-High (61:80%)	Local advantage	1	-	1	-
		Medium (41:60%)	Irrelevant	-	-	-	-

		Medium-Low (21:40%)	Global advanatage	-	1	-	1
		Low (<20%)	Global superiority	-	2	-	2

Table 31 - "Strength of domestic demand" summary table

27- Sourcing strategy

As a result of the correlation analysis, it is clear that the decision of sourcing strategy will affect as well the manufacturing strategy. For example, if a company is already sourcing from global suppliers in China so it might be more convenient to the production facilities to be located near to the suppliers. (See more details in the correlation analysis description)

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Sourcing strategy	Company strategy	Local sourcing	Local superiority	2	-	2	-
		Green field	Irrelevant	-	-	-	-
		Global sourcing	Global superiority	-	2	-	2

Table 32 - "Sourcing strategy" summary table

28- Effect of existing SC network (Manufacturing)

As mentioned before in the sourcing drivers section, also the effect of existing supply chain network may affect the strategic decision of locating the manufacturing sites. (For example if the company strategy is based on acquiring smaller companies around the world, in this case probably the global manufacturing sites will be the most suitable for company strategy)

However, this driver will be irrelevant for the Greenfield supply chain network design.

Driver	Indicator	Value	Influence	Sourcing		Manufacturing	
				Local	Global	Local	Global
Effect of existing supply chain network (Manufacturing)	Company strategy	Local based	Local superiority	2	-	2	-
		Green field	Irrelevant	-	-	-	-
		Global based	Global superiority	-	2	-	2

Table 33 - "Effect of existing SC network" summary table

4.7 Model suggested configuration

Then after inserting the value for each driver and its related score as shown in the previous tables for each driver (The input of the model), the total points will be calculated for local sourcing VS global sourcing and for local manufacturing VS global manufacturing. And the model will automatically suggest the decision with the higher score (Local VS Global). As shown in the following example of total points.

		Sourcing			Manufacturing	
		Local	Global		Local	Global
Total points	Sourcing	20	21	Manufacture	22	42
Model suggestion		Global			Global	
Degree of certainty		Possibly			Certainly	
Actual configuration		Global			Global	

Table 34 - Example of model suggested configuration

The degree of certainty was added to differentiate between the large difference between scores which means that the decision is certain and the small difference between scores which means that the decision is possible but needs more investigation and decision making tools to be more certain (It will explained in details in the result section of this paper).

Chapter 5 - Case study analysis

In order to build, test and validate the model, a case study of real 16 companies in FMCG (Fast Moving Consumer Goods) industry and in this chapter more information about theses case studies can be found.

5.1 Nestlé S.A.

Company information

Nestlé S.A. is a Swiss multinational food and beverage company, found in 1866 in Vevey, Switzerland. It is the largest food company in the world measured by revenues. Nestlé's products include baby food, bottled water, breakfast cereals, coffee, confectionery, dairy products, ice cream, pet foods, and snacks. 29 of Nestlé's brands have annual sales of over 1 billion Swiss francs (about $1.1 billion), including Nespresso, Nescafé, Kit Kat, Smarties, Nesquik, Stouffer's, Vittel, and Maggi. Nestlé has around 450 factories, operates in 86 countries, and employs around 328,000 people. It is one of the main shareholders of L'Oréal, the world's largest cosmetics company.

Company supply chain configuration

In general, all of the main raw materials can be found from the local suppliers for the plants in every region, and the final products are distributed to local market. Therefore, the supply chain structure of Nestlé is Local Sourcing – Global Manufacturing – Local Distribution.

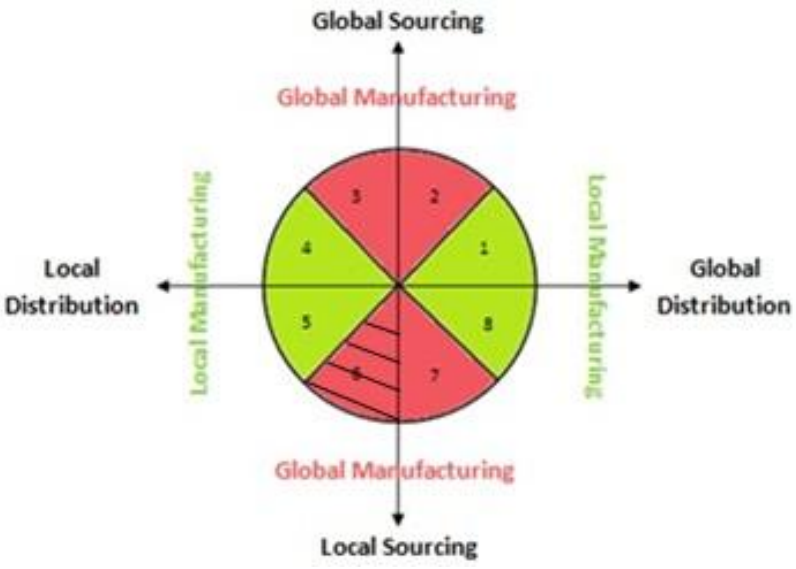


Figure 13 - "Nestle" supply chain configuration scheme

Nestlé prefers local sourcing. Considering the perishability of its supplies, the main reason for this choice is understood. Dairy products and most of the ingredients are easy to find in different regions. Therefore, by this way, both the transportation cost can be decreased; meanwhile, frequent and fresh procurement can be made. After production, most of the markets are supplied locally because of the fact that most of the products have short shelf life. Thus, by being close to market, frequent deliveries can be made with low volumes. From other production sites, there is also a support to America to meet its high consumption rate, but the amount of the global delivery is quite small.

Regions	Supply	Manufacturing	Distribution
Europe		33%	29%
N. & S. America		37%	44%
Rest of the world		30%	27%

Table 35 - "Nestle" supply chain configuration

5.2 Unilever Food

Company information

Unilever is an Anglo–Dutch multinational consumer goods company. Its products include foods, beverages, cleaning agents and personal care products. It is the world's third-largest consumer goods company measured by 2011 revenues (after Procter & Gamble and Nestlé) and the world's largest maker of ice cream. Unilever has 400 products which are sold in more than 190 countries, generating sales of €51 billion in 2012. Unilever Food is one of the three main global divisions of Unilever Corporation.

Company supply chain configuration

The sourcing of Unilever Food is operated globally in order to provide different raw materials to the plants in each region. The final products are distributed from the local production sites to the local market for decreasing the total distribution cost and the delivery lead time. Therefore, the supply chain structure of Unilever Food is Global Sourcing – Global Manufacturing – Local Distribution.

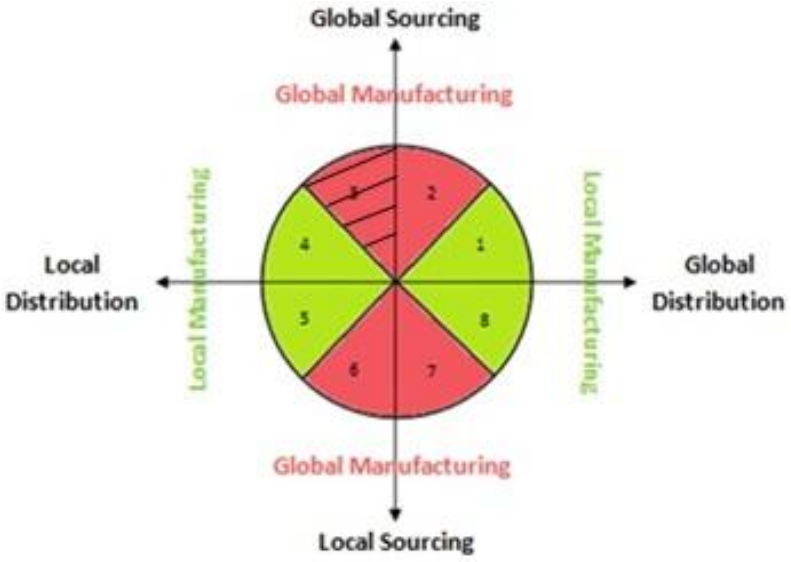


Figure 14 - "Unilever" supply chain configuration scheme

As a food maker company, Unilever Bestfood is able to source most of the raw materials from local suppliers according to the local customer's taste and preference, while some special intergradient have to be sourced from other regions. What is more, the expiration

constraint, unpredictable and fluctuating demand trend lead food company to determine a local strategy in terms of distribution. In addition, some major changes in customers' expectations are observed in this sector more solidly. Therefore, being close to market and follow the changes in the market and serve in accordance with the regions eating habits and culture, is the dominant motivation in determining the supply chain configuration. The Europe market occupies 27% of the total sales, while the American market consumes more, nearly 33% of the total sales, and the other revenue is generated in the rest markets.

Regions	Supply	Manufacturing	Distribution
Asia-Pacific & rest			40%
America (S.&N.)			33%
Europe			27%

Table 36 - "Unilever" supply chain configuration

Unilever Food is multinational with operating companies and factories on every continent. It has subsidiaries in almost 100 countries. The main production sites are located in England, Germany, France, Netherlands, United States, Brazil, South Africa, India and China.

Figure 15 - "Unilever" production sites locations

5.3 Barilla S.p.A.

Company information

Barilla S.p.A. is an Italian and European food company founded in 1877 in Ponte Tarro, Italy by Pietro Barilla. The company is privately held, and remains in the fourth generation of Barilla family ownership. The Group employs over 8,000 people and owns 30 production sites. Barilla owns 13 brands. It produces several kinds of pasta and it is the world's leading pasta maker with 40-45% of the Italian market and 25% of the US market. It produces pasta in over 120 shapes and sizes. Barilla brand pasta is sold in numerous restaurants worldwide, such as those belonging to the Pastamania chain. It is also the leading seller of bakery products in Italy. Through its acquisition of the Swedish company Wasa, it is the world's leading producer of flatbread (a Scandinavian staple), selling 60,000 tons annually.

Company supply chain configuration

The main location of the suppliers and plants are both located in North America and Europe, and the North American suppliers provide the raw materials not only for the local manufacturing sites, but also for European plants. The most of the finished products are distributed to local market from the plants, but a small part of the products are delivered to other markets except North America and Europe. Therefore, the supply chain structure of Barilla is Global Sourcing – Global Manufacturing – Global Distribution.

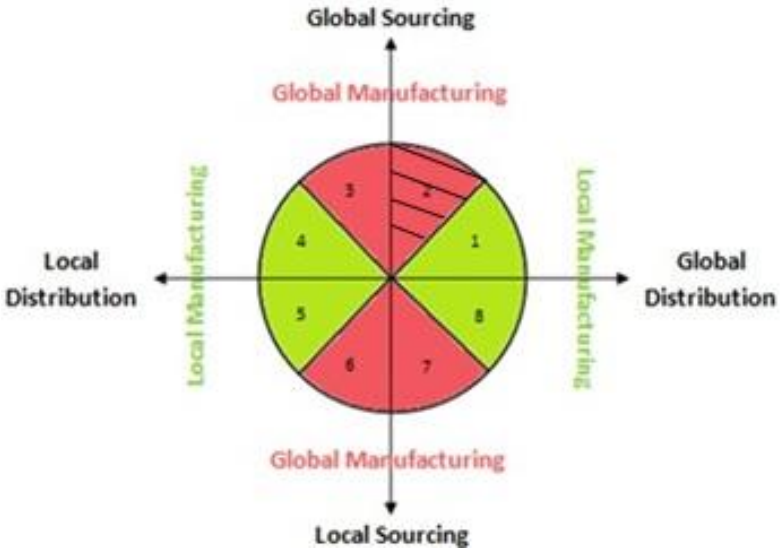


Figure 16 - "Barilla" supply chain configuration scheme

There are more than 800 raw materials and 50 types of packaging materials that Barilla uses for its portfolio of more than 1000 products. It has strategic materials that it mostly uses which are wheat, tomatoes, eggs, oils, flexible film paper and cardboard. These materials are not difficult to find in local market, taken into account that most of the materials have short life which makes better to source from the region. Moreover, production facilities are located near to market in order to decrease lead time. 25% of Barilla products are fresh, moreover, there is extreme demand fluctuations observed in distributors' order pattern. These facts put pressures in terms of production lead time and perishability of the product. That leads Barilla to produce most of its products in the region where it is consumed.

Regions	Supply	Manufacturing	Distribution
North America		 15%	
Europe		 85%	
Rest of the world			

Table 37 - "Barilla" supply chain configuration

Barilla Group has 30 production plants all over the world: in Italy, Greece, France, Germany, Norway, Russia, Sweden, Turkey, the United States (in Ames, Iowa and Avon,

New York), and Mexico. Over one thousand products, matching different moments of everyday consumption, are distributed to 100 countries.

Figure 17 - "Barilla" production sites locations

5.4 Colgate-Palmolive

Company information

The Colgate-Palmolive Company is an American multinational consumer products company focused on the production, distribution and provision of household, health care and personal products, such as soaps, detergents, and oral hygiene products (including toothpaste and toothbrushes). It is found in 1806 in New York City. Colgate-Palmolive has market leadership around the world, primarily operating in North America, Latin America, Europe, and Greater Asia/Africa.

Company supply chain configuration

Colgate-Palmolive establishes the plants in every region in order to offer the products to their local market, while the procurement is global conducted. Therefore, the supply chain structure of Colgate-Palmolive is Global Sourcing – Global Manufacturing – Local Distribution.

