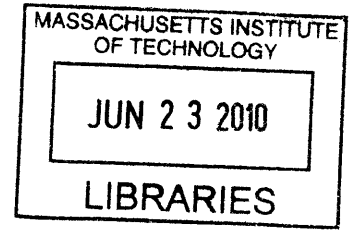


**Evolution of the Mobile Phone Supply Chain: The Case of Ecuador**

by

Santolina Savannet

Ingénieure Polytechnicienne  
École Polytechnique, 2008



Submitted to the Engineering Systems Division  
in Partial Fulfillment of the Requirements for the Degree of

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## **ABSTRACT**

The cell phone industry is growing at a vertiginous pace. It has a life-changing impact on individuals and businesses in developing countries, where it can make up for the lack of infrastructure. In Latin America, the cell phone supply chain faces challenges specific to developing countries. Success in these environments requires creative solutions and adaptable supply chains. Ecuador is no exception, and the rapid evolution of the industry over the last decade has led to various changes in the supply chain of mobile devices.

This thesis characterizes the supply chain challenges faced by the cell phone industry in Latin America. Key challenges characterizing emerging markets are highlighted. By using the case of a leading wireless network service provider in Ecuador, the document explores changes in the supply chain structure resulting from the evolution of its relationship with a supply chain solutions company, Brightstar. This evolution is represented by three different cell phone supply chains.

The supply chains provide examples of responses to the supply chain challenges. The performances of the supply chains are compared based on the notion of responsiveness. To this end, system dynamics is used as a tool to analyze the different systems and the dynamics in action. Based on this analysis, recommendations are formulated regarding the current supply chain structure.

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I dedicate this thesis to Angelica.

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# 1. Introduction

## 1.1. Background

The cell phone industry has undergone many changes in the past twenty years, as shown in Figure 1. The number of worldwide mobile phone users has grown dramatically: it exceeded 4 billion in 2009, after growing nearly 25 per cent annually for the previous eight years.

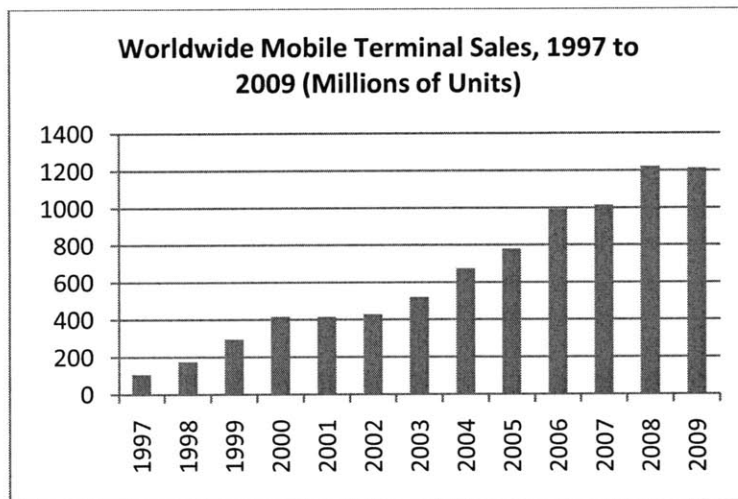


Figure 1 Worldwide Mobile Terminal Sales (Source: Gartner)

Every year, hundreds of new mobile communications devices are introduced. Beyond the handset manufacturers and consumers, the network operators, or carriers, have also undergone rapid change, dramatically expanding their networks to accommodate the billions of new users and managing the technology transitions, plus navigating industry dynamics that exhibited significant entry, as well as merger and acquisition activity.

Soaring demand revealed many opportunities for all actors in the wireless phone industry, but deregulation of telecommunications also led to stiff competition. Traditionally, mobile network

providers, or “carriers”, owned the entire wireless value chain. However, the number of players in the value chain and the complexity of interactions among them increased, the market became more competitive, rising customer expectations. These changes forced carriers to rethink their business models and focus on their core competencies: delivering secure and reliable wireless services. The value chain was pushed to evolve into a set of partnerships to deliver mobile wireless value, and carriers resorted to outsourcing. Nevertheless, the carriers’ business culture remained oriented towards cost minimization rather than value maximization, putting pressure on the ability of service providers to build economically viable business models.

Following this trend, the Latin American wireless industry has grown very rapidly over the previous few years. Latin America now constitutes a very polarized territory in terms of mobile operators: the two largest operators – Telefónica and América Móvil – together own 64% of the total subscriber base. América Móvil, a Mexican company, provides services in a large set of Latin American countries under various brand names, including Claro in Chile and Porta in Ecuador. Telefónica, based in Spain, also serves many countries under various brand names, the most common being Movistar.

In Ecuador, Movistar is an example of the pace of mergers and acquisitions in the region: from Otecel to Bellsouth Ecuador to Telefónica, in 2004. Bellsouth Ecuador was part of a major strategic move from the American telecommunications company Bellsouth Corporation. In an ambitious strategy to grow internationally, Bellsouth expanded very rapidly in Latin America, by buying existing carriers. This expansion took place in a relatively short period of time – less than a decade - compared with its long history in the United States: Bellsouth was one of the seven original Regional Bell Operating Companies created in 1984. Core to the growth and expansion strategy was a multi-brand strategy, where the wireless branch of Bellsouth in the United States took the name Cingular Wireless whilst its exported branch in Latin America kept the name Bellsouth.

The rapid growth of Bellsouth Corporation and the dizzying rate of change of the industry did not leave it much time to improve the operations it had taken over: the existing supply chains, which had not called for considerable attention thus far, merely consisted of an aggregate of local solutions to local problems, and were now inappropriate. Bellsouth Corporation realized the need to develop capabilities, and decided to outsource its logistics and supply chain. Bellsouth partnered with Brightstar Corporation, a US based company that provided logistical services and supply chain management within the wireless telecommunications industry. In 2002, the two companies set up a long-term partnership in Latin America, and started by using Ecuador as a test environment. This agreement led to the creation of Brightstar Ecuador, in 2002, and initiated a first change in the cell phone supply chain in the country. Since then, the acquisition by Telefónica Móviles in 2004 modified the supply chain structure again, with Bellsouth Ecuador becoming Movistar.

This thesis will examine the corresponding three different supply chain structures adopted over time. The first supply chain is that of Bellsouth Ecuador at its beginning, the second supply chain is that of Bellsouth Ecuador collaborating with Brightstar, and the third supply chain is that of Movistar with Brightstar.

## **1.2. Motivation**

Supply chain management is a very well developed field, of interest both to industry practitioners and academics: it is defined as 'the integration of key business processes from end-users through original suppliers that provide products, services, and information and add value for customers and other stakeholders' (Martha C. Cooper, et al. 1997). The main objective of a supply chain is to 'enhance operational efficiency, profitability and competitive position of a firm and its supply chain partners' (Min & Zhou 2002). It is characterized by a flow of goods, information and money between different players as shown in Figure 2 [adapted from Min, 2002].

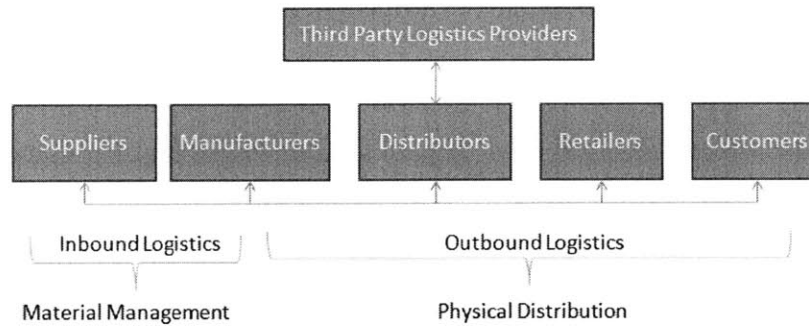


Figure 2 The supply chain process (adapted from Min, 2002)

The importance of supply chain management would seem greater in developing countries, where the pressure on cost minimization and efficiency is highest. Yet, knowledge on industry practices in developing countries is still limited. The development of a specific knowledge base on practices in emerging markets would be desirable, given the specific challenges faced by the industry in this type of environment. The case study described in this thesis aims at contributing in this direction.

The cell phone industry was of particular interest because of the major technological leap enabled by cell phones: the creation of wireless mobile phone devices changed our lives like PCs did in the 80s and Internet in the late 90s. Its impact is greater in developing countries where it often makes up for the lack of proper telecommunications infrastructure, as well as infrastructure in general. Moreover, the rapid evolution of the industry and of the corresponding supply chain facilitated the analysis of different supply chain structures that had been adopted. The strength of an analysis based on present or previously existing supply chains, compared to an analysis based on hypothetical supply chain structures, lies in the fact that existing supply chains have already proven their feasibility: although the feasibility does not necessarily imply sustainability over the long-term, the existence of the supply chain structures proves that they can be implemented. Thus, this thesis attempts to draw lessons from past behaviors to make recommendations for the present.

The choice of the company Brightstar for the case study was driven by its prominent presence in the wireless phone industry. Eight years after its creation in Miami, in 2006, the company was already the No. 1 cell phone distributor in the Americas and recognized as the largest global wireless distribution and supply chain solutions company.

### **1.3. Objective**

The purpose of this thesis is to compare the performance of the cell phone supply chain at different stages in its evolution, in order to identify best practices and make recommendations for the current supply chain.

There are several key questions to consider:

- What are the constraints of an emerging market?
- What were the different structures adopted by the cell phone supply chain over time?
- How do the performances of each structure compare to each other?

### **1.4. Methodology**

#### **1.4.1. Case study research**

The case study method was chosen for this research, which is exploring the evolution of the mobile phone supply chain. Case study methodology is helpful in business research for understanding the impact of organizational structures on the role of logistics (Ellram 1996). According to Yin (Yin 2003), the case study is a preferred strategy in exploratory research because: the research question is in the form of “how” – “how did the supply chain evolve?”, there is no possibility to control the events studied, and the focus is on a contemporary phenomenon in a real-life context.

For data collection purposes, several sources of evidence were used:

- Documents: presentations put together by companies, press releases were collected
- Archival records: historical data, when available, was retrieved
- Interviews: stakeholders from various companies and at different levels took part in structured and unstructured interviews
- Direct observation: visits of warehouses and offices, points of sales, as well as the environment surrounding the points of interest were set up

The research was undertaken at a number of intervals over an 18-month period. Three series of trips to Latin America were organized. The first series took place in Puerto Rico, Dominican Republic, and Ecuador, and then Argentina and Brazil. The objective of the first series was to explore the cell phone supply chain through open-ended and spontaneous questions; the interviews and site visits aimed at gathering general data on the challenges faced by carriers and Brightstar subsidiaries in Latin America, and their responses to these challenges. The objective of the second series, which took place entirely in Ecuador, was to gather an extensive understanding of the national cell phone supply chain involving Brightstar and Movistar; interview questions were more focused towards that goal, with a checklist of information to collect. Thus, multiple sources of evidence were used (Yin 2003). Moreover, a case study database collecting all the information was set up.

The choice of Ecuador as a focus point was based on the leading role of the subsidiary in Brightstar's supply chain solutions services. It was the second Brightstar subsidiary set up to provide these services, and developed very successfully: Brightstar Ecuador was working for all three national carriers by 2005, barely three years after its setup.

### **1.4.2. System dynamics**

In this thesis, System dynamics is applied to the evolving cell phone supply chain, in an attempt to draw a better understanding of the chain. A comparison is drawn between different supply chain management policies through the analysis of the various system structures adopted over time.

System dynamics were introduced by Forrester in the early 60s, as a modeling and simulation tool for the analysis and long-term decision-making of dynamic industrial management problems. In System dynamics, the structure of a system is depicted by causal loop diagrams, which capture the major feedback mechanisms. Causal loop diagrams play two important roles: during model development, they serve as preliminary sketches of causal hypotheses, and they can simplify the representation of a model. The structure of a dynamic system model includes stock and flow variables. The mathematical mapping of a stock-flow diagram uses a system of differential equations, which is numerically solved through simulation. One fundamental principle of System dynamics is that it is the structure of the system that gives rise to its behavior. Moreover, it encourages the modeler to examine issues from multiple perspectives.

System dynamics is an effective tool for understanding the structure and internal dynamic behaviors of a large and complex system. It can be used to explore the nonlinear dynamic behavior of a system and to study how the structure and the parameters of the system lead to behavior patterns. It can also be used to design effective and robust policies, which improve the performance of managed systems.

System dynamics is an appropriate tool for the modeling and analysis of strategic supply chain management. Indeed, a supply chain network by nature is a large and complex engineering and management system. To understand its structure and assess the effectiveness of policy design, the internal dynamic behavior of the supply chain must be studied. A supply chain is characterized by a stock and flow structure for the acquisition, storage and conversion of inputs into outputs and the decision

rules governing these flows. The flows often lead to feedbacks among the partners of the chain, as the decision of each agent impacts the other agents along the chain. Thus, System dynamics is a powerful tool to study the dynamics of the supply chain and its policy design.

The modeling process in system dynamics involves the following tasks: (1) articulating the problem to be addressed, (2) formulating a dynamic hypothesis or theory about the cause of the problem, (3) formulating a simulation model to test the dynamic hypothesis, (4) testing the model, and (5) designing and evaluating policies for improvement (Sterman 2000).

## **1.5. Thesis overview**

The thesis is structured as follows.

Chapter 1 provides background information and an overview of the thesis.

Chapter 2 recapitulates a literature review on challenges in emerging markets, the cell phone supply chain, third party logistics, performance measurement and dealers. This chapter provided a basis for the analysis of the presence of third party logistics providers in the cell phone supply chain, through its impact on supply chain performance. In the context of emerging markets, dealers play a major role in the value chain.

Chapter 3 presents supply chain challenges faced by the cell phone industry in Latin America, that have been identified during the interviews and site visits. The similarities across the countries allow for a generalization of the analysis, and depict the landscape of constraints that the supply chain should take into account.

Chapter 4 gives background information for the case study, regarding the environment and the cell phone industry in Ecuador.



Chapter 5 is the case study and describes in details the evolution of the relationship between Bellsouth and Brightstar and the different supply chains examined.

The discussion of the case is provided in Chapter 6 with two sections. The first one examines responses to supply chain challenges in emerging markets provided by the case. The second section analyzes the performance of the supply chains examined, centering on the notion of responsiveness.

Chapter 7 concludes the analysis, provides recommendations regarding the current supply chain and suggestions for future research.

## **2. Literature review**

### **2.1. Challenges of emerging markets**

Research on challenges in emerging markets recognizes the uniqueness of their business environments, and offers suggestions to deal with these challenges. However, literature review has revealed the absence of comprehensive analysis of supply chain challenges and solutions.

The saturation of existing developed markets has rendered emerging markets in the developing world more attractive to multinational corporations (MNCs). Moreover, MNCs are shifting their strategies from a focus on the wealthy elite to the base of the economic pyramid. Emerging markets present many opportunities as well as unique challenges. Success depends on the ability to recognize the specificity of these challenges and leverage the strengths of the existing market environments, rather than trying to apply the Western business-as-usual attitude. Traditional marketing frameworks should be replaced by a new framework that takes into account these differences; relationship management with local distributor partners is a key component (Arnold & Quelch 1998). A successful strategy is based on developing relationships with non-traditional partners, tailoring solutions to the environment, and building local capacity (London & Hart 2004).

In Latin America, one major challenge faced by businesses is the lack of investment in infrastructure such as transport systems, water, sanitation and electricity, which has impeded growth, competitiveness and poverty reduction (Fay & Morrison 2007).

## **2.2. Cell phone supply chain**

The telecommunications industry is well explored in literature, however the focus is placed on the upstream supply chain – issues faced by original equipment manufacturers and their suppliers – or the evolution of mobile phone technology or its sociological impact.

According to Fisher (Fisher 1997), different product parameters can be used to determine the optimal structure of supply chains. Products can be classified as being functional or innovative. When product demand exhibits a smooth pattern, demand has a low coefficient of variation and can be qualified as functional. Functional products have stable, predictable demands, long lead times and low margins; their corresponding supply chains need to be efficient logistically. However, there is an increasing number of products with shorter life cycles and larger demand variability, and applying traditional methodologies to these products may lead to considerable errors. Innovative products are associated with demand uncertainty, short lifecycle; optimal supply chain strategies need to reduce uncertainty, cut cycle time and improve flexibility.

Building on this classification, Catalan (2003) qualifies cell phone as an innovative product, given the high level of technology and innovation, and the short product life cycle. Cell phones evolved from being an engineering product to becoming a very popular consumer product for which design and availability matter more than technology. The complexity of the product, as both a mass-oriented and fashion product, combined with highly uncertain demand, requires a highly efficient supply chain.

A case study was carried out on the Danish mobile phone supply chain, focusing on performance efficiency (Catalan & Kotzab 2003). The details of the methodology used are given in Section 2.4.

### **2.3. Outsourcing and third-party logistics**

There is a growing trend of outsourcing logistics activities in a wide variety of industrial sectors.

Outsourcing, or third party logistics (3PL), describes the practice of contracting out part of or all logistics activities that were previously performed in-house. The term outsourcing can cover many areas, from manufacturing to services. In the telecommunications industry, OEMs have carried out extensive outsourcing over the past years, contracting out to Electronic Manufacturing Service providers for example (Zhai 2004). Outsourcing is best accomplished by using an approach of selecting and managing the most competent source to carry out each activity in the value chain (McIvor 2003).

The volatility of the telecommunications industry renders long-term partnership relations with suppliers inappropriate; these relationships will only last as long as they remain competitive in terms of cost, technology and quality (McIvor 2003).

Benefits and risks of logistics outsourcing, also called third party logistics (3PL), can be classified as strategy-, finance- and operations-related (Lonsdale 1999). From a strategic perspective, outsourcing can enable companies to focus on their core competencies and improve customer satisfaction.

However, companies risk losing control over the logistics function as well as customer contact, and have lower responsiveness to customer needs. On the financial side, gains can be made on certain fixed and variable costs, whilst 3PL can achieve economies of scale. The difficulty lies in quantifying the real cost savings of outsourcing given the fee structure of the 3PL provider. Finally, on the operations side, 3PL can result in a reduction in inventory levels, order cycle times, lead times, and improve customer service. However, outsourcing can lead to a disruption in inbound flows, and these benefits can come at the expense of the ability to deal with special product needs (Lonsdale 1999).

## **2.4. Supply chain performance assessment**

The natural procedure to follow when assessing supply chain performance is to quantify performance by using specific key indicators.

Performance measures can be classified into three types: resource, output and flexibility (Beamon 1999). Performance indicators of supply chains abound, yet the difficulty resides in identifying the appropriate indicators for the supply chain considered, and combining them in one measurement system. Aramyán (2006) attempted to fill this gap in the case of agri-food supply chains, by suggesting a framework for measuring the performance of these chains.

Performance metrics that measure internal logistics operations should be set apart from those that measure supply chain management. For instance, inventory turn rate yields different results when considered at the retailer level or the supplier level; this metric should be replaced by total inventory carrying costs, to take into account the risk of holding inventory, which increases downstream of the chain. An alternative perspective is the use of customer-supplier profit and loss statements: the maximization of profitability at each link of the supply chain is necessary to maximize performance for the whole chain (Lambert & Pohlen 2001).

Catalan (2003) focuses on the notion of responsiveness, as a key variable for the performance analysis of the mobile phone supply chain. Responsiveness is defined as two components: one indicating both the flow of information and the flow of goods in the chain, and another indicating product demand transparency. Four evaluation variables are set up for the analysis of responsiveness: delivery lead times, postponement strategies, the bullwhip effect and information exchange. The four variables contribute on both levels of responsiveness, as depicted in Figure 3.