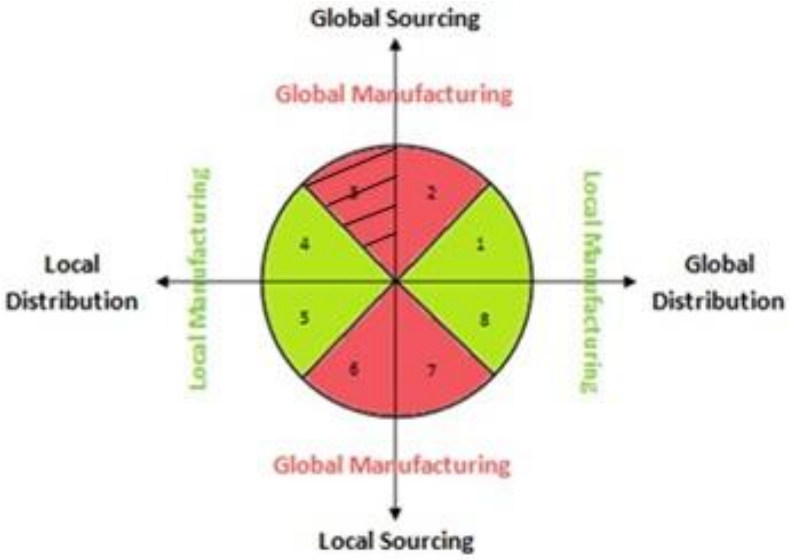


Figure 18 - "Colgate-Palmolive" supply chain configuration scheme

The most of the common raw materials can be sourced in the local market's region, while some items have to be procured globally. Tallow is a key ingredient in bar soap production and is derived from cattle. Colgate sources tallow from suppliers in North America, Latin America and Europe. In addition, sourcing of palm oil, which is an important ingredient for the company, is made from Malaysia, Indonesia and Thailand. It prefers local distribution due to the fact that its demand shows high fluctuation and the product has to be on shelf when customer wants to purchase that product loyalty is low. Therefore, company wants to be close to customer in distribution stage in order to supply market frequently and increase its flexibility in order to adopt changes in customer demand.

Regions	Supply	Manufacturing	Distribution
North America		22%	
South America		32%	
Europe- S. Pasific		24%	
Asia-Africa		22%	

Table 38 - "Colgate-Palmolive" supply chain configuration

In the U.S., the company operates approximately 60 properties of which 14 are owned. Overseas, the company operates approximately 280 properties of which 80 are owned in over 70 countries. Major overseas facilities used by the Oral, Personal and Home Care segment are located in Australia, Brazil, China, Colombia, France, Guatemala, Italy, Mexico, Poland, South Africa, Thailand, Venezuela and elsewhere throughout the world.

Figure 19 - "Colgate-Palmolive" production sites locations

5.5 Carlsberg Beer

Company information

Carlsberg was founded in 1847 by the brewer J.C. Jacobsen, just outside the city ramparts of Copenhagen, Denmark. In fact, in 1883 Carlsberg's Emil Christian Hansen develops a method for propagating pure yeast, which revolutionises the brewing industry. This date is a real milestone in the brewing industry. The yeast is named Saccharomyces Carlsbergensis and given freely to the world. It was isolated in the Department of Chemistry and Department of Physiology. The concept of pH was developed there as well as advances in protein chemistry. The laboratory was part of the Carlsberg Foundation until 1972 when it was renamed the Carlsberg Research Centre and transferred to the brewery. Other important dates in the company's history are 1906, when Ny Carlsberg and Gl. Carlsberg join forces under the name Carlsberg Breweries with Carl Jacobsen as Director, and 1939, when 55% of all beer imported to the U.K. is from Carlsberg. Another

significant moment in the history of the company is represented by the merge of Carlsberg and rival Danish brewer Tuborg in 1970, to form the United Breweries A/S. Similarly, in 1992 Carlsberg merges with English brewery Tetley, and five years later Carlsberg becomes unique owner of Carlsberg-Tetley. In 2007, with Kronenbourg's acquisition, Carlsberg has completed a significant growth, which led the company to a leading position in the brewing sector. Since 2009, Carlsberg became the 4th largest brewery group in the world employing around 45,000 people.

Company supply chain configuration

In general, Carlsberg uses the local strategy for the supply chain design, indicating sourcing from local suppliers and fed to local plant in order to meet the demand of local customers. Therefore, Carlsberg's supply chain structure is Local Sourcing – Global Manufacturing – Local Distribution.

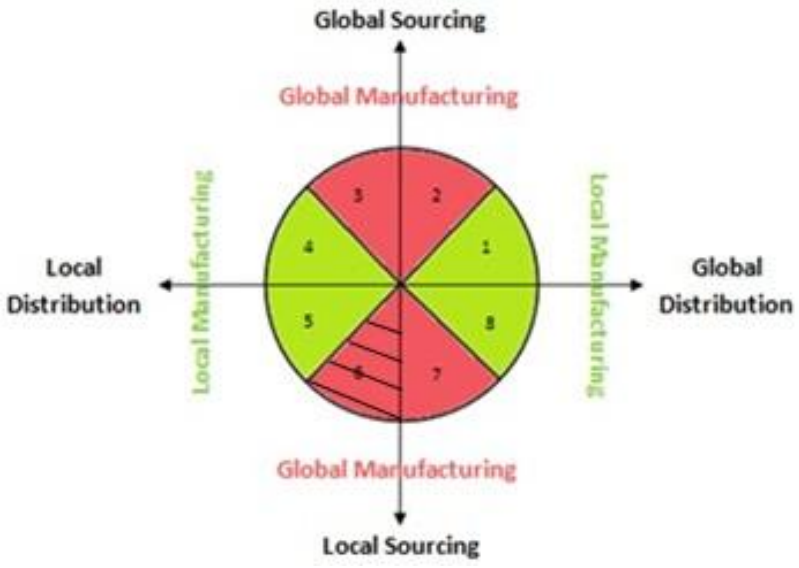


Figure 20 - "Carlsberg" supply chain configuration scheme

A brewery can produce beer if it has water, barley (which is a basic cereal grain), hops (flowering vine to balance sweetness of malt) and yeast (unicellular fungi). Therefore, most of brewing raw materials can be sourced directly from nature. Carlsberg, supplies those raw materials locally due to being available in all existing markets and reducing transportation cost. Only some less important raw materials, such as plugs, are sourced

from Asia. The Carlsberg Group's business is completely dependent on the availability of quality barley. Malting barley is a niche cereal accounting for less than 2% of world grain production, and further water scarcity and flooding may affect future availability and quality. For these reasons, in order to secure its supply in all regions, the company gives significant importance to its investments on supply. By developed projects, it improves yields and higher the quality of crops, benefiting both farmers and Carlsberg. Moreover, the company prefers to locate the manufacturing sites close to its customers and suppliers, as well as local distribution with mainly same reasons. Beer, as being a fast consuming good, has to follow customer demand and react quickly. Moreover, having a shelf life not very long, leads the product have a fast turn over in the stores and supermarkets. Therefore, refreshment should be made very quickly that makes lead time and frequency of the supply critically important to satisfy customer. This leads being proximate to market quite important for determining distribution strategy.

Regions	Supply	Manufacturing	Distribution
North-West EU			
Easter Europe			
Asia			

Table 39 - "Carlsberg" supply chain configuration

The Carlsberg Group divide up their operations into three market areas: Northern & Western Europe, Europe and Asia. There are many plants in each region, therefore we list some main sites in the following chart.

Figure 21 - "Carlsberg" production sites locations

5.6 Coca-Cola Beverage

Company information

The Coca-Cola Company is an American multinational beverage corporation and manufacturer, retailer and marketer of nonalcoholic beverage concentrates and syrups, which is headquartered in Atlanta, Georgia. It is found in 1892 in Atlanta by John Pemberton, Asa Griggs Candler. The company produces concentrate, which is then sold to licensed Coca-Cola bottlers throughout the world. The bottlers, who hold territorially exclusive contracts with the company, produce finished product in cans and bottles from the concentrate in combination with filtered water and sweeteners. The bottlers then sell, distribute and merchandise Coca-Cola to retail stores and vending machines. The Coca-Cola Company also sells concentrate for soda fountains to major restaurants and food service distributors. The Coca-Cola Company has, on occasion, introduced other cola drinks under the Coke brand name. The most common of these is Diet Coke, with others including Caffeine-Free Coca-Cola, Diet Coke Caffeine-Free, Coca-Cola Cherry, Coca-Cola Zero, Coca-Cola Vanilla, and special versions with lemon, lime or coffee. Coca-Cola has been officially available in every country in the world except Cuba and North Korea.

Company supply chain configuration

The company does sourcing, manufacturing and distribution independently in each region. Therefore, the supply chain structure of Coca-Cola is Local Sourcing – Global Manufacturing – Local Distribution.

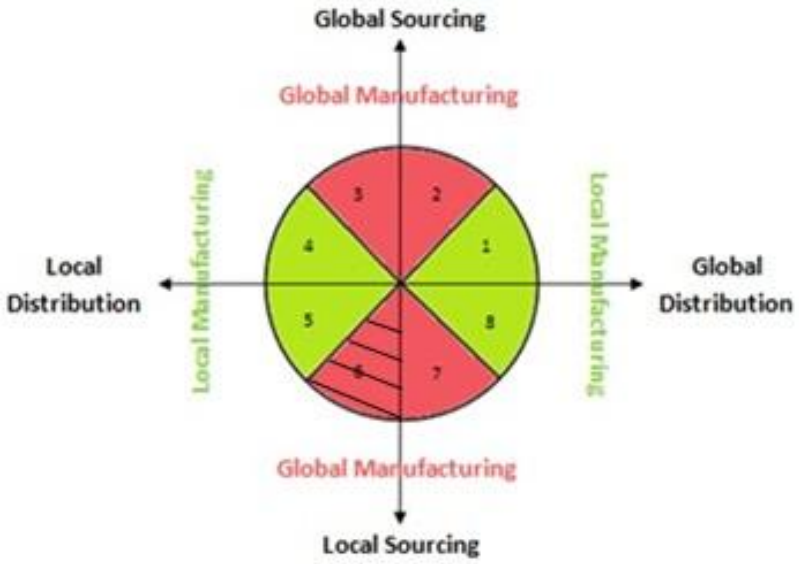


Figure 22 - "Coca-Cola" supply chain configuration sheme

Coca-Cola's production is not a complicated and various ingredients required process. Main activities are to mix water, sweetener and CO2 with Coca-Cola syrup whose recipe is kept as secret known as merchandise "7X". All of the intergradient can be found in every region easily. The company produces the concentrated syrup itself which is then sold to licensed Coca-Cola bottlers throughout the world. Among the more than 200 countries where Coca-Cola operates business in, most of them have the plants in order to provide common and specialized products. Local distribution has substantial benefits to the sales because of the dynamic nature of coke demand. It is very important to replenish shelves in the retail outlets with the maximum fill rate to be available anytime to customer. In order to achieve it, distribution should be made decentralized and thus closer to market. By this way, Coca-Cola shortens the delivery time, decrease transportation cost, bring innovations to market faster, and reduce time to send returns to suppliers.

Regions	Supply	Manufacturing	Distribution
North America			 22%
South America			 29%
Europe			 15%
Asia-Pacific			 18%
Africa			 16%

Table 40 - "Coca-Cola" supply chain configuration

5.7 Lindt & Sprüngli

Company information

The Lindt & Sprüngli Group is a luxury Swiss chocolate and confectionery company which is globally active, developing, producing, and selling chocolate products in the premium quality segment. The holding company, Chocoladefabriken Lindt & Sprüngli AG, has its headquarters in Zurich. Lindt & Sprüngli is offering a large selection of products in more than 120 countries around the world with Lindt , Ghirardelli and Caffarel brands . It has also 20 subsidiary companies worldwide which is excluded from our work. At present there are around 200 Lindt shops worldwide.

Company supply chain configuration

The required raw materials, such as cacao, milk, sugar, etc. are sourced from different regions, and then the plants in Europe and North America distribute the final products to global market. Therefore, the supply chain structure of Lindt & Sprüngli is Global Sourcing – Global Manufacturing – Global Distribution.

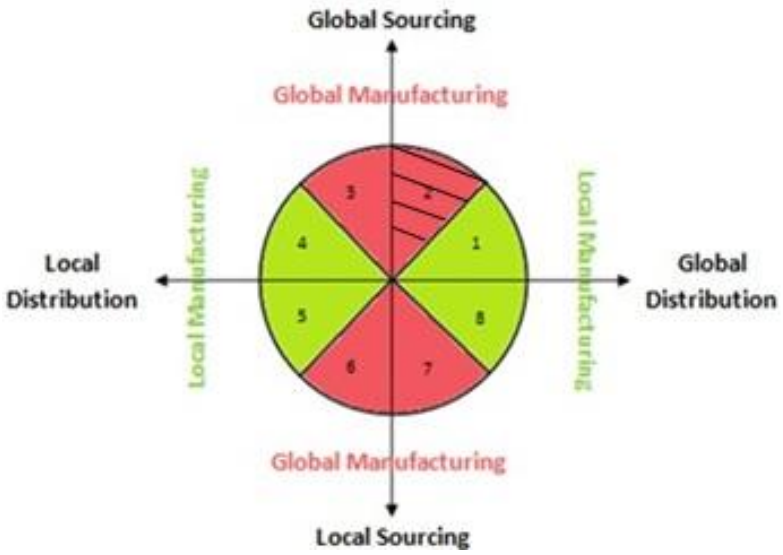


Figure 23 - "Lindt" supply chain configuration scheme

Analyzing Lindt's supply chain configuration, it is realized that the company prefers both local and global sourcing for different types of supplies having different characteristics. The essential raw material of the company is cacao as it can be predicted. Beside this, milk, sugar, hazelnuts and almonds and palm oil are required primarily as ingredient for Lindt & Sprüngli's premium chocolate. These fillings and raw materials are supplied as following: local sourcing is preferred for dairy products, sugar and packages. Milk and sugar is sourced within the boundaries close to where factories are located because of availability, decreasing transportation cost and shelf life. There is no point supplying milk globally as it is easy to find nearby with the same quality and thus increases the control level which is critical for especially dairy products to be fresh and hygienic. Moreover, packaging materials are sources locally because of environmental concerns and decreasing costs. However, other ingredients (cacao, hazelnuts, almond and palm oil) should be procured with different strategy mostly because of availability. These raw materials are not growing everywhere in the world, but specific regions. Combining availability and sustainability concerns, Lindt chooses the locations to obtain these ingredients such as Nuts from Turkey and Italy, cacao from Ghana and Latin America and almonds from USA. In order to acquire high quality supplies and fulfill its environmental and social responsibilities, it makes long term relations with the suppliers applying

improvement projects in farms and in region. Analysis related to production facility network, it can be seen that the company prefers to be close to its customers when it is considered that 93% of its sales occur in USA and EU. This preference can be linked with the reasons to decrease lead time and increase delivery frequency. Lindt distributes remaining 7% of the products globally from those facilities to the rest of the world.