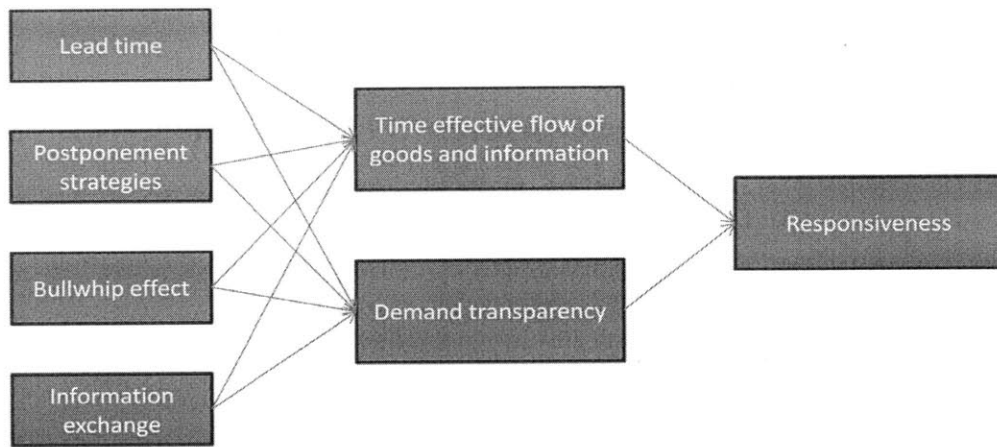


Figure 3 Responsiveness assessment model (Source: Catalan, 2003)

## 2.5. Dealers

One characteristic of the cell phone supply chain is its reliance on dealers: independent, relatively small business owners who are dedicated to selling cell phones. Contrary to retailers, who own commercial space and rent pieces of it to their suppliers, dealers do not usually sell other products.

Dealers play a major role in distribution in developing countries, as a small and medium enterprise (SME), providing a major source of employment, particularly for low-skilled labor. The ease of setting up a small business results in stiff competition, which gives suppliers – manufacturers - considerable power (Frazier et al. 1989). The level of power of the manufacturer determines the influence strategies that it will use in its relationship with the dealers: more powerful manufacturers tend to rely on threats and legal processes, whereas less powerful manufacturers would use low pressure means of influence and be more collaborative (Kale 1986).

SMEs offer more flexibility as a whole than large corporations; however, their growth is stifled by the lack of available finance (Newberry & Damassa 2006): few of them have access to bank loans. Indeed, poor contract enforcement, high levels of corruption, restrictive banking regulations and high inflation

tend to be correlated with underdeveloped financial systems (Demirguc-Kunt & Levine 1999). Moreover, lack of transparency and asymmetric information between banks and SMEs can preclude financing. When financing is available, interest rates are often prohibitively expensive, and dealers may not have enough collateral to pledge. Small businesses tend to be informationally opaque, without strong financial ratios, collateral, or credit scores (Berger & Udell 2002).

The very limited capital of dealers constitutes a major issue in the cell phone supply chain given the high value of the products flowing compared to the financing means available to the dealers. Generally, dealers are unable to pay upfront for the phones they would like to sell. The distribution landscape of developing countries prevents them from ignoring this major channel. Suppliers resort to trade credit in order to ensure the viability of dealers; dealers are able to sell products and pay their suppliers later. Trade credit is the largest source of short-term business credit in the United States and other nations around the world. Trade credit can mitigate the informational asymmetry problem between banks and firms by incorporating private information in the lending relationship between suppliers and their customers (Biais & Gollier 1997).

This non-traditional form of credit can be described simply: “Suppliers lend goods and banks lend cash”, yet explanations for the popularity of this activity are more subtle. One main argument explaining why non-financial firms act as financial intermediaries is the monitoring advantage of suppliers over banks. The informational advantage of the suppliers may come from the input transaction itself, as suppliers collect data on product deliveries (Burkart & Ellingsen 2004). Trade credit is more prevalent in less developed credit markets due to the higher difficulty in diverting inputs, compared to cash; moreover, trade credit is characterized by shorter maturity since it loses its advantage once illiquid products have been sold and converted into liquid cash (Burkart & Ellingsen 2004). Furthermore, suppliers have a comparative advantage over banks by controlling the supply of goods: they can threaten to cut the

supply to enforce payment. Also, trade credit provides another advantage to dealers, by working as a signal and facilitating access to bank loans (Cook 1999).



### **3. Cell phone supply chain challenges in Latin America**

This section briefly introduces the Latin American wireless industry. The cell phone supply chain is then described, highlighting the challenges. The last subsection provides supply chain challenges encountered repeatedly during site visits in various Latin American countries that appeared specific to the rapidly growing and evolving environment.<sup>1</sup>

#### **3.1. Overview of the Latin American wireless industry**

Latin America includes some 20 countries, where the primary languages are Spanish, Portuguese and French. The region has often been pock-marked by political and social unrest. Many economies exhibit instability and cyclical crises, with frequent oscillation between privatization and nationalization of industries. The gross income per capita is relatively low,<sup>2</sup> as is the Internet penetration (30%, according to Internet World Stats). The e-commerce culture, though growing, is very limited. For the mobile handset industry, there are high security risks and heavy insurance requirements. Although low wages may be attractive to some businesses, they are sometimes offset by heavy social costs. Finally, the pool of human capital is limited, which makes talent acquisition and availability challenging in some markets. Market penetration had seen a rapid increase in the past few years, and varies from medium to high, from 80% in Ecuador to 120% in Argentina. Cell phones play a key role in isolated locations where landline infrastructures were costly and or unavailable, such as in rural communities and outlying areas. Throughout the continent, there is a high percentage of prepaid phones, which use scratch cards for resupply of phone call time credits, with low Average Revenue Per User (ARPU).

---

<sup>1</sup> Parts of this chapter have been taken from an unpublished case study written with Erica Gralla, PhD student at the MIT Engineering Systems Division, under the supervision of Charlie Fine

<sup>2</sup> (6,780 US dollars in Latin America & Caribbean, World Development Indicators Database, <http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf>)

### 3.2. Challenges of the wireless industry

The cell phone supply chain is composed of (see Figure 4): original equipment manufacturers (OEMs), who develop and produce handsets; network service providers (NSPs), or “carriers”, who provide the wireless network service; retailers and dealers, dedicated to selling phones; and the final consumer.



Figure 4 Cell phone supply chain

From the consumption perspective, the final consumer buys a complete kit, which includes the cell phone, manuals and all the accessories, from the retailers or dealers. The latter have usually procured mobile phones through their head offices from carriers, or distributors such as Brightstar who would deliver and replenish. Carriers and distributors have typically bought the cell phones directly from producers’ country representatives, who can be assimilated to the original equipment.

Carriers and distributors share forecasts, preferences and appointments with OEMs for them to plan supply. Dealers collect and send in their points of sales data to their head office, and can meet with operators, OEMs and distributors to exchange sales information. Operators can use this data to compare against their own forecasts, and order according to the resulting expected sales for the next period.

Each stakeholder in the supply chain is faced with a different set of challenges and has different incentives, as shown in Table 1. OEMs need to develop handsets that will satisfy both carriers and customers. However, once the product is a finished good, they need to sell as many of them as possible.

NSPs are faced with a vast array of choice from which they need to decide which to select, how to customize standard handsets, and how to maximize the average revenue per user (ARPU). Often,

handset retailers and distributors operate independently of both carriers and manufacturers. Their concern is to minimize their inventory risk and maximize turnover. They are seldom concerned with selling products generating high ARPU, nor promoting certain brands. The vast choice of products and services is also problematic for consumers, whose loyalty carriers need to fight for.

OEMs	NSPs	Retailers/Dealers	Consumers
<ul style="list-style-type: none"> <li>- Develop products satisfying carriers and consumers</li> <li>- Maximize sales</li> </ul>	<ul style="list-style-type: none"> <li>- Choose products satisfying consumers</li> <li>- Maximize ARPU</li> </ul>	<ul style="list-style-type: none"> <li>- Minimize inventory risk</li> <li>- Maximize sales</li> </ul>	<ul style="list-style-type: none"> <li>- Looking for fashion or functional product</li> <li>- Minimize cost</li> </ul>

Table 1 Incentives of supply chain players

In addition to this inherent supply chain complexity, frequent changes of particular actors resulting from numerous mergers and acquisitions contribute to operational difficulties.

A key feature of the wireless telecom industry is the high level of demand uncertainty, as well as the short life cycle of mobile devices: typically 1.5-2 years, but much higher, up to 4-6 months, in some particularly fast markets such as Hong Kong. The high obsolescence rate is due both to the rapid evolution of technology as well as the fashion features of the mobile device industry. As much as what one wears or drives, the mobile phone defines a component of its owner’s personality and identity. In Latin America, the fashion aspect of phones is particularly important, since it is considered as a social status symbol. New consumers keep appearing, adding new segments, new product features, new locations or new technologies to the already wide customer base. Thus, the uncertainty on the market and the short product life cycles render forecasts very difficult.

The dynamics of the evolution of the cell phone industry are depicted in the exploratory cause-and-effect diagram in Figure 5. The various supply chain challenges encountered are highlighted in bold. Exogenous variables are underlined.

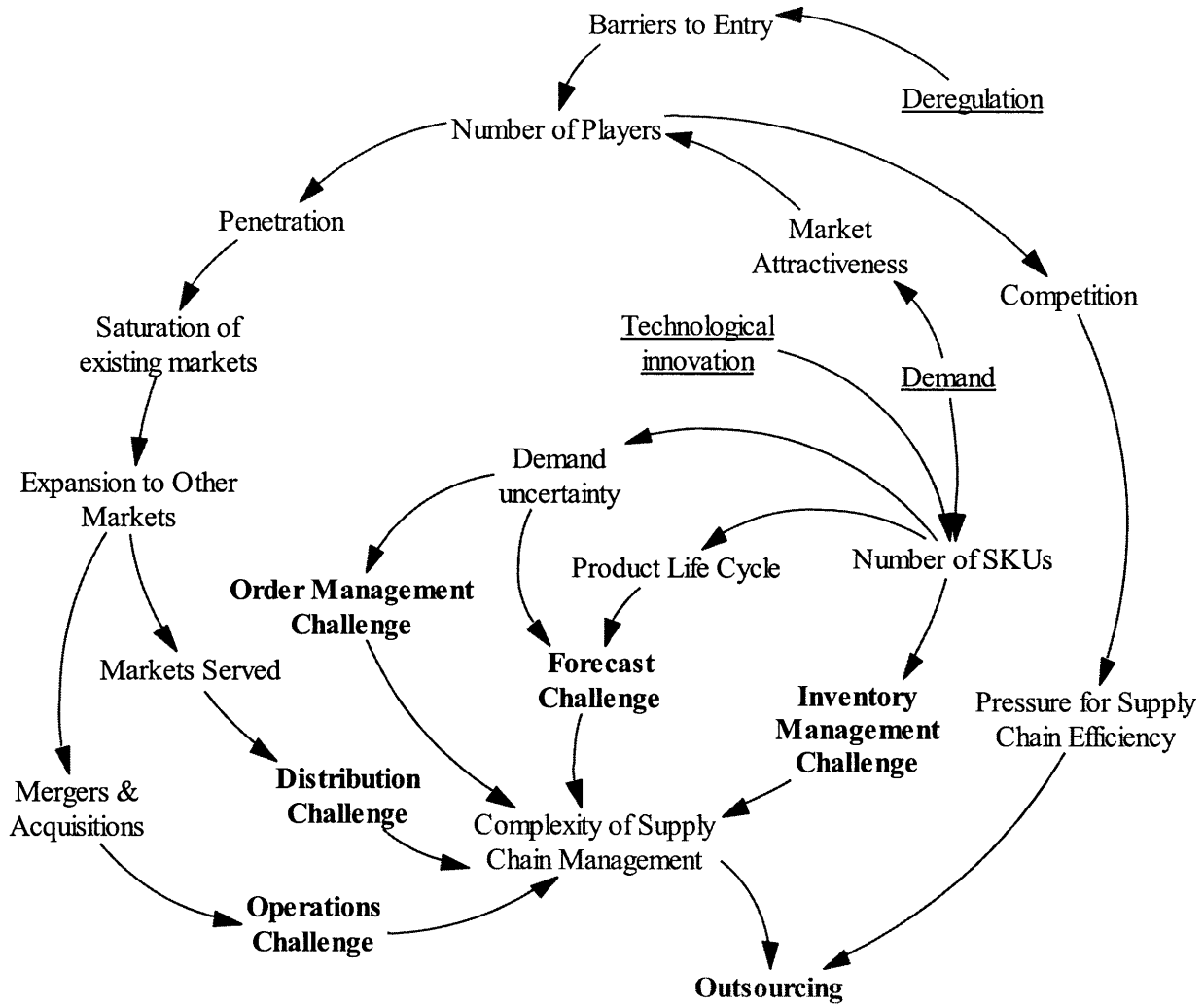


Figure 5 Cell Phone Industry Dynamics in the Past Decade

As demand for cell phones increased, more carriers were attracted into the market. The resulting sales increased penetration of wireless phone technologies, approaching saturation of the market. Companies then had to turn to other markets if they hoped to grow, leading to many mergers and acquisitions. Operations expanded and became increasingly complex, which pushed carriers to outsource. Expansion to logistically challenging areas to reach also rendered distribution more difficult.

The increase in demand combined with a high rate of technological innovation exponentially increased the number of SKUs. Demand became more unpredictable, which made the portfolio decision difficult for carriers in the order management process. Moreover, as new products kept being introduced, product life cycle decreased, which increased the complexity of forecasting. The growth in the number of SKUs also increased inventory which became harder to manage. Thus, supply chain management became increasingly complex, which pushed carriers to look for help through outsourcing.

Meanwhile, stiff competition increased pressure for better supply chain management, which is not part of the core competencies of carriers; outsourcing seems the best way to handle this challenge.

One particularity of the cell phone industry is the tie between the product and the service: the main source of revenue made out of the sales of phones comes from the service – the air time or plan - delivered with it. The money is not made on the electronics, not on the product sold to the physical customer, but rather on the service sold. In other words, the value of the phone lies in its service, provided by the network service provider/carrier, as opposed to the physical product itself, which has been provided by the manufacturers. In fact, the manufacturers are selling the physical phones to the carrier, whilst the carrier is selling the service to the final consumer. This perspective explains the significant subsidies provided by carriers on the sales of phones, conditional to the service subscribed. This reasoning holds for both pre-paid and post-paid phones. In the case of pre-paid phones, although the carrier does not get paid regularly directly by the user of the phone, the fact that the user has a line with the carrier leads to continued revenue for the carrier, as long as other users keep calling the phone. This particularity influences relationships between the supply chain players.

### **3.3. Challenges in emerging markets**

Emerging markets are nations with social or business activity in the process of rapid growth and industrialization, considered to be in a transitional phase between developing and developed status. Although the exact list of countries is not universally defined, some countries in Latin America – Argentina, Brazil, Chile, Mexico, Colombia and Peru – are generally included. Political scientist Ian Bremmer defined an emerging market as “a country where politics matters at least as much as economics to the markets”.

From interviews and site visits in Puerto Rico, Dominican Republic, and Ecuador, and then Argentina and Brazil, a number of characteristics emerged. Some challenges were identified as being less often encountered in more developed environments: (1) the tax and policy environments are often idiosyncratic and subject to change with very short notice, (2) logistics and transportation networks are piecemeal so that a firm aspiring to serve the continent comprehensively needs to fill gaps in infrastructure and local partner capabilities, (3) supply chains must reach low-income customers in far-flung parts of the country with very poor transportation infrastructure, and (4) security and trust-related issues could be difficult, requiring very secure facilities and transportation capabilities.

It can be noted that although the analysis focused on the cell phone industry, the relevance of these challenges is not restricted and conclusions can be applied to other industries.

#### **3.3.1. Volatile business environment**

Business is often problematic in emerging markets. Common factors include government instability or coups, corruption, or policy instability. The unpredictability of future policies and economic setting which may have direct impact on costs, supply or demand is challenging for businesses. For instance, in

Ecuador, the socialist-leaning government brutally increased import duties by 50% temporarily. The rise in import duties leads to a sudden increase to costs, which are difficult to offset as rapidly.

### **3.3.2. Lack of capabilities**

Emerging markets are characterized by rapid growth and industrialization. As a result, markets change rapidly, the customer base is varied and includes low-income populations, and there is inconsistent availability of important services, partners, and infrastructure.

Emerging markets often lack key aspects of infrastructure, industry, or regulations that enable business to run smoothly. The wireless industry needs transportation providers to deliver phones, customs regulations that allow for reliable imports and prohibit black-market competition, and providers of IT systems to track and support operations. For example, many markets lack reliable transportation providers, especially in hard-to-reach areas. Tierra del Fuego, at the southern tip of Argentina, is cut off from the rest of the country by ocean and by a corner of Chile, without a major airport. The Amazon rainforest is notoriously difficult to travel through, with some areas accessible only by canoe.

Moreover, the network operators often did not have sophisticated knowledge in certain aspects of logistics, such as demand forecasting, IT system development, and performance measurement. For example, one operator utilized three separate software systems, and workers had to copy and paste customer data from one system to another in order to prepare each invoice – an extremely inefficient process.

The interdependence of the stakeholders' systems and infrastructure, and on partners' and governments' capabilities, highlights weak links in the chain which sometimes constitute barriers to a proper functioning of the supply chain.

### **3.3.3. Penetrating low income brackets**

Carriers benefit most from the sales of phones generating high average revenue per user (ARPU), which are usually high-end phones, where revenue comes from services such as data streaming. As the high-end cell phone market gets saturated, carriers are pushed to address the lower income market. For instance, in Argentina, the level of penetration of 120% forces carriers to look out for new market segments. The lower income market is found both in poor urban areas and remote rural areas. The latter may present considerable delivery challenges, due to the lack of infrastructure available to reach them. In Ecuador, the system of addresses is not well developed in most rural areas, which leads to frequent failed deliveries due to incomplete or non-existent addresses. Moreover, operating such a far-flung network brings management challenges as well, since personnel stationed in remote urban areas has to be managed.

In the lower-income segment, cost sensitivity is higher, margins are thinner, and low-end phones are the rule. Moreover, carriers also need to offer a service in accordance with the means of the customer, who is permanently faced with income uncertainty. This uncertainty explains the higher success of prepaid phones over postpaid phones: the pre-paid structure enables customers who do not qualify for post-paid plans to buy and limit their phone credit according to their unpredictable budget. This situation goes against the interest of carriers, who have a preference for post-paid customers who ensure them a minimum revenue each month.

In order to distribute to this very diverse population, the cell phone distribution channel is very diverse itself. Distribution channels are differentiated in two categories. The direct channel is carrier-owned stores, selling exclusively products for their own network. The indirect channel is operated independently, and can be divided into two types: retailers, who own commercial space and sell various products, and dealers, who only sell cell phones. Thus, the distribution landscape includes big retailers



and islands in malls as well as small mom-and-pop stores selling cell phones over the counter and individuals selling scratch cards on the streets.

Furthermore, in low-income environments, downstream members of the supply chain may not be able to function without some assistance from the carriers or other stakeholders, particularly financial. Small mom-and-pop distributors, for example, may not have the cash on hand nor access to bank loans enabling the purchase of a large inventory of phones. Several factors may explain this situation: an underdeveloped banking system, expensive interest rates, or prohibitively high levels of guarantee.

#### **3.3.4. Security and trust**

Security constitutes a major issue in Latin America since armed, well-organized robberies are not uncommon. The high value of phones, or the cash equivalence of scratch cards, renders the cell phone industry vulnerable. Theft by employees in the warehouse is not unusual. The transportation of products is also risky, and regular equipment may require a security upgrade. For instance, products carried in regular pallets with plastic wrap would be replaced by stones through a hole. The isolation of some areas and the rugged geography of the country facilitate assaults, often by wealthy and well-equipped bandits.