Regions	Supply	Manufacturing	Distribution
North America			
South America			
Europe			
Asia			
Pacific			
Africa			

Table 41 - "Lindt" supply chain configuration

Lindt & Sprüngli has 6 production sites in Europe, 2 in North America. It manufactures various products of its renowned Lindt brand in Switzerland, Germany, France, Italy, and Austria, as well as in the United States.

Figure 24 - "Lindt" production sites locations

5.8 Kellogg's Cereal

Company information

Kellogg Company is a multinational food manufacturing company headquartered in Michigan, United States. The company is founded in 1906 and incorporated in Delaware in 1922, and its subsidiaries are engaged in the manufacture and marketing of ready-to-eat cereal and convenience foods. Its principal products are ready-to eat cereals and convenience foods, such as cookies, crackers, savory snacks, toaster pastries, cereal bars, fruit-flavored snacks, frozen waffles and veggie foods. These products are marketed under the Kellogg's name in more than 180 countries.

Company supply chain configuration

The raw materials for the Kellogg's Cereal products can be found in every region. By taking into consideration the different customer's preference, the plants are also located in different region in order to provide the goods to their local market. Therefore, the supply chain structure of Kellogg's Cereal is Local Sourcing – Global Manufacturing – Local Distribution.

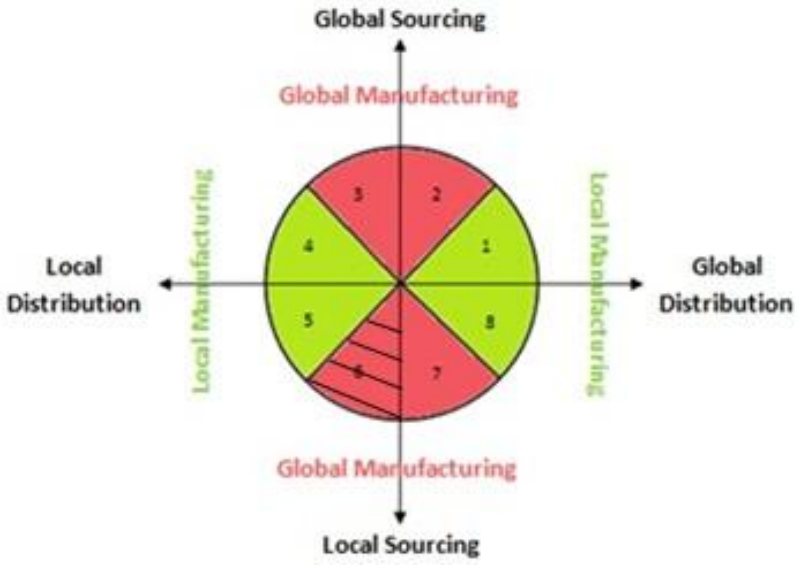


Table 42 - "Kellogg" supply chain configuration scheme

When the supply chain is analyzed for the cereals produced, it is seen as the flow is done totally local, i.e. the raw materials are supplied locally, and the facilities are close to

market. Raw materials of Kellogg's Cereal are mostly agricultural commodities which are generally not specific to a region but able to be grown in many places. Some global sourcing can be done such as cacao in small scales but in our study, we emphasized only the main raw materials that are used in the vast majority of whole production process. In the same way, packaging materials which contains mainly carton board, corrugated, and plastic are obtained from local region. Moreover, the products have the features of low shelf life and low product-value density which makes worthless to carry the products from another region. Kellogg's Cereal's production does not required high skilled labors and it does not require a high investment to build a facility. These drivers indicate the rightfulness of the company to produce in each market that it operates.

Regions	Supply	Manufacturing	Distribution
North America			
South America			
Europe			
Asia			
Pacific			
Africa			

Table 43 - "Kellogg" supply chain configuration

The products are manufactured in 35 countries worldwide. The largest factory is located in Manchester, United Kingdom, which is also the location of its European headquarters. In the following chart, only some main manufacturing sites are marked.

Figure 25 - "Kellogg" production sites locations

5.9 Absolut Vodka

Company information

Absolut Vodka is a brand of vodka, which is third largest spirits worldwide after Bacardi and Smirnoff. It is sold nearly in 130 countries. The head quarter of the company is in Stockholm, Sweden. Since its launch in 1979, Absolut Vodka has achieved significant worldwide sales growth, from 10,000 nine-liter cases (90,000 liters) to 11.0 million nine-liter cases in 2010 (99.0 million of liters).

Company supply chain configuration

In order to provide the premium quality products, all the raw materials are sourced from local suppliers, and manufactured in the plant in Sweden, despite the final products are sold worldwide. Therefore, the supply chain structure of Absolut Vodka is Local Sourcing – Local Manufacturing – Global Distribution.

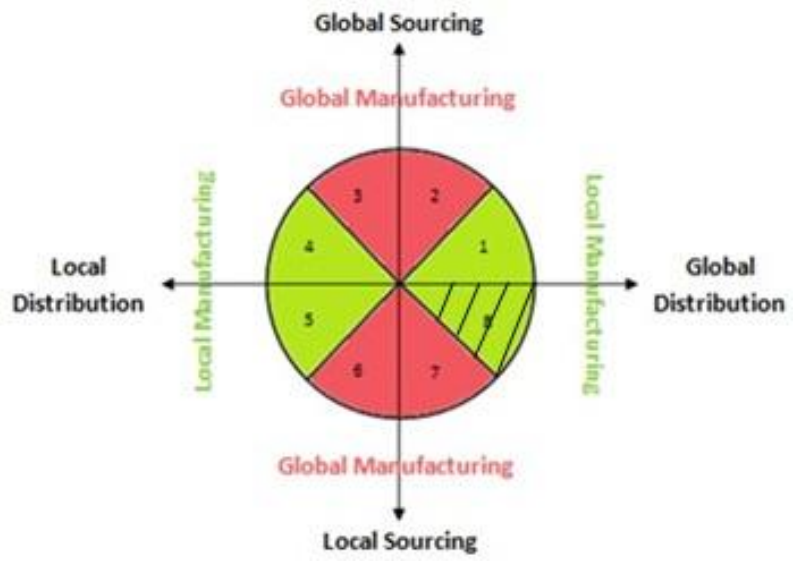


Figure 26 - "Absolut" supply chain configuration scheme

Sourcing is preferred to be 100% local by using the hardy wheat grains and water as the main ingredients of the very same region. Åhus provides the distillery with the raw materials to produce the millions of bottles of Absolut Vodka sold around the world because of the quality of the grains which ensures to satisfy the high quality standards of the company. Manufacturing is done in Åhus as well to represent the country Sweden and exploit its recognition with this high quality raw materials and production standards. Since each bottle is produced in one plant and this is the prior decision of company in terms of its supply chain design and it is consumed worldwide, global distribution is the only option to complete its supply chain and reach all its markets, mainly in Americas and Europe.

Regions	Supply	Manufacturing	Distribution
North America			
South America			
Europe			
Asia			
Rest of the world			

Table 44 - "Absolut" supply chain configuration

5.10 Chicco Toys

Company information

Chicco is an Italian baby care brand established in 1958 and it is the most important brand of Artsana, an Italian company founded in 1946. Chicco specializes in making clothing and equipment for babies and toddlers, including strollers, high chairs, car seats and toys. Chicco is a multinational company that is present in more than 170 different countries through its offices or licensed distributors. Other than Italy, the biggest markets for Chicco products are Spain, USA, Portugal, France, Brazil, Germany, Greece, Russia and Ukraine. There are over 400 Chicco shops in the world.

Company supply chain configuration

Chicco operates in a highly globalized level, and all the three main operating processes are conducted on the global base, i.e. Global Sourcing – Global Manufacturing – Global Distribution.

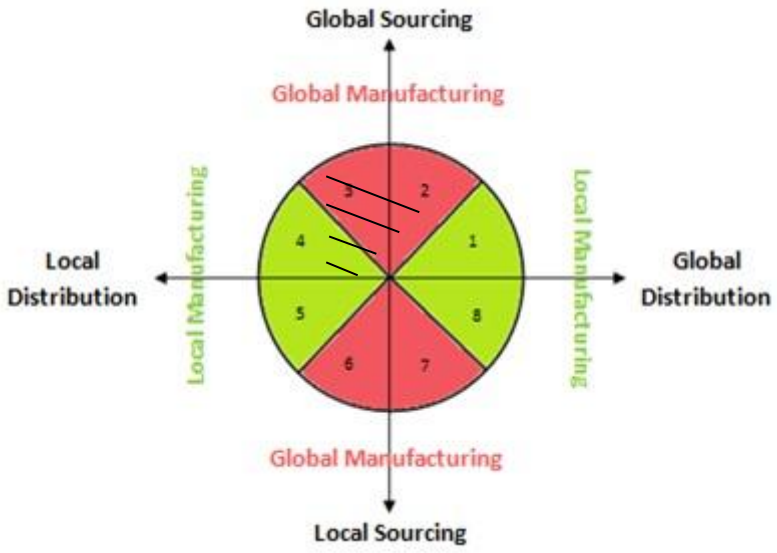


Figure 27 - "Chicco" supply chain configuration scheme

China provides the majority of the raw materials, components, and finished products for Chicco Toys, the total quantity accounts on 90% of the overall procurement capacity, and the remaining suppliers are located in Europe. As the biggest market, 65% of the products are consumed in Europe. It's about 10% of the finished products are sold in Americas, and remaining 25% of the products are distributed to other markets.

Regions	Supply	Manufacturing	Distribution
America (N., Ctr., S.)			10%
Europe	10%	10%	65%
Rest of the world	90%	90%	25%

Table 45 - "Chicco" supply chain configuration

Chicco Toys establishes 8 plants around the whole world. There are 6 manufacturing centers n China, which is linked to nearly 90% of total production of the toys. Moreover, the production in Europe is allocated to two plants in Italy and Romania.

Figure 28 - "Chicco" production sites locations

5.11 Lego

Company information

The LEGO Group is a privately held company based in Billund, Denmark. The company is still owned by the Kirk Kristiansen family who founded it in 1932. The LEGO Group is engaged in the development of children's creativity through playing and learning. Based on the world-famous LEGO® brick, the company today provides toys, experiences and teaching materials for children. The LEGO Group has approximately 10,000 employees,

and it is the world's third largest manufacturer of play materials. Its head office is in Billund, Denmark and LEGO products are sold in more than 130 countries.

Company supply chain configuration

Asian suppliers provide the raw materials or final products to the plants located in Europe and North America, and then all the products are distributed to global market. Therefore, the strategic supply chain configuration of LEGO is Global Sourcing – Global Manufacturing – Global Distribution.

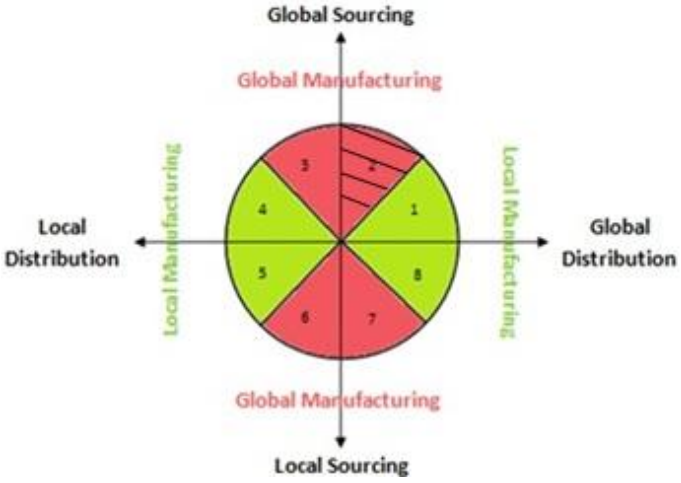


Figure 29 - "Lego" supply chain configuration model

LEGO has small portion of outsourcing from Asia in order to support local consumption in that region. The main raw material of LEGO is crude oil that the company is depended on in order to produce bricks. Crude oil is sourced from Saudi Arabia which is transported to Indonesia in order to obtain plastic granules. By the entry of those plastic granules, major supply of the production is met. Most of the demand of the world is met by the factories in Europe beside North America. That's what the plant in Mexico is dedicated for. LEGO makes its distribution to Australia, EU, Asia and European markets as it is seen in the network chart below. The dominant strategy followed can be said as to be closer to market as the main consumption is done in Europe and North America, which the deduction is also supported by the annual report of the company with the statement of "LEGO produces where it is used".

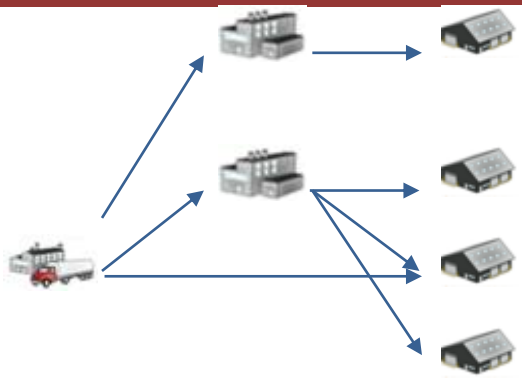
Regions	Sourcing	Manufacturing	Distribution
North America Europe Asia Rest of the world			

Table 46 - "Lego" supply chain configuratio

Manufacturing of LEGO occurs at a number of locations around the world. LEGO owns production plants in Denmark (headquarter, still most of R&D studies take place here), Czech Republic, Hungary and Mexico.

5.12 Zara

Company information

Zara is a Spanish clothing and accessories retailer founded in 1975 by Amancio Ortega and Rosalía Mera. It is the flagship chain store of the Inditex group. Inditex is one of the world's largest fashion retailers, welcoming shoppers at its eight store formats which are Zara, Pull & Bear, Massimo Dutti, Bershka, Stradivarius, Oysho, Zara Home and Uterqüe boasting 6.058 stores in 86 markets. The Inditex Group is made up of more than 100 companies operating in textile design, manufacturing and distribution. Zara needs just two weeks to develop a new product and get it to stores, compared to the six-month industry average, and launches around 10,000 new designs each year. Zara has resisted the industry-wide trend towards transferring fast fashion production to low-cost countries. Zara stores have men's clothing and women's clothing, each of these subdivided in Lower Garment, Upper Garment, Shoes, Cosmetics and Complements, as well as children's clothing (Zara Kids).

Company supply chain configuration

Zara operates the business on the basis of a truly global supply chain structure, i.e. Global Sourcing – Global Manufacturing – Global Distribution, in order to maximize resource used, minimize inventory and lead time.

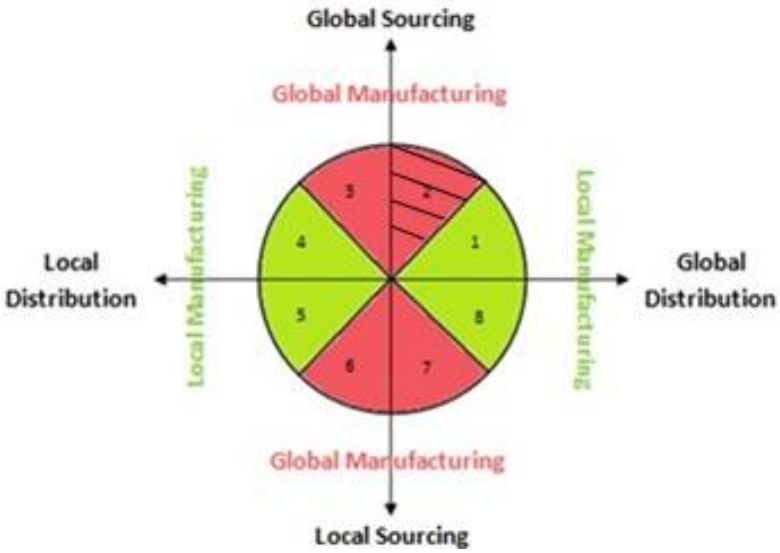


Figure 30 - "Zara" supply chain configuration scheme

Zara deeply understands the procurement has direct connection with company profit. In its supply chain, Zara is benefiting from the cost advantages of mostly Asian-Pacific countries. The Asian suppliers are the main providers of raw materials, components and sub-assemblies, they send the purchased items both to local plants and European plants. In order to minimize the delivery lead time, Zara establishes the manufacturing sites close to the market, except the America market due to the small sales and high production cost. The Europe market consume nearly 70% of the total sales, the America market and Asia market take on 18% and 12% of the sales.

Regions	Supply	Manufacturing	Distribution
Europe		76%	70%
N. & S. America			18%
Rest of the world		24%	12%

Table 47 - "Zara" supply chain configuration

All of the plants are located in Asia and Europe. The Zara basic label is daily commodity, i.e. underwear, basic t-shirts, socks, etc. are mainly produced in China, which presume cheaper production and longer lead time. On the other hand, the labels like Zara RTF, mainly consisting of up-to-date fashion designs are produced in Portugal and Spain, meaning higher production cost and shorter lead time, but helping fast reaction on demand.

Figure 31 - "Zara" production sites locations

5.13 BasicNet Group

Company information

The BasicNet Group was founded in 1994 when the Football Sport Merchandise Srl Marco Boglione from the failure Maglificio Calzificio Torinese, taking a sample of the brand, the warehouse and the property. Maglificio Calzificio Torinese, founded in 1916 and survived during the Second World War with the provision of clothing to the armed forces during the 60 converts, thanks to the ideas of Maurizio Vitale, from company mainly produces underwear to one of the most active and modern clothing enterprises youth and sports. The Group's objective is to become a leading global operator in the casual and sport. The brands managed by the Group BasicNet are positioned in the casual segment, fast-growing market since the late 70s and believed to be intended to have a progressive development in light of the liberalization of the global costume. Nowadays, BasicNet has

developed a network consisting of 8 group companies, 18 licensees, 6 sourcing certers, and 200 independent factories on which the BasicNet uses to produce the products.

Company supply chain configuration

BasicNet Group is not engaged in manufacturing so that it outsources to third parties. Therefore, the main manufacturing activities are taken place in Far East where is closer to the raw material sources. The finished products are distributed globally, while the dominant market is Europe. In a conclusion, the supply chain structure of BasicNet Group is Global Sourcing – Global Manufacturing – Global Distribution.

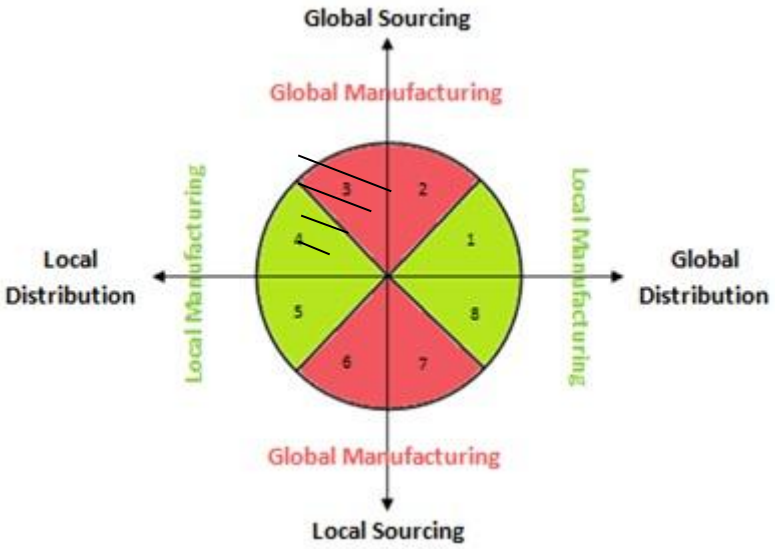


Figure 32 - "BasicNet" supply chain configuration scheme

BasicNet Group supervises and optimizes the manufacturing activities via dedicated Sourcing Centers, all manufacturing phases on behalf of the licensees, capturing significant economies of scale by seeking out the production sources more appropriate (in terms of cost and standard of quality) at the worldwide level. The outsourcing of the finished products is mostly in the Far East (about 70% of the entire production), the remaining part is attributed to Europe, mainly in Italy, a market that is already consolidated the company's inception. The market served most weighted is Europe, which obtains estimated the 66.53% of total sales. Following is the Asia and Oceania, reaching 17.76% of sales, and then America with 8, 25%.

Regions	Supply	Manufacturing	Distribution
Asia-Pasific		 70%	 21%
Europe		 30%	 70%
Rest of the world			 9%

Table 48 - "BasicNet" supply chain configuration

5.14 Heineken NV

Company information

Heineken NV is the Netherlands-based company, founded in 1864 by Gerard Adriaan Heineken in Amsterdam, and engaged in manufacturing and selling beer. It owns and manages a portfolio of beer brands. Its principal brand is Heineken. In addition, the Company has more than 170 international, regional, local and specialty beers, including Amstel, Birra Moretti, Cruzcampo, Deperados, Dos Equis, Foster's, Newcastle Brown Ale, Ochota, Primus, Sagres, Sol, Star, Tecate, Zlaty Bazant and Zywiec, among others. Additionally, it produces cider with brands such as Strongbow Gold and Bulmer's. Its operations business comprises five segments: Western Europe, Central and Eastern Europe, The Americas, Africa and the Middle East, and Asia Pacific. The Company is active through numerous subsidiaries, license agreements, affiliates and strategic partnerships and alliances, worldwide. Heineken ranks as the third largest brewer in the world after Anheuser-Busch InBev and SABMiller, based on volume.

Company supply chain configuration

Beer is brewed from 100% natural ingredients, which can be sourced in each region of the world. Heineken purchased the raw materials with local sourcing strategy. The suppliers work together with local plants in order to fulfill the local demand. Therefore, the supply chain configuration of PepsiCo Beverage is Local Sourcing – Global Manufacturing – Local Distribution.

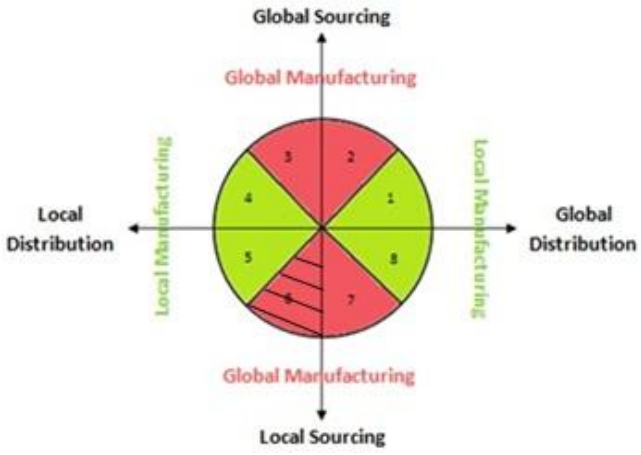


Figure 33 - "Heineken" supply chain configuration scheme

Heineken is running local sourcing projects linked to raw materials in many regions in order to guarantee both the supply of raw materials and the supply of local communities. Local sourcing also eliminates import duties, secures a sustainable supply of raw materials and reduce the transportation. Heineken owns over 190 breweries in more than 70 countries and employs approximately 85,000 people. Heineken organizes the company into five main territories which are then divided into regional operations. The regions are: Western Europe, Central and Eastern Europe, The Americas, Africa and the Middle East, and Asia Pacific. These territories contain 115 brewing plants in more than 65 countries, brewing local brands in addition to the Heineken brand.

Regions	Sourcing	Manufacturing	Distribution
Americas			
Western Europe			
Central and Eastern EU			
Asia - Pacific			
Africa & Middle East			

Table 49 - "Heineken" supply chain configuration

5.15 PepsiCo Beverage Company

Company information

PepsiCo, a Fortune 500, American Multinational Corporation is under the food consumer product industry and is the world leader in convenient foods and beverages. The Company makes, markets, sells and distributes a range of foods and beverages in more than 200 countries and territories. PepsiCo is organized into four business units: PepsiCo Americas Foods (PAF), which includes Frito-Lay North America (FLNA), Quaker Foods North America (QFNA) and all of its Latin American food and snack businesses (LAF); PepsiCo Americas Beverages (PAB), which includes all of its North American and Latin American beverage businesses; PepsiCo Europe, which includes all beverage, food and snack businesses in Europe, and PepsiCo Asia, Middle East and Africa (AMEA), which includes all beverage, food and snack businesses in AMEA. It manufactures markets and sells a range of salty, convenient, sweet and grain-based snacks, carbonated and non-carbonated beverages, dairy products and other foods. PepsiCo beverage Company (PBC) is an operating unit of PepsiCo Inc., the second largest food and beverage company in the world. PBC was formed in 2010 when PepsiCo acquired two large bottlers, PepsiCo bottling Group and PepsiCo America Inc., and named combine PepsiCo Beverage Company.

Company supply chain configuration

The raw materials used in manufacturing PepsiCo's beverage and food products were: apple, pineapple juice and other fruit juice concentrates, corn, aspartame, corn sweeteners, flour, flavoring, grapefruits, oats, oranges, rice potatoes, sucralose, sugar, vegetable and other oils, and wheat.

5.16 H&M

Company information

H&M Group (Hennes & Mauritz AB) is a Sweden-based company, and is one of the world's largest and fastest growing clothing retailers. The company is a pioneer of "fast fashion".

It operates under such brand names, as H&M (be analyzed in this research), H&M Home, COS, Monki, Weekday, Cheap Monday and & Other Stories. H&M targets the Hip & Modish, and designs cheap yet chic clothing, mainly for men and women ages 18 to 45, children's apparel, and its own brands of cosmetics. By the end of 2012, fast-growing H&M operates some 2, 774 stores in some 48 countries and offers online shopping in eight countries. The firm doesn't own factories but buys its goods from suppliers primarily in Asia and Europe. H&M opened its first women's clothing store in 1947 as Hennes (Swedish for "hers"); it later bought the hunting and men's clothing store Mauritz Widforss. H&M is controlled by the family of chairman Stefan Persson (the billionaire son of founder Erling Persson).

Company supply chain configuration

H&M does not own any factories, whereas the products are sourced from independent suppliers, mainly in Europe and Asia. These suppliers manufacture our products and generally source fabrics and other components needed. All the final products are delivered to the market in Europe, Asia-Pacific and Americas globally. Therefore, the supply chain configuration of H&M is Local Sourcing – Global Manufacturing – Global Distribution.

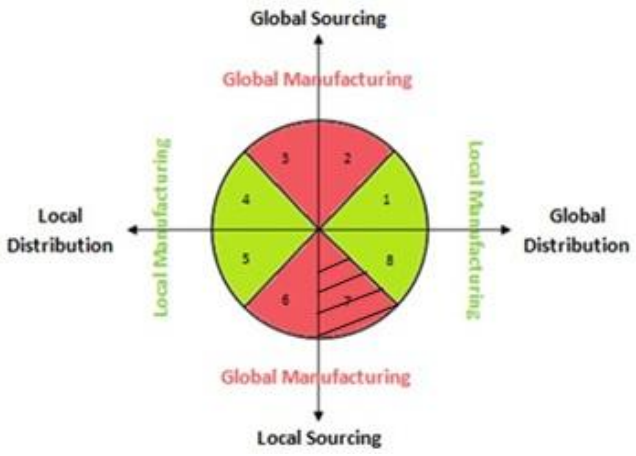


Figure 34 - "H&M" supply chain configuration scheme

In H&M, the clothes designed by the headquarters at Stockholm were made in more than 20 countries in Europe and Asia. After the garments were manufactured, they were shipped to stores across the world. The products with higher lead times were made in Asia, and those that were in high demand were made in Europe. All the products were distributed across the world to its stores, located in prominent shopping districts in 25 countries across the world. Initially, all the production activities of H&M took place in Sweden. In the 1960s, production was carried out in other Scandinavian countries and in the UK. In the late 1960s, some of the production activities were shifted to southern European countries like Italy and Portugal. By the early 1970s, H&M was also producing in Hungary, Poland, and erstwhile Yugoslavia. In 1978, H&M ventured into the Far Eastern countries with a production office in Hong Kong. As of 2000, H&M had 22 production offices worldwide.