The informal market is strong in Ecuador, and in addition to stolen phones, smuggling of cell phones is a major concern of businesses as very cheap phones get sold on the market.

The rampancy of thefts and robberies fosters distrust between supply chain partners and towards employees.

## 4. Background of case study

This section provides background on Ecuador and the national cell phone industry, and gives more details on the evolution of the relationship between Brightstar and Bellsouth, now Telefónica.

### 4.1. Ecuador

#### 4.1.1. Macroeconomic context

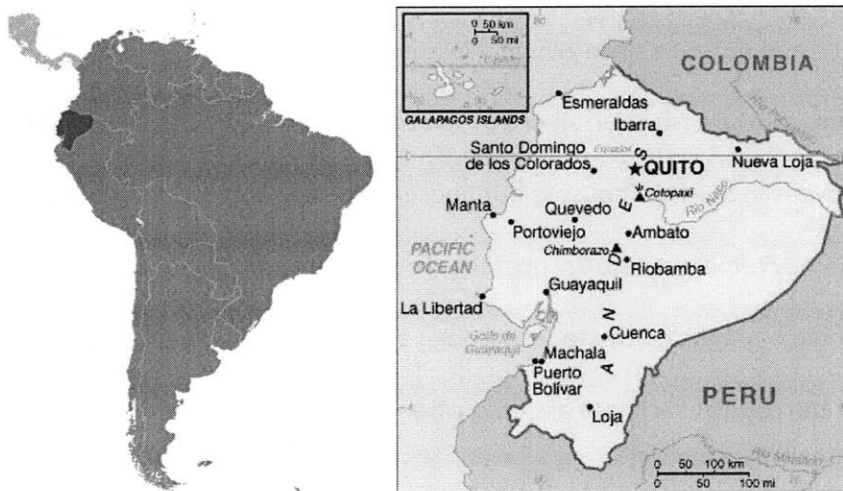


Figure 6 Map of Ecuador (Source: CIA Factbook Ecuador)

The Republic of Ecuador is located on the northwest coast of South America (see Figure 6). The Republic of Colombia to the north, the Republic of Peru to the south and east and the Pacific Ocean to the west surround it. In addition, Ecuador is situated right on the equator and covers 283,830 sq. Km. including 8,000 sq. Km. of the Galapagos Islands 965 Km. off the coast. Its capital is the Metropolitan District of Quito.

Ecuador is very diverse geographically and ethnically. There are four geographical regions: the coast that represents approximately one fourth of the country's land; the highlands mainly represented by the Andes Mountains extending from north to south in two parallel ranges; the eastern region represented by the tropical jungle and the Amazon River and the Galapagos Islands.

In 2010, the population has been estimated at 13,478,600, and the GNI per capita US\$ 3,643.15. The population is mainly of Indigenous, Spanish and African origin. The Ecuadorians have migrated from the mountainous central highland region, where they were heavily concentrated a few years ago, and today the population is divided about equally between that area and the coastal lowlands: the urban population is now over 60%. The tropical forest region remains sparsely populated and contains only about 3% of the population.

The infrastructure system is not very developed. According to a 2006 Economist Intelligence Unit report, the country's roadways are poor and the railways as nearly derelict. The World Bank Logistics Performance Index ranks Ecuador 71<sup>st</sup> for overall LPI, which is based on six key dimensions: customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timeliness.

#### **4.1.2. Political and economic environment**

Ecuador has a relatively long, albeit unstable, experience with democratic rule. It was once considered a relatively stable country, at least compared to its Andean neighbours. In the last decade, however, Ecuador suffered a number of serious political and economic crises. The three last popularly elected presidents of Ecuador did not complete their terms. In 1999, political uncertainty and plunging public confidence in the economy led to a fall in Ecuador's GDP of more than 30% in just a year.

The financial and economic system was almost crippled by rampant corruption, but the dollarization in 2000 had stabilizing effects. External debt was \$13.1 billion, representing 94% of GDC, and banking

regulations and supervision was still weak. The country's remaining viable banks contracted their loan portfolio, with 95% of the loans going to just 5% of their clients. The investment climate was also one of the region's worst, tarnished by pervasive corruption, a dysfunctional judicial system, and non-enforcement of contractual obligations.

From 2002 to 2006, the economy grew 5.5%, the highest five-year average in 25 years. The poverty rate declined but remained high at 38% in 2006. Petroleum is a major national resource and has accounted for more than half of the country's export earnings and one-fourth of public sector revenues in recent years. At the same time, political decisions regarding revenue tax on foreign oil companies under the current President Rafael Correa generated economic uncertainty; private investment dropped and the economy contracted in 2009.

According to the World Economic Forum's Global Competitiveness Report for 2007-08, the three most problematic factors for doing business in Ecuador are government instability/coups, corruption, and policy instability.

## **4.2. The cell phone industry in Ecuador**

The industry is described here in three parts: network service providers, who are providing the wireless service; customers, for which the supply chain is dedicated; and the distribution channel, which constitutes the link between the two.

### **4.2.1. Supply: Network service providers in Ecuador**

The wireless phone market is divided between three carriers, dominated by Porta, with 70% market share. Movistar has 27%, whilst the governmental player Alegro has a stable 3%. Porta, formerly owned by Conecel, launched operations in 1996 and was bought by a US telecommunications company in 1997. It has kept dominating the market since then, and was acquired at 60% by a Mexican company in 2000.

Movistar was formerly BellSouth Ecuador, which was acquired 100% by Telefónica Móviles in October 2004: a more detailed description of this operator is given later. Finally, Alegro was created by the government in 2003 in order to decrease prices in the wireless phone market.

The two leading carriers are very competitive. Facing scarcity in the skilled labor market, the carriers do not hesitate to fight over their employees, creating a race to the top in terms of training. The high penetration rate of 80% reinforces the stiff competition. The relationship between the carriers is reflected by the high costs of communication between lines of different carriers. Clients thus find it cheaper to have one phone for each carrier, to the benefit of the latter.

#### 4.2.2. Demand: Customer base

Mobile telephony penetration grew 71% from 2002 to 2008, see Figure 7.

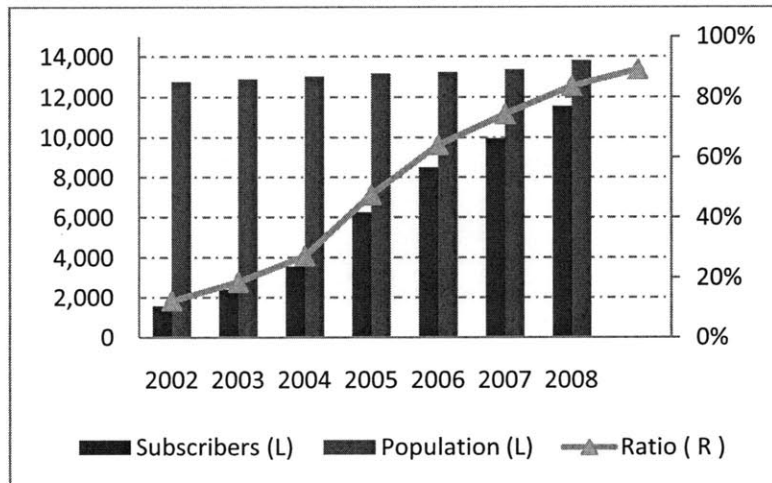


Figure 7 Cell phone growth in Ecuador (Source: Brightstar)

The subscribership of mobile phone use is now at nearly 85%, after a decade of very dynamic growth. By comparison, the density of fixed-line services, which are publicly provided, is at about 14 per 100 persons. There is a higher demand for pre-paid phones than post-paid phones, at a ratio of 87% versus

13%. This difference can be partly explained by the income distribution of the population, and the ease of obtaining a pre-paid phone compared to a post-paid.

#### **4.2.3. Linking supply with demand: Distributors**

Around 68% of the total volume is distributed through the indirect channel. Although retailers are usually big, Best Buy-style chains, dealers are small and usually do not have credit history nor access to bank loans. In this thesis, the indirect channel will be divided between big dealers and small dealers. Small dealers are financially constrained and are limited by their capital. Big dealers, on the other side, have a large capital and have access to various sources of credit such as commercial banks.

## **5. Case study: Brightstar and Movistar**

This section provides descriptions of the three different supply chains representative of the evolution of Movistar, and highlights the key challenges and differences of the supply chains.

### **5.1. 2002 – Bellsouth: growth and expansion**

Bellsouth was originally a landline company, and known as such by several generations. In 1996, telecommunications industry was deregulated in the United States: companies could now provide cable TV together with landline and cell phone services. Thus, Bellsouth decided to diversify in the cell phone market, although without previous experience. That same year, Bellsouth created Bellsouth International to expand its cell phone services: it started by expanding in Latin America, a convenient target region since its headquarters were in Atlanta. Bellsouth did not create any new cellular networks, but would buy existing network operators and bring over the name of Bellsouth. Thus, Bellsouth Ecuador was a takeover of an existing carrier, Otecel, an Ecuadorian network operator who launched in 1994.

In spite of the privatization of the mobile telecommunications sector, in 1998 only two operators had been licensed by the Ministry of Telecommunications. By mid-1998, Conecel and Bellsouth Ecuador had 61% and 39% of market share respectively.

Nevertheless, Bellsouth Ecuador faced difficult challenges and decided to outsource. The basic cell phone supply chain, with no outsourcing, is modelled in Figure 8.