Regions	Sourcing	Manufacturing	Distribution
Asia-Pacific			
Europe			
Americas			

Table 50 - "H&M" supply chain configuration

Chapter 6 - Correlation analysis

The objective of this chapter is to explain how the weights of the drivers in the model were identified.

After building the model and completing the list of drivers and its influence on the sourcing or manufacturing decision, it was clear that not all the drivers have the same level of influence on taking the strategic decision for sourcing and manufacturing.

So, the correlation analysis was used to define the weight (Level of influence) for each driver in the model based on the actual data of 9 companies in the FMCG (Fast Moving Consuming Goods) industry.

In the following table it is shown the result of each driver measured in a scale from 1 (Lowest) to 5 (Highest) indicating the criticality of the driver and its impact on supply chain cost.

1 → Low criticality (Lowe impact on supply chain cost)

2 → Medium-low criticality (Medium-low impact on supply chain cost)

3 → Medium criticality (Medium impact on supply chain cost)

4 → Medium-high criticality (Medium-high impact on supply chain cost)

5 → High criticality (High impact on supply chain cost)

		Common drivers									
		1	2	3	4	5	6	7	8	9	10
No.	Company	Product variety	Technology level	Order cycle time	Demand predictability	Demand volatility	Dimension of market	Competition level	Import tariff	Quality of infrastructure	COO
1	Nestle	5	1	4	1	2	4	2	2	1	1
2	Unilever Bestfood	3	1	4	1	1	4	2	2	1	1
3	Barilla	5	1	3	1	1	3	2	2	2	1
4	Colgate-Palmolive	5	1	4	1	2	5	3	1	1	1

7	Carlsberg Beer	5	1	5	1	1	2	3	1	1	1
8	CocoCola Beverage	5	1	5	1	2	5	2	1	1	1
6	Lindt&Sprungli	4	1	5	1	2	3	2	1	1	1
5	Kellogg's	5	1	4	1	2	4	2	1	1	2
9	Absolut Vodka	1	2	5	2	2	3	3	1	1	4

Table 51 - "Common drivers" criticality scale

		Sourcing drivers			
		11	12	13	14
No.	Company	Local availability of purchased itmes	Competitin of domestic suppliers	Quality of domestic sources	Profit margin
1	Nestle	2	2	1	2
2	Unilever Bestfood	2	3	2	3
3	Barilla	2	2	1	2
4	Colgate-Palmolive	1	2	1	2
7	Carlsberg Beer	1	1	1	2
8	CocoCola Beverage	1	2	1	2
6	Lindt&Sprungli	3	1	2	3
5	Kellogg's	1	1	1	3
9	Absolut Vodka	1	1	1	2

Table 52 - "Sourcing drivers" criticality scale

		Manufacturing drivers										
		15	16	17	18	19	20	21	22	23	24	25
No.	Company	Risk of obsolescence	Complete-ness	Corporate taxation schemes	Political stability	Stability of domestic currency	Environment concerns and regulation	Labor cost	Labor quality	Energy cost	Technology readiness	Strength of domestic market
1	Nestle	1	5	1	1	3	5	5	2	5	1	4
2	Unilever Bestfood	1	5	2	2	2	4	5	1	5	1	4
3	Barilla	1	5	5	2	2	5	3	1	5	3	2
4	Colgate-Palmolive	1	4	3	3	1	3	5	1	3	1	4
7	Carlsberg Beer	1	5	1	1	2	4	5	1	5	1	4
8	CocoCola Beverage	1	5	3	3	1	3	5	1	3	1	4
6	Lindt&Sprungli	1	3	1	1	3	5	5	2	5	1	2
5	Kellogg's	1	5	3	3	1	3	5	1	3	1	2
9	Absolut Vodka	1	3	3	1	2	5	5	1	5	1	4

Table 53 - "Manufacturing drivers" criticality scale

Then the actual results of model configuration is as per the following table:

Local sourcing → 0 , Global sourcing → 1

Local manufacturing → 0 , Global manufacturing → 1

		Supply chain configuration	
No.	Company	Global sourcing	Global Manufacturing
1	Nestle	0	1
2	Unilever Bestfood	1	1
3	Barilla	1	1
4	Colgate-Palmolive	1	1
7	Carlsberg Beer	1	1
8	CocoCola Beverage	0	0
6	Lindt&Sprungli	1	1
5	Kellogg's	0	0
9	Absolut Vodka	0	0

Table 54 - Actual companies supply chain configurations

Then, the final correlation coefficients between different drivers and the sourcing/manufacturing strategic decision are shown in the following table.

It should be noted that the positive value of the coefficient means that increasing the level of criticality (Impact on SC cost) of this driver will influence the decision towards the global decision while the negative value of the coefficient means that increasing the level of criticality of this driver will influence the decision towards the local decision.

And as the absolute value of the coefficient increases (Either positive or negative value) it means that this driver has higher influence on the related decision as shown in the following table:

No.	Driver	Global sourcing	Global Manufacturing
1	*Product variety*	0.15	0.30

2	*Cycle time*	-0.22	-0.35
3	*Completeness*	-0.06	0.09
4	*Demand predictability*	-0.40	-0.50
5	*Demand volatility*	-0.63	-0.50
6	*Dimension of market*	-0.32	-0.25
7	*Competition level*	0.16	0.00
8	*Import tariff*	0.16	0.50
9	*Quality of infrastructure*	0.32	0.25
10	*Country of origin effect (COO)*	-0.52	-0.66
11	*Risk of obsolescence*	#DIV/0!	#DIV/0!
12	*Technology level*	-0.40	-0.50
13	*Availability of purchased itmes*	0.40	0.57
14	*Competitin of domestic suppliers*	0.22	0.35
15	*Quality of domestic sources*	0.48	0.38
16	*Profit margin*	0.16	0.00
17	*Corporate taxation schemes*	-0.04	-0.31
18	*Political stability*	-0.11	-0.36
19	*Stability of domestic currency*	0.17	0.53
20	*Environment regulation*	0.11	0.36
21	*Labor cost*	-0.32	-0.25
22	*Labor quality*	-0.06	0.38
23	*Energy cost*	0.32	0.50
24	*Technology readiness*	0.32	0.25
25	*Strength of domestic market*	-0.16	0.00
	Global sourcing	1.00	0.79
	Global Manufacturing		1.00
	Global distribution		

Table 55 - Drivers' correlation coefficients

And below is the how the weights of the drivers were identified based on the absolute value of the correlation coefficient shown in the table relative to sourcing or manufacturing decision separately.

Correlation coefficeint classification	
Absolute value of coefficient	**Weight**
< 0.3 (Low)	1
0.3 : 0.5 (Medium)	2
0.5 : 0.7 (Med.-High)	3
> 0.7 (High)	4

Table 56 - Correlation coefficient classification

One of the very important notes noticed when analyzing the coefficient values that the global sourcing is strongly correlated with the global manufacturing with coefficient of

.79 (Weight=4) which means that the companies which already have global supply chain network tend also to have a global manufacturing facilities to be located closer to suppliers to optimize the transportation costs.

In the following table there is a list of all drivers in the model and its corresponding weight as a conclusion to the correlation analysis.

			Weight	
		Driver	Sourcing (Ws)	Manufacturing (Wm)
Common	1	Product variety	1	1
	2	Technology level	2	3
	3	Order cycle time	1	2
	4	Demand predictability	2	2
	5	Demand volatility	3	2
	6	Dimension of the market	2	1
	7	Competition level	1	1
	8	Import tariff	1	2
	9	Quality of infrastructure	2	1
	10	Country of origin effect	3	3
Sourcing	11	Local availability of purchased items	2	-
	12	Competition of domestic suppliers	1	-
	13	Quality of domestic sources	2	-
	14	Profit margin	1	-
	15	Effect of existing SC network	1	-
Manufacturing	16	Risk of obsolescence	-	1
	17	Completeness	-	1
	18	Corporate taxation schemes	-	1
	19	Political stability	-	2
	20	Stability of domestic currency	-	3
	21	Environmental regulations	-	2
	22	Labor cost	-	1
	23	Labor quality	-	2
	24	Energy cost (US$ Cents / KWh)	-	2
	25	Technology readiness	-	1
	26	Strength of domestic demand	-	1
	27	Sourcing strategy	-	4
	28	Effect of existing SC network	-	1

Table 57 - Weights of drivers as a result of correlation analysis

Chapter 7 - Results and conclusion

7.1 Results

After adding the weights, the model was tested again using first the data of 9 companies mentioned before in FMCG industry. After inserting the value of each driver based on the actual data collected from different companies. Then the model is able to automatically indicate the influence of the driver on Local Vs Global scale (See scoring system section for more details). Then automatically the model is calculating the total score for Local sourcing, Global sourcing, Local manufacturing and global manufacturing and suggest the recommended configuration for the company accordingly.

The following formulas were used to calculate the final score for sourcing (Local vs Global) and manufacturing (Local Vs Global) after adding the effect of the weights of different drivers.

Local sourcing (Total score) = Ws1*Ls1 + Ws2*Ls2 + Ws3*Ls3 + ….. Ws28*Ls28

Global sourcing (Total score) = Ws1*Gs1 + Ws2*Gs2 + Ws3*Gs3 + ….. Ws28*Gs28

Local manufacturing (Total score) = Wm1*Lm1 + Wm2*Lm2 + Wm3*Lm3 + ….. Wm28*Lm28

Global sourcing (Total score) = Wm1*Gm1 + Wm2*Gm2 + Wm3*Gm3 + ….. Wm28*Gm28

While,

Ws(N) → The sourcing weight of the driver (N)

Ls(N) → The local sourcing score of driver (N)

Gs(N) → The global sourcing score of driver (N)

Wm(N) → The manufacturing weight of driver (N)

Lm(N) → The local manufacturing weight of driver (N)

Gm(N) → The global manufacturing score of driver (N)

7.2 Certainty analysis

The degree of certainty of the configuration suggested by the model depends mainly on the difference in total points between the local and global option of the decision (Sourcing or manufacturing). Generally, as the difference in total points between local and global options increases, we are more certain about the suggested configuration by the model.

In the following table it is shown the relation between the difference in total points between local and global option, and the degree of certainty of the suggested configuration.

Certainty analysis	
Degree of Certainty	**Difference in total points**
Possibly	Low (1-2 Points)
Probably	Medium (3-4 Points)
Certainly	High (5 points or more)

Table 58 - Degrees of certainty

Now, the result of 1 company (Unilever) will be discussed as an example to show how the model is operating practically.

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Unilever				FMCG		Netherlands						
						Sourcing			Manufacturing			
Type	No.	Driver	Driver indicator	Effective value	Influence	Ws	Local	Global	Wm	Local	Global	
Common	1	Product variety	Number of products in company portfolio	Medium-High (700:1000)	Global advantage	1	-	1	1	-	1	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2	
	5	Demand volatility	variance of the demand in one year	Low (<5%)	Global superiority	3	-	2	2	-	2	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-	
	8	Import tariff	Official import tariff	Medium (5:10%)	Irrelevant	1	-	-	2	-	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		10	21		11	17	
Sourcing	11	Local availability of purchased items	Qualitative	Medium-High	Local advantage	2	1	-				
	12	Competition of domestic suppliers	Qualitative	Medium	Irrelevant	1	-	-				
	13	Quality of domestic sources	Qualitative	Medium-High	Local advantage	2	1	-				
	14	Profit margin	Profit %	Medium (30:40%)	Irrelevant	1	-	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		4	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	1	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1	
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1	
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		12	25	
Conclusion												
Total points						Sourcing	14	21	Manufacture	23	42	
Model suggestion							Global			Global		
Degree of certainity							Certainly			Certainly		
Actual configuration							Global			Global		

Table 59 - "Unilever" strategic global supply chain configuration model

Here we can notice that after inserting the "Effective value" of each driver (Based on actual datra collected for this company) and after applying the previous formulas to calculate the total scores we have the following results:

Sourcing result:
Local sourcing (Total score) = 14
Global sourcing (Total score) = 21
So, the model automatically suggests the "**Global**" decision for sourcing, and as the difference in points is high (7 points) so the degree of certainty is believed to be "**Certain**"

Also, we can notice that the actual sourcing decision for Unilever is "Global" as the model suggests. So, the color of the word "**Global**" Automatically turns to **Green** to indicate the model suggestion is aligned with the actual company supply chain configuration. Otherwise (If the suggestion does not match with the actual configuration it would turn the word color to red)

Manufacturing result:

Local manufacturing (Total score) = 23
Global manufacturing (Total score) = 42
So, the model automatically suggests the "**Global**" decision for manufacturing, and as the difference in points is high (19 points) so the degree of certainty is believed to be "**Certain**"

Again, we can notice that the actual manufacturing decision for Unilever is "**Global**" as the model suggests. So, the color of the word "**Global**" Automatically turns to **Green** to indicate the model suggestion is aligned with the actual company supply chain configuration. Otherwise (If the suggestion does not match with the actual configuration it would turn the word color to red)

In the following table, it is shown the results of the 9 companies used in the correlation analysis to test the model (Nestle, Unilever, Barilla, Colgate, Carlsberg, Coca-Cola, Lindt, Kellogg's, Absolut)