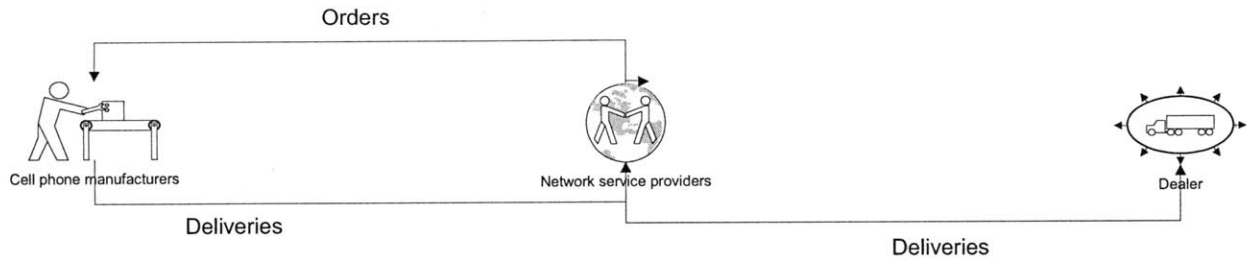


Figure 8 Basic cell phone supply chain

The particular supply chain examined is detailed in Figure 9.

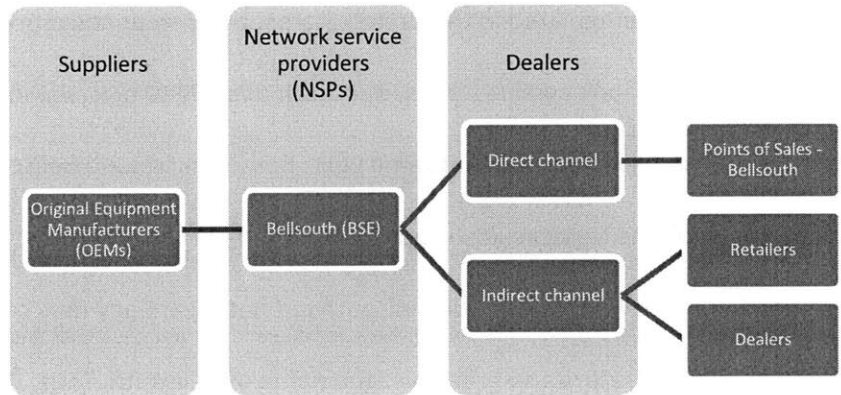


Figure 9 Supply chain Bellsouth

There are two main processes to consider: (1) the phone ordering process, and (2) the phone delivery process.

(1) Phone ordering process

Bellsouth made a forecast of sales for all of its distributors based on historical data, and would send the corresponding purchase order to the OEMs. When Bellsouth received the phones from the manufacturers, it allocated it to the different distribution channels, based on the sales of each. Although the inventory was assigned and available to each dealer, it still physically and financially belonged to Bellsouth. Once assigned, the dealer was guaranteed its inventory. Thus, the dealer did not buy its



whole inventory upfront: it would buy a few days worth, and leave the rest at Bellsouth's. When the dealer bought the inventory, it did not pay cash directly: Bellsouth granted them some trade credit. The process is modelled in Figure 10.

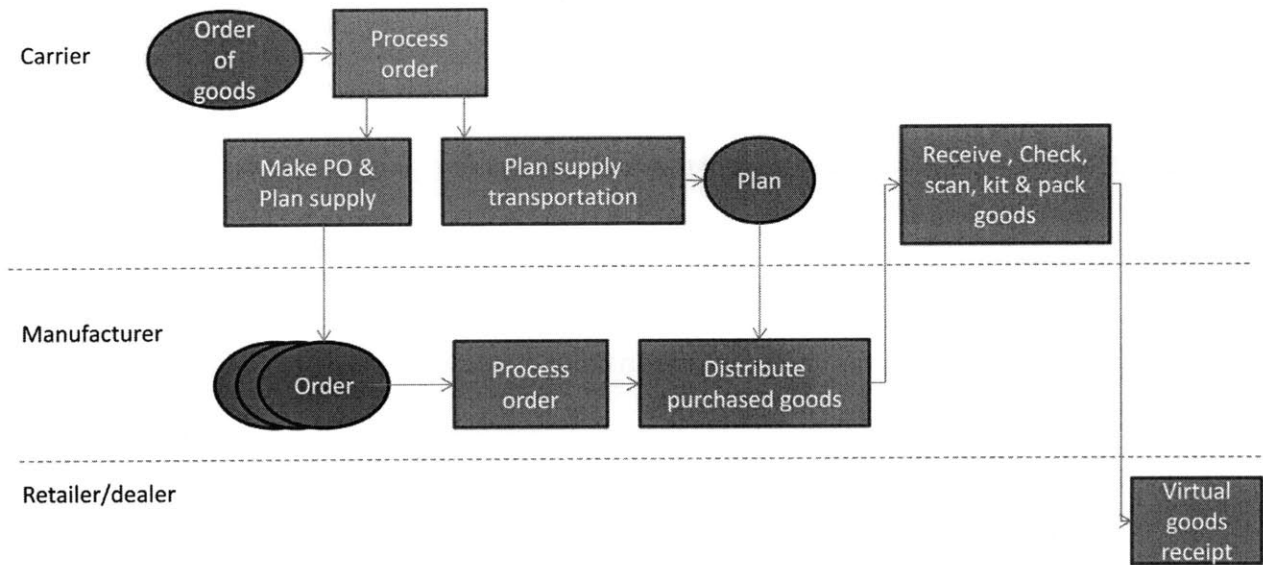


Figure 10 Phone ordering process Bellsouth

This model is different from the classic consignment model, where the ownership of the products does not change until they are sold to the final customer. Here, Bellsouth owned the product until they were sold to the dealer, but it is called “consignment” to the extent that the dealer was assigned its products earlier without having to pay for it.

There was no penalty for non-used inventory: distributors were not penalized when they do not use the entire inventory they have been assigned. Moreover, once the inventory changed ownership, when the dealer bought it, Bellsouth lost track of it: there was no penalty for leftover inventory at the dealer's, and the cost was only for the dealer to bear.

(2) Phone delivery process

When a dealer would need to replenish its inventory, it would get in touch with Bellsouth and decide of the best way to implement the delivery: the dealer would come and get it at Bellsouth's warehouse, or a transportation provider would be contracted.

The system described above was favourable to the dealers given that they did not need to tie down capital equivalent to the inventory they request. Furthermore, they bore a minimal risk for excess inventory since Bellsouth was bearing most of the risk.

However, the system also presented disadvantages.

Firstly, distributors needed to provide a guarantee in order to be allowed inventory in the first place. This guarantee could be hard for some dealers to put together, and thus prevent them from starting a business.

Secondly, the allocation of phones is based on the previous sales of the distributors. Therefore, big dealers got more phones than smaller dealers. In a scenario where the big dealer had leftover inventory at Bellsouth and the small dealer did not have enough, the inventory was not transferred from one to the other. Since there was no penalty for non-used inventory, the retailer had no incentive in blocking less inventory. Thus, the diversity of the playing field made this system very unfavourable to small players: the allocation system prevented small dealers from growing.

Thirdly, inventory management was not Bellsouth's core competency. This may translate into poor logistics operations and planning. For example, the distinction between SKUs which differentiated phones down to their colour, and a broader distinction of cell phones was challenging for Bellsouth. Details such as the color of the cell phone could be determinant for sales, yet forecasts did not reach that level of detail and lacked accuracy.

## 5.2. 2003-2004 – Brightstar Ecuador

Headquartered in Miami, Florida, Brightstar was founded in 1997, specializing in distribution of wireless devices to customers in Latin America. Founded in the midst of the Internet and mobile phone boom of the late 1990s, Brightstar began business as a mobile handset distributor that purchased handsets in bulk from major manufacturers such as Motorola and distributed these handsets to small retailers, primarily in Latin America. In 2000, in a business diversification strategy, Brightstar created a Supply Chain Solutions division, which focused on reducing operational costs and increasing speed to market for network operators. Thus, Brightstar offered a new service of end-to-end supply chain management of mobile handsets for mobile network and service operators. The role of Brightstar is represented in Figure 11. Brightstar Corporation, based in Miami, is differentiated from Brightstar subsidiary, located in each country.

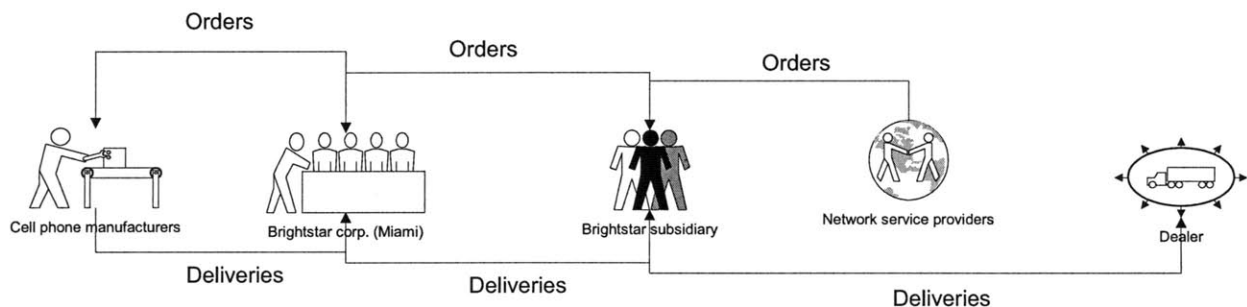


Figure 11 Brightstar in the supply chain

Bellsouth Corporation and Brightstar Corporation decided to create a long-term partnership in Latin America that would enable Bellsouth to focus on marketing and operating the network whilst Brightstar would be in charge of logistics and supply chain; Brightstar Ecuador – also called Stimm – started as a pilot operation. The Ecuador Subsidiary was created in December 2002 and started formal operations in March 2003. Operations started with 7 people in a 300 m<sup>2</sup> facility, to handle an estimated volume of 18k telephone units per month. In March 2003, Brightstar started a contract with Bellsouth, providing all

their CDMA handsets, with the full scope of 3PL services including purchasing. Stimm became the logistics arm of BellSouth by providing warehousing and shipping to points of sales, using BellSouth's inventories. In May, the partnership was in full mode: Stimm was buying and maintaining inventory for BellSouth, doing fulfillment and kitting, and "selling" to both BellSouth and its distributors.