	Sourcing		Manufacturing	
	Local	Global	Local	Global
1- Nestle				
Total points	18	19	29	30
Model suggestion	Global		Global	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
2- Unilever				
Total points	14	21	23	42
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
3- Barilla				
Total points	13	21	18	38
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
4- Colgate				
Total points	20	21	22	42
Model suggestion	Global		Global	
Degree of certainity	Possibly		Certainly	
Actual configuration	Global		Global	
5- Carlsberg				
Total points	21	21	25	43
Model suggestion	Equal		Global	
Degree of certainity	Equal		Certainly	
Actual configuration	Local		Global	
6- Coca-Cola				
Total points	22	21	33	34
Model suggestion	Local		Global	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
7- Lindt				
Total points	16	18	24	35
Model suggestion	Global		Global	
Degree of certainity	Possibly		Certainly	
Actual configuration	Global		Global	
8- Kellogg's				
Total points	20	18	32	30
Model suggestion	Local		Local	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
9- Absolut				
Total points	24	12	33	29
Model suggestion	Local		Local	
Degree of certainity	Certainly		Probably	
Actual configuration	Local		Local	

Table 60 - Results of the model 1/2

Then after defining the weights and finalizing the complete version of the model it was validated again using the data of other 7 companies in FMCG industry (Or similar industries). See the following table:

	Sourcing		Manufacturing	
	Local	Global	Local	Global
10- Chicco				
Total points	10	13	13	30
Model suggestion	Global		Global	
Degree of certainity	Probably		Certainly	
Actual configuration	Global		Global	
11- Lego				
Total points	11	22	19	39
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
12- Zara				
Total points	14	16	26	33
Model suggestion	Global		Global	
Degree of certainity	Possibly		Certainly	
Actual configuration	Global		Global	
13- BasicNet				
Total points	7	15	16	33
Model suggestion	Global		Global	
Degree of certainity	Certainly		Certainly	
Actual configuration	Global		Global	
14- Heineken				
Total points	20	19	31	32
Model suggestion	Local		Global	
Degree of certainity	Possibly		Possibly	
Actual configuration	Local		Global	
15- PepsiCo				
Total points	20	24	32	33
Model suggestion	Global		Global	
Degree of certainity	Probably		Possibly	
Actual configuration	Local		Global	
16- H&M				
Total points	17	16	33	30
Model suggestion	Local		Local	
Degree of certainity	Possibly		Probably	
Actual configuration	Local		Global	

Table 61 - Results of the model 2/2

7.3 Comments on results

By analyzing the results we can notice the following:

- The model is generally valid and can suggest the actual configuration implemented by the company.
- The exceptions (In which the model was not able to suggest the actual configuration) were few. Just 2 cases out of 16 companies (Nestle & Pepsico) in sourcing and a similar number for manufacturing (Kellog's & H&M out of 16 cases)
- The level of accuracy of the model for the Sourcing decision is calculated to be 14(Correct suggestions)/16(Total cases) = **87.5 %**
- The level of accuracy of the model for the Manufacturing decision is calculated to be 14(Correct suggestions)/16(Total cases) = **87.5 %**
- More cases are needed in the future research in order to improve the accuracy of the model.
- When the degree of certainty is "**Certain**", the model is accurate and able to suggest the actual configuration of the company in 100% of cases.
- In one case (The sourcing decision of Carlsberg) the total scores of local and global option are equal to each other (21 points). So, in this case the model is not able to suggest one option over the other. In this case, probably other factors will be taken into consideration to support the decision making. Also, the mix between local and global sourcing can be studied.

7.4 Conclusion & Future research

The study was aimed at developing a model able to support the strategic decision of sourcing and manufacturing for multinational companies. And the steps of the study were the following points:

- Drivers definition
- Driver influence analysis
- Preliminary model development (without driver weights)

- Correlation analysis to define weights (Using data of 9 companies in FMCG industry)
- Final model development (With driver weights)
- Validation of the model using data of other 7 companies in FMCG industry

And if we went back to the research objectives:

- **Q1**: What are the main drivers affecting the strategic sourcing and manufacturing decision (Local VS Global)?
- **Q2**: How these drivers can affect the strategic sourcing and manufacturing decision (Local VS Global)?
- **Q3**: What is the relationship between the drivers and the supply chain configuration?

And after obtaining the previously discussed results, we can say that the model achieved the target objective.

Limitations of the model:

- 16 case studies may be considered as a limited number of case studies.
- The "Distribution" configuration decision is not included in the model due to lack of its related data.
- The model with its current version is only valid for FMCG industry.

Future research:

- Increase number of case studies to improve the accuracy of the model.
- Extend the model to include the "Distribution" decision as well.
- Extend the model to more industry sectors (Automotive, home appliances,etc.)

References

Beamon, B.M. (1998), "Supply chain design and analysis: Models and methods", International Journal of Production Economics, Vol. 55, pp. 281-294.

Melnyk, S.A., Narasimhan, R. and DeCampos, H.A. (2013), "Supply chain design: issues, challenges, frameworks and solutions", International Journal of Production Research, Vol. 52, No. 7, pp. 1887-1896.

Chopra and Meindl, 2004 Chopra, S. and Meindl, P (2004), "Supply Chain Management: Strategy, Planning and Operations, second ed. Prentice Hall, Upper Saddle River, NJ.

Rushton, A. and Saw, R. (1992), "A methodology for logistics strategy planning", International Journal of Logistics Management, Vol. 3, No. 1, pp. 46-62.

Mourits, M. and Evers, J.J.M. (1996), "Distribution network design: an integrated planning support framework", Logistics Information Management, Vol. 9, No. 1, pp.45-54.

Vila, D., Martel, A. and Beauregard, R. (2006), "Designing logistics networks in divergent process industries: A methodology and its application to the lumber industry", International Journal of Production Economics, Vol. 102, pp. 358-378.

Collin, J., Eloranta, E. and Holmstrom, J. (2009), "How to design the right supply chains for your customers", Supply Chain Management: An International Journal, Vol. 14, No. 6, pp. 411-417.

Smith, J.M. (1999), "Item selection for global purchasing", European Journal of Purchasing & Supply Management, Vol. 5, No. 3-4, pp. 117-127.

Gebennini, E., Gamberini, R. and Manzini, R. (2009), "An integrated production-distribution model for the dynamic location and allocation problem with safety stock optimization", International Journal of Production Economics, Vol. 122, No. 1, pp. 286-304.

Gunasekaran, A., Patel, C. and McGaughey, R.E. (2004), "A framework for supply chain performance measurement", International Journal of Manufacturing Economics, Vol. 87, No. 3, pp. 333-347.)

Jayaraman (1998), "Transportation, facility location and inventory issues in distribution network design", International Journal of Operations & Production Management, USA

Tsiakis and Papageorgiou (2008), "Optimal production allocation and distribution supply chain networks", International Journal of Production Economics, UK

Ballou, R.H. (1977), "Reformulating a logistics strategy: A concern for the past, present and future", International Journal of Physical Distribution, Vol. 7, No. 5, pp. 283-93.

Perl and Sirisoponsilp (1993), "Distribution network: facility location, transportation and inventory"

International Journal of Physical Distribution & Logistics Management, USA

Vidal, C.J. and Goetschalckx, M. (1997), "Strategic production-distribution models: A critical review with emphasis on global supply chain models", European Journal of Operational Research, Vol. 98, pp. 1-18.

Bilgen, B. and Ozkarahan, I. (2004), "Strategic tactical and operational production-distribution models: a review", International Journal of Technology Management, Vol. 28, No. 2, pp. 151-171.

Nasiri et al. (2010), The impact of integrated analysis on supply chain management: A coordinated approach for inventory control policy,Supply Chain Management: An International Journal , Iran

Harrison, A. and van Hoek, R. (2001), International Logistics: A Supply Chain Approach, Financial Times Prentice Hall, Upper Saddle River, New Jersey.

Ganeshan, R. and Harrison, T.P. (1995), "An Introduction to Supply Chain Management", Technical Report, Department of Management Science and Information Systems, The Pennsylvania State University, University Park, PA.

Georgiadis et al. (2011) "Optimal design of supply chain networks under uncertain transient demand variations", Omega, Greece

R. Narasimhan and S. Mahapatra (2004), "Decision models in global supply chain management" *Industrial Marketing Management, USA*

M. P. Knudsen and P. Servais (2007), "Analyzing internationalization configurations of SME's: The purchaser's perspective" *Journal of Purchasing & Supply Management, Denmark*

*Creazza et al. (2010), "*Evaluating logistics network configuration for a global supply chain*", Supply Chain Management: An International Journal, Italy*

Hong and Holweg (2002) "Evaluating the effectiveness and efficiency of global sourcing strategies: a conceptual note research", working paper, Cambridge: Institute of Management, University of Cambridge, the UK

A. C. Garavelli (2003) "Flexibility configurations for the supply chain management", International Journal of Production Economics, Italy

M.A. Cohen and H.L. Lee (1989), "Resource deployment analysis of global manufacturing and distribution networks", Journal of Manufacturing and Operations Management, Vol. 2, pp. 81-104.)

S. Tzafestas and G. Kapsiotis (1994), "Coordinated control of manufacturing/supply chains using multi-level techniques", Computer Integrated Manufacturing Systems, Vol. 7, No. 3, pp. 206-221.

M.A. Cohen and H.L. Lee (1988), "Strategic analysis of integrated production-distribution systems: models and methods", Operations Research, Vol. 36, No. 2, pp. 216-228.)

M.A. Cohen and H.L. Lee (1989), "Resource deployment analysis of global manufacturing and distribution networks", Journal of Manufacturing and Operations Management, Vol. 2, pp. 81-104.

H.L. Lee and C. Billington (1993), "Material management in decentralized supply chains", Operations Research, Vol. 41, No. 5, pp. 835-847.

Geoffrion and Graves (1974) "Multicommodity distribution system design by benders decomposition", Management Science, USA

J.E. Hodder and M.C. Dincer (1986), "A multifactor model for international plant location and financing under uncertainty", Computers & Operations Research, Vol. 13, No. 5, pp. 601-609.

H. Min and E. Melachrinoudis (1999), "The relocation of a hybrid manufacturing/distribution facility from supply chain perspectives: a case study", Omega, Vol. 27, pp. 75-85.

L.A.Moncayo-Martinez and D.Z.Zhang (2011) "Multi-objective ant colony optimization: A meta-heuristic approach to supply chain design" International Journal of Production Economics, UK

C.J. Vidal and M. Goetschalckx (2001), "A global supply chain model with transfer pricing and transportation cost allocation", European Journal of Operational Research, Vol. 129, pp. 134-158

X. Zhao, J. Xie and R.S.M. Lau (2001), "Improving the supply chain performance: use of forecasting models versus early order commitments", International Journal of Production Research, Vol. 39, No. 17, pp. 3923-3939.

Lim and Shiode (2011), The impact of online shopping demand on physical distribution networks: a simulation approach, International Journal of Physical Distribution & Logistics Management, Korea

Y.H. Lee and S.H. Kim (2002), "Production-distribution planning in supply chain considering capacity constraints", Computers and Industrial Engineering, Vol. 43, No. 1-2, pp. 169-190.

Y.J. Jang, S.Y. Jang, B.M. Chang and J. Park (2002), "A combined model of network design and production and distribution planning of a supply network", Computer and Industrial Engineering, Vol. 43, pp. 71-83.

Min and Zhou, 2002; Vakharia, 2002) (A.J. Vakharia (2002), "E-business and supply chain management", Decision Science, Vol. 33, pp. 495-504.

J.D. Camm, T.E. Chorman, F.A. Dill, J.R. Evan, D.J. Sweeney and G.W. Wegryn (1997), "Blending OR/MS judgment, and GIS: restructuring P&G's supply chain", Interfaces, Vol. 27, pp. 128-142.

S. Talluri (2000), "An IT/IS acquisition and justification model for supply chain management", International Journal of Physical Distribution & Logistics Management, Vol. 30, pp. 221-237.)

J.M. Smith (1999), "Item selection for global purchasing", European Journal of Purchasing & Supply Management, UK

T. Randall and K.Ulrich (2001), "Product Variety, Supply Chain Structure, and Firm Performance: Analysis of the U.S. Bicycle Industry", Management Science, USA

R. Stratton and R.D. H. Warburton (2006), "Managing the trade-off implications of global supply" International Journal of Production Economics, USA

S.Kumar and A.K. Chatterjee (2013), "A heuristic-based approach to integrate the product line selection decision to the supply chain configuration", International Journal of Production Research, India

M. J. Meixell and V. B. Gargeya (2005), USA, Transportation Research Part E: Logistics and Transportation Review Global supply chain design: A literature review and critique

M.Christopher and D.R. Towill (2002), UK, "Developing market specific supply chain strategies", The International Journal of Logistics Management

M. L. F. Cheng, R. Bhatnagar and S.C. Graves (2007), Singapore, "Logistics network design with supplier consolidation hubs and multiple shipment options", Journal of Industrial and Management Optimization

A. Z. Zeng andC.Rossetti (2003), USA, "Developing a framework for evaluating the logistics costs in global sourcing processes: an implementation and insights", International Journal of Physical Distribution & Logistics Management

Cooper, H.M. (1989), "Integrating research: a guide for literature review", Applied Social Research Methods Series, Vol. 2, Sage, Newbury Park, CA.

Lovell et al. (2005), UK, "Product value-density: managing diversity through supply chain segmentation", International Journal of Logistics Management

Rushton and Saw (1992), UK, "A methodology for logistics strategy planning", International Journal of Logistics Management.

Fisher, M.L. (1997), "What is the right supply chain for your product", Harvard Business Review, Vol. 75, No. 2, pp. 105-16.

S.J. Chen and E. Huang (2007), USA, "A systematic approach for supply chain improvement using design structure matrix" , Journal of Intelligent Manufacturing

J.S.Srai and M.Gregory (2008), UK, "A supply network configuration perspective on international supply chain development", International Journal of Operations & Production Management.

Leeuw, S., Holweg, M. and Williams, G. (2011), "The impact of decentralised control on firm-level inventory: Evidence from the automotive industry", International Journal of Physical Distribution & Logistics Management, Vol. 41, No. 5, pp. 435-456.

Appendix

Full companies results

1- Nestlé S.A.