In the value chain, Brightstar was responsible for: purchase and import; receiving, warehousing and production; and distribution and billing. The value-added services provided by Brightstar and the role of BellSouth are depicted in Figure 12.

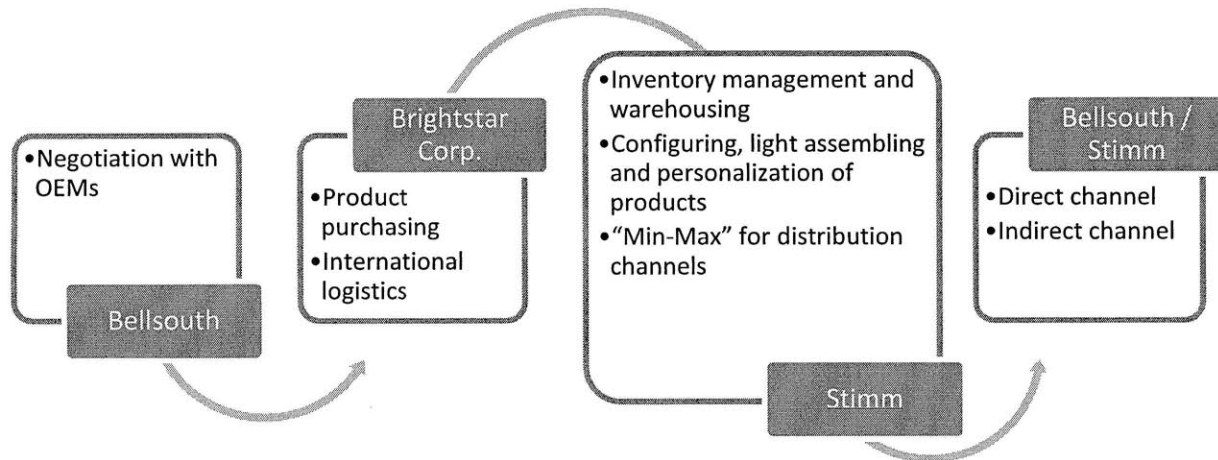


Figure 12 Role of Brightstar in the value chain

More precisely, the services offered by Brightstar are described in Table 2.

Table 2 Services offered by Brightstar

Portfolio definition	<ul style="list-style-type: none"> <li>- Brightstar gives advice to BellSouth on the products</li> <li>- Based on the information provided by BellSouth, Brightstar places purchase orders, imports the products, prepares and conducts deliveries to points of sales</li> </ul>
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Negotiation with suppliers	<ul style="list-style-type: none"> <li>- Bellsouth negotiates prices, terms and conditions with the OEMs. Brightstar is its purchasing agent, and OEMs are informed that purchases are managed according to the conditions negotiated with Bellsouth.</li> <li>- Brightstar gives advice based on its knowledge and experience of international markets</li> </ul>
Purchase and imports	<ul style="list-style-type: none"> <li>- Bellsouth gives Brightstar a rolling forecast of 12 months, and places each month open purchase orders for the trimester to Brightstar</li> <li>- Brightstar sends purchase orders to the OEMs. All the benefits that Brightstar negotiates with the OEMs are transferred to Bellsouth</li> <li>- Brightstar plans and coordinates deliveries, and pays all costs associated with transport, insurance, and import</li> </ul>
Receiving, warehousing and production	<ul style="list-style-type: none"> <li>- Brightstar is responsible for the receiving and inventory management, according to the conditions given by Bellsouth</li> </ul>
Distribution and billing	<ul style="list-style-type: none"> <li>- Brightstar prepares orders and distributes the product to points of sales <ul style="list-style-type: none"> <li>o Direct channel: Brightstar replenishes according to a Min-Max (also known as <math>(R, s, S)</math> ) policy, with parameters set by Brightstar and Bellsouth</li> <li>o Indirect channel: Brightstar proactively suggests deliveries to distributors according to the sales of each</li> <li>o Brightstar sends the invoice at the moment of delivery, and sends via email to Bellsouth daily archives with the serial numbers delivered to each point of sale</li> </ul> </li> </ul>

The supply chain is given in Figure 13.

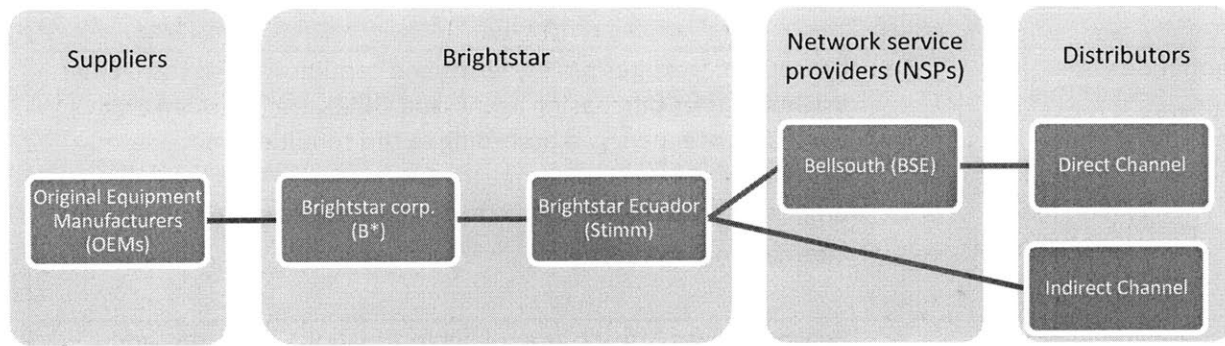


Figure 13 Supply chain Bellsouth - Brightstar

(1) Phone ordering process

Approximately 3 months in advance, Bellsouth made a forecast of the quantity that its direct channel needed (V1), as well as the quantity for its indirect channel (V2). Thus, a purchase order of V1 + V2 was sent to Stimm. Through this order, Bellsouth committed to purchase the products from Stimm: Brightstar did not bear any risk. This PO was transmitted to Brightstar corp., which in turn sent it to the OEMs: thus, all phones went through the central warehouse in Miami before being distributed to the different subsidiaries. After fulfilling the order, the products travelled to Brightstar's headquarters in Miami, and an invoice was issued. The phone ordering process is depicted in Figure 14.

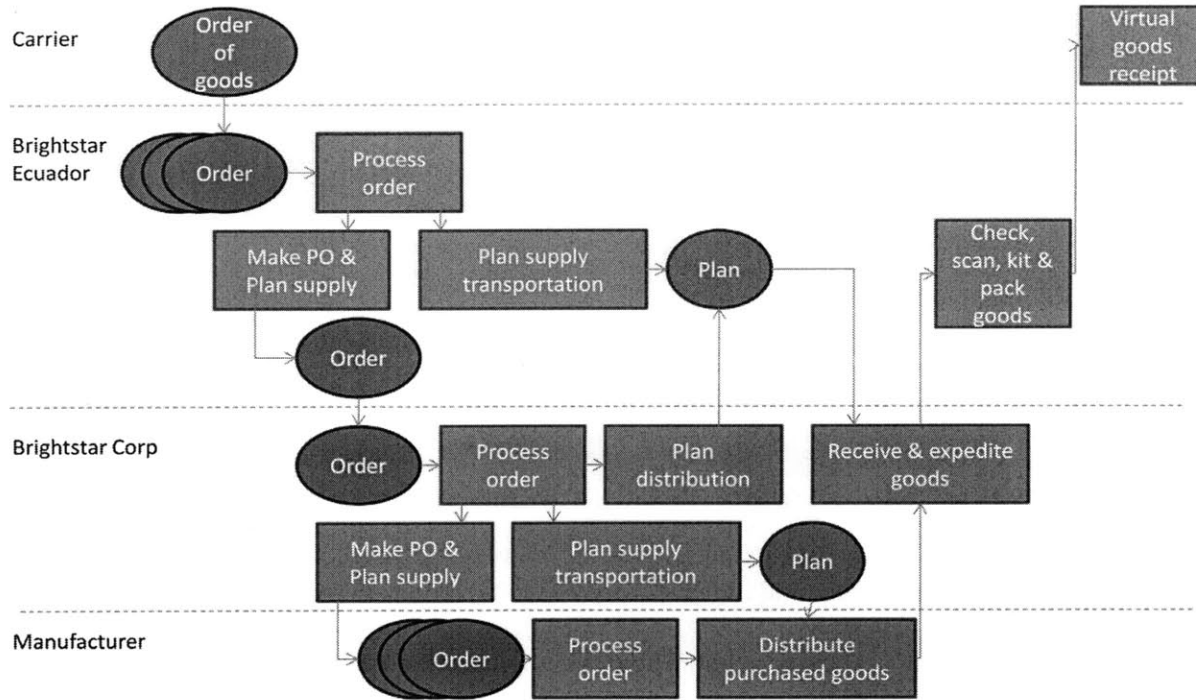


Figure 14 Phone ordering process with Brightstar

(2) Phone delivery process

There were two ways that the inventory at Brightstar could decrease. The inventory could be sold to the direct channel or the indirect channel, according to their demand and the decision of the carrier (see Figure 15). Stimm was committed to delivering products within the next day of the order (two days later for the Galapagos).