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Nestle				FMCG		Switzerland						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2	
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	1	3	-	1	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-	
	8	Import tariff	Official import tariff	Medium (5:10%)	Irrelevant	1	-	-	2	-	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		10	19		11	17	
Sourcing	11	Local availability of purchased items	Qualitative	Medium-High	Local advantage	2	1	-				
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	1	-				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	Medium-High (40:50%)	Local advantage	1	1	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		8	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	Medium (30:40%)	Irrelevant				1	-	-	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Medium stability (70:80%)	Irrelevant				3	-	-	
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2	
	23	Labor quality	School enrollment, tertiary (% gross)	Medium-High (50:59%)	Local advantage				2	1	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1	
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		18	13	
Conclusion												
Total points						Sourcing	18	19	Manufacture	29	30	
Model suggestion							Global			Global		
Degree of certainity							Possibly			Possibly		
Actual configuration							Local			Global		

2- Unilever Food

Strategic global supply chain configuration model													
Company				Industry sector		Country of origin							
Unilever				FMCG		Netherlands							
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing				
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)		
Common	1	Product variety	Number of products in company portfolio	Medium-High (700:1000)	Global advantage	1	-	1	1	-	1		
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-		
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-		
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2		
	5	Demand volatility	variance of the demand in one year	Low (<5%)	Global superiority	3	-	2	2	-	2		
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2		
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-		
	8	Import tariff	Official import tariff	Medium (5:10%)	Irrelevant	1	-	-	2	-	-		
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-		
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2		
					Total points [Common drivers]		10	21		11	17		
Sourcing	11	Local availability of purchased items	Qualitative	Medium-High	Local advantage	2	1	-					
	12	Competition of domestic suppliers	Qualitative	Medium	Irrelevant	1	-	-					
	13	Quality of domestic sources	Qualitative	Medium-High	Local advantage	2	1	-					
	14	Profit margin	Profit %	Medium (30:40%)	Irrelevant	1	-	-					
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-					
					Total points [Sourcing drivers]		4	0		-	-		
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2		
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-		
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	1		
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-		
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1		
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2		
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2		
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-		
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2		
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-		
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1		
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2		
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-		
					Total points [Manufacturing drivers]		-	-		12	25		

Conclusion					
Total points	Sourcing	14	21	Manufacture	23	42
Model suggestion		Global			Global	
Degree of certainity		Certainly			Certainly	
Actual configuration		Global			Global	

3- Barilla S.p.A.

Strategic global supply chain configuration model												
Company			Industry sector		Country of origin							
Barilla			FMCG		Italy							
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	Medium-High (700:1000)	Global advantage	1	-	1	1	-	1	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2	
	5	Demand volatility	variance of the demand in one year	Low (<5%)	Global superiority	3	-	2	2	-	2	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-	
	8	Import tariff	Official import tariff	Medium (5:10%)	Irrelevant	1	-	-	2	-	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	Medium (3.6 : 4.5)	Irrelevant	2	-	-	1	-	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		6	21		9	17	
Sourcing	11	Local availability of purchased items	Qualitative	Medium-High	Local advantage	2	1	-				
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	1	-				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	Medium (30:40%)	Irrelevant	1	-	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		7	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	High (>50%)	Global superiority				1	-	2	
	19	Political stability	Political Stability index	Medium-High (6 : 7.5)	Local advantage				2	1	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1	
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	1	
	22	Labor cost	Monthly Average wage (US$/Month)	Medium (1500:2500 $/M)	Irrelevant				1	-	-	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2	
	25	Technology readiness	Networked readiness index	Medium (3.51 : 4.5)	Irrelevant				1	-	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-High (61:80%)	Local advantage				1	1	-	
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		9	21	

Conclusion					
Total points	Sourcing	13	21	Manufacture	18	38
Model suggestion		Global			Global	
Degree of certainity		Certainly			Certainly	
Actual configuration		Global			Global	

4- Colgate-Palmolive

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Colgate-Palmolive				FMCG		USA						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2	
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	1	2	-	1	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium	Irrelevant	1	-	-	1	-	-	
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	2	2	-	2	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		9	21		10	20	
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-				
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	1	-				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	High (>50%)	Local superiority	1	2	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		11	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	1	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Very Stable (>90%)	Global superiority				3	-	2	
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	1	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	Medium (11:15 Cents / KWh)	Irrelevant				2	-	-	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1	
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		12	22	

Conclusion					
		Sourcing		Manufacture	
Total points		20	21	22	42
Model suggestion		Global		Global	
Degree of certainity		Possibly		Certainly	
Actual configuration		Global		Global	

5- Carlsberg Beer

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Carlsberg				FMCG		Denmark						
						Sourcing			Manufacturing			
Type	No.	Driver	Driver indicator	Effective value	Influence	Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-
	3	Order cycle time	Time from receive order to delivery	Short (< 3 Days)	Local superiority	1	2	-	2	2	-
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2
	5	Demand volatility	variance of the demand in one year	Low (<5%)	Global superiority	3	-	2	2	-	2
	6	Dimension of the market	No. of countries sell company products	Global presence (<100 country)	Global advantage	2	-	1	1	-	1
	7	Competition level	Qualitative	Medium	Irrelevant	1	-	-	1	-	-
	8	Import tariff	Official import tariff	Low (<5%)	Global advantage	1	-	1	2	-	1
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2
					Total points [Common drivers]		10	21		12	19
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-			
	12	Competition of domestic suppliers	Qualitative	High	Local superiority	1	2	-			
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-			
	14	Profit margin	Profit %	Medium-High (40:50%)	Local advantage	1	1	-			
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-			
					Total points [Sourcing drivers]		11	0		-	-
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-
	18	Corporate taxation schemes	Total tax rate	Medium-Low (20:30%)	Local advantage				1	1	-
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-
					Total points [Manufacturing drivers]		-	-		13	24

Conclusion					
Total points	Sourcing	21	21	Manufacture	25	43
Model suggestion		Equal			Global	
Degree of certainity		Equal			Certainly	
Actual configuration		Local			Global	

6- Coca-Cola Beverage

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Coca-Cola				FMCG		USA						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing		
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	☆ 2	1	-	☆ 2
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	☆ 2	-	3	☆ 2	-
	3	Order cycle time	Time from receive order to delivery	Short (< 3 Days)	Local superiority	1	☆ 2	-	2	☆ 2	-
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	☆ 2	2	-	☆ 2
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	☆ 1	2	-	☆ 1
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	☆ 2	1	-	☆ 2
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	☆ 1	-	1	☆ 1	-
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	☆ 2	2	-	☆ 2
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	☆ 2	-	1	☆ 2	-
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	☆ 2	3	-	☆ 2
					Total points [Common drivers]		11	21		13	20
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	☆ 2	-			
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	☆ 1	-			
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	☆ 2	-			
	14	Profit margin	Profit %	High (>50%)	Local superiority	1	☆ 2	-			
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-			
					Total points [Sourcing drivers]		11	0		-	-
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	☆ 2
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	☆ 2	-
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	☆ 1
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	☆ 2	-
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Very Stable (>90%)	Global superiority				3	-	☆ 2
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	☆ 1
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	☆ 2
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	☆ 2	-
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	Medium (11:15 Cents / KWh)	Irrelevant				2	-	-
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	☆ 2	-
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	☆ 1
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	☆ 2	-
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-
					Total points [Manufacturing drivers]		-	-		20	14

Conclusion					
Total points	Sourcing	22	21	Manufacture	33	34
Model suggestion		Local			Global	
Degree of certainity		Possibly			Possibly	
Actual configuration		Local			Global	

7- Lindt & Sprüngli

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Lindt				FMCG		Switzerland						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	Medium-High (700:1000)	Global advantage	1	-	☆ 1	1	-	☆ 1	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	☆ 2	-	3	☆ 2	-	
	3	Order cycle time	Time from receive order to delivery	Short (< 3 Days)	Local superiority	1	☆ 2	-	2	☆ 2	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	☆ 2	2	-	☆ 2	
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	☆ 1	2	-	☆ 1	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	☆ 2	1	-	☆ 2	
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	☆ 1	-	1	☆ 1	-	
	8	Import tariff	Official import tariff	Medium (5:10%)	Irrelevant	1	-	-	2	-	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	☆ 2	-	1	☆ 2	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	☆ 2	3	-	☆ 2	
					Total points [Common drivers]		11	18		13	15	
Sourcing	11	Local availability of purchased items	Qualitative	Medium	Irrelevant	2	-	-				
	12	Competition of domestic suppliers	Qualitative	High	Local superiority	1	☆ 2	-				
	13	Quality of domestic sources	Qualitative	Medium-High	Local advantage	2	☆ 1	-				
	14	Profit margin	Profit %	Medium-High (40:50%)	Local advantage	1	☆ 1	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		5	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	☆ 2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	☆ 2	-	
	18	Corporate taxation schemes	Total tax rate	Medium (30:40%)	Irrelevant				1	-	-	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	☆ 2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Medium stability (70:80%)	Irrelevant				3	-	-	
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	☆ 2	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	☆ 2	
	23	Labor quality	School enrollment, tertiary (% gross)	Medium-High (50:59%)	Local advantage				2	☆ 1	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	☆ 2	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	☆ 2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-High (61:80%)	Local advantage				1	☆ 1	-	
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	☆ 2	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		11	20	
Conclusion												
Total points						Sourcing	16	18	Manufacture	24	35	
Model suggestion							Global			Global		
Degree of certainity							Possibly			Certainly		
Actual configuration							Global			Global		

8- Kellogg's Cereal

Strategic global supply chain configuration model													
Company				Industry sector		Country of origin							
Kellogg's – Cereal				FMCG		USA							
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing				
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)		
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2		
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-		
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-		
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2		
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	1	2	-	1		
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2		
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-		
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	2	2	-	2		
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-		
	10	Country of origin effect	Industry sector	Medium-Low	Global advantage	3	-	1	3	-	1		
					Total points [Common drivers]		10	18		11	17		
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-					
	12	Competition of domestic suppliers	Qualitative	High	Local superiority	1	2	-					
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-					
	14	Profit margin	Profit %	Medium (30:40%)	Irrelevant	1	-	-					
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-					
					Total points [Sourcing drivers]		10	0		-	-		
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2		
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-		
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	1		
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-		
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Very Stable (>90%)	Global superiority				3	-	2		
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	1		
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2		
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-		
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	Medium (11:15 Cents / KWh)	Irrelevant				2	-	-		
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-		
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-High (61:80%)	Local advantage				1	1	-		
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-		
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-		
					Total points [Manufacturing drivers]		-	-		21	13		
Conclusion													
Total points						Sourcing	20	18	Manufacture	32	30		
Model suggestion							Local			Local			
Degree of certainity							Possibly			Possibly			
Actual configuration							Local			Global			

9- Absolut Vodka

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Absolut Vodka				FMCG		Sweden						
						Sourcing			Manufacturing			
Type	No.	Driver	Driver indicator	Effective value	Influence	Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	Medium-Low (100:400)	Local advantage	1	1	-	1	1	-	
	2	Technology level	Qualitative	Medium-Low	Local advantage	2	1	-	3	1	-	
	3	Order cycle time	Time from receive order to delivery	Short (< 3 Days)	Local superiority	1	2	-	2	2	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium-High	Global advantage	2	-	1	2	-	1	
	5	Demand volatility	variance of the demand in one year	Low (<5%)	Global superiority	3	-	2	2	-	2	
	6	Dimension of the market	No. of countries sell company products	Global presence (<100 country)	Global advantage	2	-	1	1	-	1	
	7	Competition level	Qualitative	Medium	Irrelevant	1	-	-	1	-	-	
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	2	2	-	2	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect	Industry sector	Medium-High	Local advantage	3	1	-	3	1	-	
					Total points [Common drivers]		12	12		13	11	
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-				
	12	Competition of domestic suppliers	Qualitative	High	Local superiority	1	2	-				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	High (>50%)	Local superiority	1	2	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		12	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	High (>50%)	Global superiority				1	-	2	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1	
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1	
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		20	18	

Conclusion					
Total points	Sourcing	24	12	Manufacture	33	29
Model suggestion		Local			Local	
Degree of certainity		Certainly			Probably	
Actual configuration		Local			Local	

10- Chicco Toys

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Chicco				FMCG		Italy						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	Medium-Low (100:400)	Local advantage	1	1	-	1	1	-	
	2	Technology level	Qualitative	Medium-Low	Local advantage	2	1	-	3	1	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium-High	Global advantage	2	-	1	2	-	1	
	5	Demand volatility	variance of the demand in one year	Medium (11:15%)	Irrelevant	3	-	-	2	-	-	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium	Irrelevant	1	-	-	1	-	-	
	8	Import tariff	Official import tariff	Medium (5:10%)	Irrelevant	1	-	-	2	-	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	Medium (3.6 : 4.5)	Irrelevant	2	-	-	1	-	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		4	12		6	10	
Sourcing	11	Local availability of purchased items	Qualitative	Medium	Irrelevant	2	-	-				
	12	Competition of domestic suppliers	Qualitative	Medium-Low	Global advantage	1	-	1				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	High (>50%)	Local superiority	1	2	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		6	1		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Medium-Low (9:12 Months)	Global advantage				1	-	1	
	17	Completeness	Item Fill Rate (IFR%)	Medium (92:95%)	Irrelevant				1	-	-	
	18	Corporate taxation schemes	Total tax rate	High (>50%)	Global superiority				1	-	2	
	19	Political stability	Political Stability index	Medium-High (6 : 7.5)	Local advantage				2	1	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1	
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	1	
	22	Labor cost	Monthly Average wage (US$/Month)	Medium (1500:2500 $/M)	Irrelevant				1	-	-	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2	
	25	Technology readiness	Networked readiness index	Medium (3.51 : 4.5)	Irrelevant				1	-	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-High (61:80%)	Local advantage				1	1	-	
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		7	20	

Conclusion				
Total points	Sourcing	10	13	Manufacture	13	30
Model suggestion		Global			Global	
Degree of certainity		Probably			Certainly	
Actual configuration		Global			Global	

11- Lego

Strategic global supply chain configuration model													
Company				Industry sector		Country of origin							
Lego				FMCG		Denmark							
						Sourcing			Manufacturing				
Type	No.	Driver	Driver indicator	Effective value	Influence	Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)		
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2		
	2	Technology level	Qualitative	Medium-Low	Local advantage	2	1	-	3	1	-		
	3	Order cycle time	Time from receive order to delivery	Medium (7:10 Days)	Irrelevant	1	-	-	2	-	-		
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium-High	Global advantage	2	-	1	2	-	1		
	5	Demand volatility	variance of the demand in one year	Medium-High (16:20%)	Local advantage	3	1	-	2	1	-		
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2		
	7	Competition level	Qualitative	Medium	Irrelevant	1	-	-	1	-	-		
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	2	2	-	2		
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-		
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2		
					Total points [Common drivers]		9	16		7	16		
Sourcing	11	Local availability of purchased items	Qualitative	Low	Global superiority	2	-	2					
	12	Competition of domestic suppliers	Qualitative	Low	Global superiority	1	-	2					
	13	Quality of domestic sources	Qualitative	Medium	Irrelevant	2	-	-					
	14	Profit margin	Profit %	High (>50%)	Local superiority	1	2	-					
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-					
					Total points [Sourcing drivers]		2	6		-	-		
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Medium-Low (9:12 Months)	Global advantage				1	-	1		
	17	Completeness	Item Fill Rate (IFR%)	Medium-High (96:97%)	Local advantage				1	1	-		
	18	Corporate taxation schemes	Total tax rate	Medium-Low (20:30%)	Local advantage				1	1	-		
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-		
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1		
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2		
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2		
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-		
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2		
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-		
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-Low (21:40%)	Global advantage				1	-	1		
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2		
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-		
					Total points [Manufacturing drivers]		-	-		12	23		
Conclusion													
Total points						Sourcing	11	22	Manufacture	19	39		
Model suggestion							Global			Global			
Degree of certainity							Certainly			Certainly			
Actual configuration							Global			Global			

12- Zara

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
Zara				FMCG		Spain						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Short (< 3 Days)	Local superiority	1	2	-	2	2	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium-High	Global advantage	2	-	1	2	-	1	
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	1	2	-	1	
	6	Dimension of the market	No. of countries sell company products	Global presence (<100 country)	Global advantage	2	-	1	1	-	1	
	7	Competition level	Qualitative	Medium-High	Global advantage	1	-	1	1	-	1	
	8	Import tariff	Official import tariff	Medium-High (11:15%)	Local advantage	1	1	-	2	1	-	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		11	16		14	14	
Sourcing	11	Local availability of purchased items	Qualitative	Medium	Irrelevant	2	-	-				
	12	Competition of domestic suppliers	Qualitative	Medium	Irrelevant	1	-	-				
	13	Quality of domestic sources	Qualitative	Medium-High	Local advantage	2	1	-				
	14	Profit margin	Profit %	Medium-High (40:50%)	Local advantage	1	1	-				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		3	0		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	High (< 3 Months)	Local superiority				1	2	-	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	Medium (30:40%)	Irrelevant				1	-	-	
	19	Political stability	Political Stability index	Medium-High (6 : 7.5)	Local advantage				2	1	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1	
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2	
	22	Labor cost	Monthly Average wage (US$/Month)	Medium (1500:2500 $/M)	Irrelevant				1	-	-	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2	
	25	Technology readiness	Networked readiness index	Medium-High (4.51 : 5)	Local advantage				1	1	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-High (61:80%)	Local advantage				1	1	-	
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	2	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		12	19	
Conclusion												
Total points						Sourcing	14	16	Manufacture	26	33	
Model suggestion							Global			Global		
Degree of certainity							Possibly			Certainly		
Actual configuration							Global			Global		

13- BasicNet Group

Strategic global supply chain configuration model													
Company				Industry sector		Country of origin							
BasicNet				FMCG		Italy							
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing				
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)		
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	☆ 2	1	-	☆ 2		
	2	Technology level	Qualitative	Medium-Low	Local advantage	2	☆ 1	-	3	☆ 1	-		
	3	Order cycle time	Time from receive order to delivery	Medium-Long (11:14 Days)	Global advantage	1	-	☆ 1	2	-	☆ 1		
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium	Irrelevant	2	-	-	2	-	-		
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	☆ 1	2	-	☆ 1		
	6	Dimension of the market	No. of countries sell company products	Global presence (<100 country)	Global advantage	2	-	☆ 1	1	-	☆ 1		
	7	Competition level	Qualitative	Medium-High	Global advantage	1	-	☆ 1	1	-	☆ 1		
	8	Import tariff	Official import tariff	Medium-High (11:15%)	Local advantage	1	☆ 1	-	2	☆ 1	-		
	9	Quality of infrastructure	Quality of overall infrastructure index	Medium (3.6 : 4.5)	Irrelevant	2	-	-	1	-	-		
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	☆ 2	3	-	☆ 2		
					Total points [Common drivers]		3	15		5	14		
Sourcing	11	Local availability of purchased items	Qualitative	Medium	Irrelevant	2	-	-					
	12	Competition of domestic suppliers	Qualitative	Medium	Irrelevant	1	-	-					
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	☆ 2	-					
	14	Profit margin	Profit %	Medium (30:40%)	Irrelevant	1	-	-					
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-					
					Total points [Sourcing drivers]		4	0		-	-		
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	High (< 3 Months)	Local superiority				1	☆ 2	-		
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	☆ 2	-		
	18	Corporate taxation schemes	Total tax rate	High (>50%)	Global superiority				1	-	☆ 2		
	19	Political stability	Political Stability index	Medium-High (6 : 7.5)	Local advantage				2	☆ 1	-		
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	☆ 1		
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	☆ 1		
	22	Labor cost	Monthly Average wage (US$/Month)	Medium (1500:2500 $/M)	Irrelevant				1	-	-		
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	☆ 2	-		
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	☆ 2		
	25	Technology readiness	Networked readiness index	Medium (3.51 : 4.5)	Irrelevant				1	-	-		
	26	Strength of domestic demand	Domestic sales / Total sales	Medium-High (61:80%)	Local advantage				1	☆ 1	-		
	27	Sourcing strategy	Company strategy	Global sourcing	Global superiority				4	-	☆ 2		
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-		
					Total points [Manufacturing drivers]		-	-		11	19		
Conclusion													
Total points						Sourcing	7	15	Manufacture	16	33		
Model suggestion							Global			Global			
Degree of certainity							Certainly			Certainly			
Actual configuration							Global			Global			

14- Heineken NV

Strategic global supply chain configuration model													
Company				Industry sector		Country of origin							
Heineken				FMCG		Netherlands							
						Sourcing			Manufacturing				
Type	No.	Driver	Driver indicator	Effective value	Influence	Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)		
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2		
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-		
	3	Order cycle time	Time from receive order to delivery	Short (< 3 Days)	Local superiority	1	2	-	2	2	-		
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium	Irrelevant	2	-	-	2	-	-		
	5	Demand volatility	variance of the demand in one year	Medium-Low (6:10%)	Global advantage	3	-	1	2	-	1		
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2		
	7	Competition level	Qualitative	Medium	Irrelevant	1	-	-	1	-	-		
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	2	2	-	2		
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-		
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2		
					Total points [Common drivers]		10	17		12	16		
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-					
	12	Competition of domestic suppliers	Qualitative	High	Local superiority	1	2	-					
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-					
	14	Profit margin	Profit %	Low (<20%)	Global superiority	1	-	2					
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-					
					Total points [Sourcing drivers]		10	2		-	-		
N	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2		
	17	Completeness	Item Fill Rate (IFR%)	Medium-High (96:97%)	Local advantage				1	1	-		
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	1		
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-		
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1		
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2		
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2		
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-		
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2		
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-		
	26	Strength of domestic demand	Domestic sales / Total sales	Medium (41:60%)	Irrelevant				1	-	-		
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-		
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-		
					Total points [Manufacturing drivers]		-	-		19	16		
Conclusion													
Total points						Sourcing	20	19	Manufacture	31	32		
Model suggestion							Local			Global			
Degree of certainity							Possibly			Possibly			
Actual configuration							Local			Global			

15- PepsiCo Beverage Company

Strategic global supply chain configuration model												
Company				Industry sector		Country of origin						
PepsiCo				FMCG		USA						
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing			
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)	
Common	1	Product variety	Number of products in company portfolio	Medium-Low (100:400)	Local advantage	1	1	-	1	1	-	
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-	
	3	Order cycle time	Time from receive order to delivery	Medium-Short (3:6 Days)	Local advantage	1	1	-	2	1	-	
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	High	Global superiority	2	-	2	2	-	2	
	5	Demand volatility	variance of the demand in one year	Low (<5%)	Global superiority	3	-	2	2	-	2	
	6	Dimension of the market	No. of countries sell company products	Global presence (>100 country)	Global superiority	2	-	2	1	-	2	
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-	
	8	Import tariff	Official import tariff	No tariff	Global superiority	1	-	2	2	-	2	
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-	
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2	
					Total points [Common drivers]		11	22		12	20	
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-				
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	1	-				
	13	Quality of domestic sources	Qualitative	High	Local superiority	2	2	-				
	14	Profit margin	Profit %	Low (<20%)	Global superiority	1	-	2				
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-				
					Total points [Sourcing drivers]		9	2		-	-	
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	Low (> 1 year)	Global superiority				1	-	2	
	17	Completeness	Item Fill Rate (IFR%)	High (98:100%)	Local superiority				1	2	-	
	18	Corporate taxation schemes	Total tax rate	Medium-High (40:50%)	Global advantage				1	-	1	
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-	
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Very Stable (>90%)	Global superiority				3	-	2	
	21	Environmental regulations	Environmental Performance Index (EPI)	Medium-High (61:75)	Global advantage				2	-	1	
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2	
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-	
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	Medium (11:15 Cents / KWh)	Irrelevant				2	-	-	
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-	
	26	Strength of domestic demand	Domestic sales / Total sales	Medium (41:60%)	Irrelevant				1	-	-	
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-	
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-	
					Total points [Manufacturing drivers]		-	-		20	13	
Conclusion												
Total points						Sourcing	20	24	Manufacture	32	33	
Model suggestion							Global			Global		
Degree of certainity							Probably			Possibly		
Actual configuration							Local			Global		

16- H&M

Strategic global supply chain configuration model													
Company				Industry sector		Country of origin							
H&M				FMCG		Sweden							
Type	No.	Driver	Driver indicator	Effective value	Influence	Sourcing			Manufacturing				
						Ws	Local (Ls)	Global (Gs)	Wm	Local (Lm)	Global (Gm)		
Common	1	Product variety	Number of products in company portfolio	High (>1000)	Global superiority	1	-	2	1	-	2		
	2	Technology level	Qualitative	Low (Functional)	Local superiority	2	2	-	3	2	-		
	3	Order cycle time	Time from receive order to delivery	long (> 14 Days)	Global superiority	1	-	2	2	-	2		
	4	Demand predictability	Medium Abs. Perc. Error (MAPE%)	Medium-High	Global advantage	2	-	1	2	-	1		
	5	Demand volatility	variance of the demand in one year	Medium (11:15%)	Irrelevant	3	-	-	2	-	-		
	6	Dimension of the market	No. of countries sell company products	Global presence (<100 country)	Global advantage	2	-	1	1	-	1		
	7	Competition level	Qualitative	Medium-Low	Local advantage	1	1	-	1	1	-		
	8	Import tariff	Official import tariff	Medium-High (11:15%)	Local advantage	1	1	-	2	1	-		
	9	Quality of infrastructure	Quality of overall infrastructure index	High (>5)	Local superiority	2	2	-	1	2	-		
	10	Country of origin effect	Industry sector	Low	Global superiority	3	-	2	3	-	2		
					Total points [Common drivers]		10	14		11	15		
Sourcing	11	Local availability of purchased items	Qualitative	High	Local superiority	2	2	-					
	12	Competition of domestic suppliers	Qualitative	Medium-High	Local advantage	1	1	-					
	13	Quality of domestic sources	Qualitative	Medium-High	Local advantage	2	1	-					
	14	Profit margin	Profit %	Low (<20%)	Global superiority	1	-	2					
	15	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant	1	-	-					
					Total points [Sourcing drivers]		7	2		-	-		
Manufacturing	16	Risk of obsolescence	Expected time before obsolescence	High (< 3 Months)	Local superiority				1	2	-		
	17	Completeness	Item Fill Rate (IFR%)	Medium (92:95%)	Irrelevant				1	-	-		
	18	Corporate taxation schemes	Total tax rate	High (>50%)	Global superiority				1	-	2		
	19	Political stability	Political Stability index	High (7.5 : 10)	Local superiority				2	2	-		
	20	Stability of domestic currency	(min. value/max. value) against US dollar	Stable (80:90%)	Global advantage				3	-	1		
	21	Environmental regulations	Environmental Performance Index (EPI)	High (>75)	Global superiority				2	-	2		
	22	Labor cost	Monthly Average wage (US$/Month)	High (>3000 $/M)	Global superiority				1	-	2		
	23	Labor quality	School enrollment, tertiary (% gross)	High (>60%)	Local superiority				2	2	-		
	24	Energy cost (US$ Cents / KWh)	Electricity pricing	High (>20 Cents / KWh)	Global superiority				2	-	2		
	25	Technology readiness	Networked readiness index	High (>5)	Local superiority				1	2	-		
	26	Strength of domestic demand	Domestic sales / Total sales	High (>80%)	Local superiority				1	2	-		
	27	Sourcing strategy	Company strategy	Local sourcing	Local superiority				4	2	-		
	28	Effect of existing SC network	Supply chain network analysis	Greenfield	Irrelevant				1	-	-		
					Total points [Manufacturing drivers]		-	-		22	15		
Conclusion													
Total points						Sourcing	17	16	Manufacture	33	30		
Model suggestion							Local			Local			
Degree of certainity							Possibly			Probably			
Actual configuration							Local			Global			