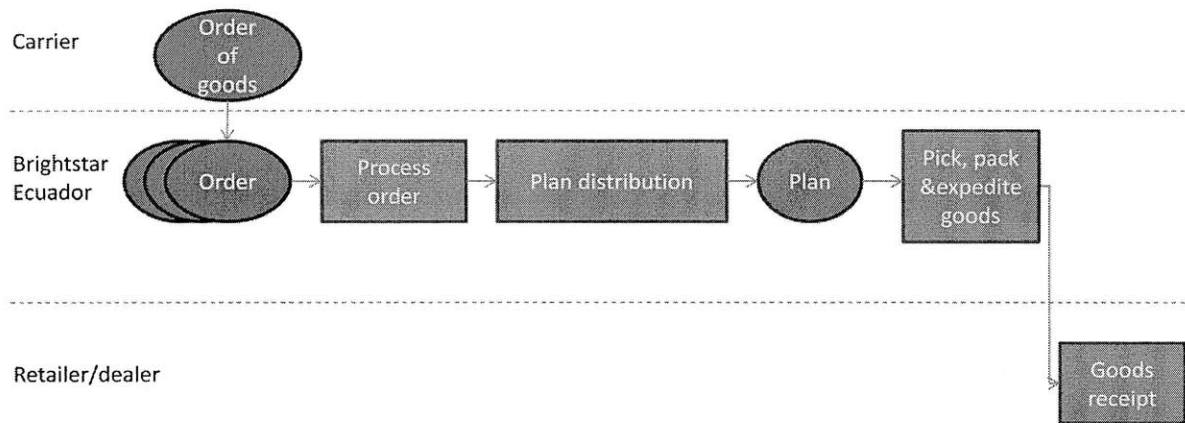


Figure 15 Phone delivery process with Brightstar

However, if demand was insufficient and the inventory was left over after 60 days, which is a cut-off point for the obsolescence of cell phones, Stimm sold the phones to Bellsouth, who was obliged to take it all.

Although the inventory belonged to Brightstar from the moment it was received from the OEMs to the delivery to the distribution channels, Brightstar did not bear any risk. Indeed, if the indirect channel did not pay on time, Brightstar could go to Bellsouth and be paid directly: the money would be taken from the guarantee provided, and if necessary also by the commission that Bellsouth owed the distributor.

Brightstar could maximize its sales to the indirect channel by playing with the allocation of phones between the distributors. Using reverse logistics, Brightstar could tap into the overstock of one distributor to fulfil the successful sales of another. Thus, Brightstar pooled inventory risk by leveraging its large customer base. Furthermore, the centralized structure of Brightstar allows for a very flexible inventory buffer in Miami: if demand in Ecuador turned out being much lower than the inventory purchased, Brightstar would be able to sell it to other subsidiaries.

Brightstar and Bellsouth cooperated to develop a forecasting process which included weekly and monthly reports, and follow-ups. The role of Brightstar was to monitor daily and aggregated sales,



compare them to the forecast and inventory level, and send a warning when the trend deviates from the forecasts.

Regarding financial flow, the payment terms between Stimm and Bellsouth were the same as those between the OEMs and Brightstar. The profits of Brightstar come from the fee charged for moving the phones as well as storing them.

Brightstar attempted to quantify the value-added of the services it provided. Firstly, Brightstar implemented a rigorous control of nonconforming products: this service decreases revision costs, lost ARPU, lost customers and recovery costs. Secondly, warehousing services provided lead to savings in insurance, increased sales due to higher inventory accuracy and savings in reprocess management. Finally, a reliable order management saves working capital for dealers, as well as insurance for distribution. These savings have to be compared to the cost of working with Brightstar – a lump sum that ensures the provision of all these services - in order to properly quantify the value-added of the services.

The results and details are given in Table 3<sup>3</sup>.

Table 3 Quantification of Brightstar services (Source: Brightstar)

<b>Service: Receiving - Control of nonconforming products</b>			
<b>Impact</b>	<b>Annual savings</b>	<b>Justification</b>	<b>Details</b>
Decrease in nonconforming products reaching the end user	68,000	Approximately 5% of NC products reach the end user. OEMs do not take responsibility for revision/repair costs	2,438 units revised (5% of 48,777 PNC not refundable by OEM) x \$25 (revision cost per unit)

<sup>3</sup> The numbers used in Table 3 are approximate and do not intend to accurately reflect reality.

		Carriers do not perceive the ARPU corresponding to users who do not use the services when the unit is being repaired	2,438 units revised x 15 (days of non usage of service) x \$0.45 (daily ARPU) x 40% of EBITDA margin
Value creation in customer satisfaction and customer retention	117,000	Approx. 1% of customers with bad experience with a new phone change to another mobile operator	487 unsatisfied customers (1% of 48,777 PNC) x \$0.45 x 365 (days in a year) (lost customer)
		Approx. 1% of customers who need to take the phone to a repair center change to another mobile operator	487 x \$75 (cost of recovery)
Actions to recover nonconforming product	148,000	Approx. 20% of nonconforming inventory is not recovered nor replaced by OEMs	\$738,801 (NC products recovered in 2008) x 20%
<b>Service: Warehousing, Production/Kitting</b>			
<b>Impact</b>	<b>Annual savings</b>	<b>Justification</b>	<b>Details</b>
Savings in insurance, losses and wastage at the warehouse	870,000	Full risk insurance costs for a warehouse with a monthly average value of US\$ 24m in handsets and US\$ 16m in cards	0.2% of total monthly average inventory value (\$40 m) + 1.2% x \$2m (5% first risk or deductible)

		Monthly provision to cover for losses and wastage is 0.1%-0.2% of inventory value	Handsets: 0.2% x \$24m Cards: 0.1% x \$16m
Opportunity cost to increase channel sales	48,000	Inventory accuracy increases sales	2% (increment in sales) x 60,000 (monthly sales volume) x 5% (inventory accuracy difference between B* and industry) x 12 (months) x \$13.80 (monthly ARPU) x 40% (EBITDA margin)
Savings in reprocess management	71,000	Production based on forecast and for stock leads to reprocess approximately 25% of the initial processed inventory	\$0.50 (average reprocessing cost) x 20% (inventory NOT reprocessed due to a good production management plan) x 712,000 units
<b>Service: Order Management, Pick-Pack, Distribution &amp; Delivery – Customer Service</b>			
<b>Impact</b>	<b>Annual savings</b>	<b>Justification</b>	<b>Details</b>

Savings in working capital reduction – dealers	47,000	A reliable lead time of 24 hours allows for a decrease in working capital and an improvement in the cash flow, and a reduction in the inventory required at the POS (estimation: a minimum of 10% saving on the ideal 20 days inventory)	(2 days inventory reduction/562 days) x 9% (lending bank rate) x 60,000 (handsets dispatched per month) x 12 (months) x \$196 (ASP 2008) x 68% (phone units % to the indirect channel)
Savings in insurance due to distribution losses	1,350,000	In Ecuador, the transportation insurance market cost to secure inventory is at least 0.5% of the declared value	0.5% x \$21m (average transported value per month) x 12 (months) x \$93,000 (real deductible value for claims in 2008)

### 5.3. 2004 – The change of era: Telefónica steps in

In 2004, Telefónica, who was already the world's sixth largest telecommunications company, acquired all of Bellsouth's cellular assets in Latin America. In 2009, Telefónica introduced its partner Celistics, which had been providing international logistics management services for Telefónica in Latin America since July 2008.

## Celistics expands its services to Telefónica in Latin America

**Madrid, July 29, 2009** – Celistics has signed a contract with Telefónica expanding the services it provides to the mobile telephony operator in Latin America.

### National Logistics

Celistics, which had been providing international logistics management services for Telefónica in Latin America since July 2008, will now also provide national logistics services. Celistics will be responsible for Telefónica's entire distribution chain, from device manufacturer centers to points of sale venues.

### SIM Cards and Memory Cards

The companies have also reached an agreement to distribute both SIM and memory cards. This will allow Celistics to provide Telefónica with additional value-added services.

### Countries

Telefónica's mobile operators in Mexico, Guatemala, El Salvador, Nicaragua, Panama, Venezuela, Colombia, Ecuador, Chile, Uruguay, Peru and Argentina will benefit from this new contract as it will allow Celistics to provide more comprehensive services to these markets.

*Source: Celistics*

From then on, Stimm's role is limited to national logistics services, whilst Celistics is taking over international logistics management, as shown in Figure 16.

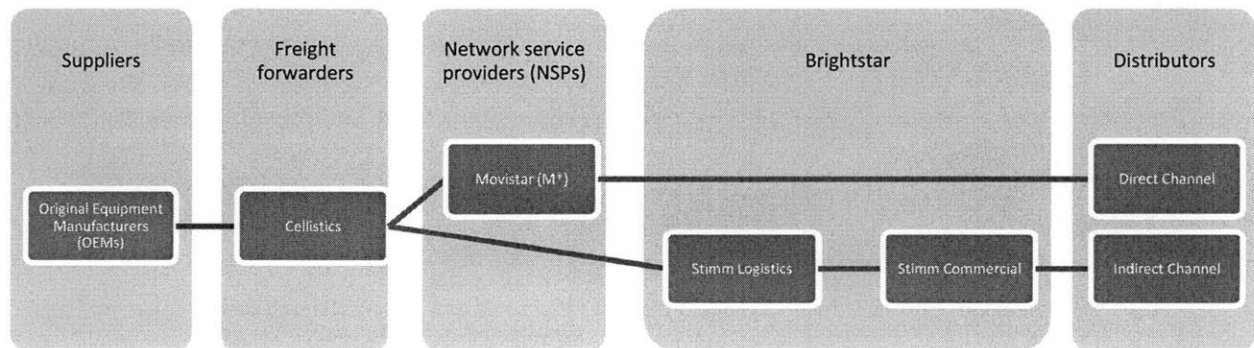


Figure 16 Supply chain Movistar - Brightstar

From Movistar's perspective, the supply chain remains the same, except for the inclusion of another party. It should be noted that Telefónica has already been working extensively with Celistics in other

regions in Latin America, which probably facilitates the addition of a new player in the supply chain.

However, this change may have other disadvantages, which are discussed in Chapter 6.

According to Chandler [Chandler, A.D., (1962) Strategy and Structure: Chapters in the History of Industrial Enterprise, MIT Press.], who conducted a study of almost 100 large American companies, changes in organization structure are a result of a change in corporate strategy. In our case, the rule applies: it is the change in the corporate attitude of the customer, Bellsouth, who underwent an acquisition by Telefónica, which forced changes in the supply chain and the respective responsibilities of its stakeholders. The evolution of the relationship is depicted in the chart in Figure 17.

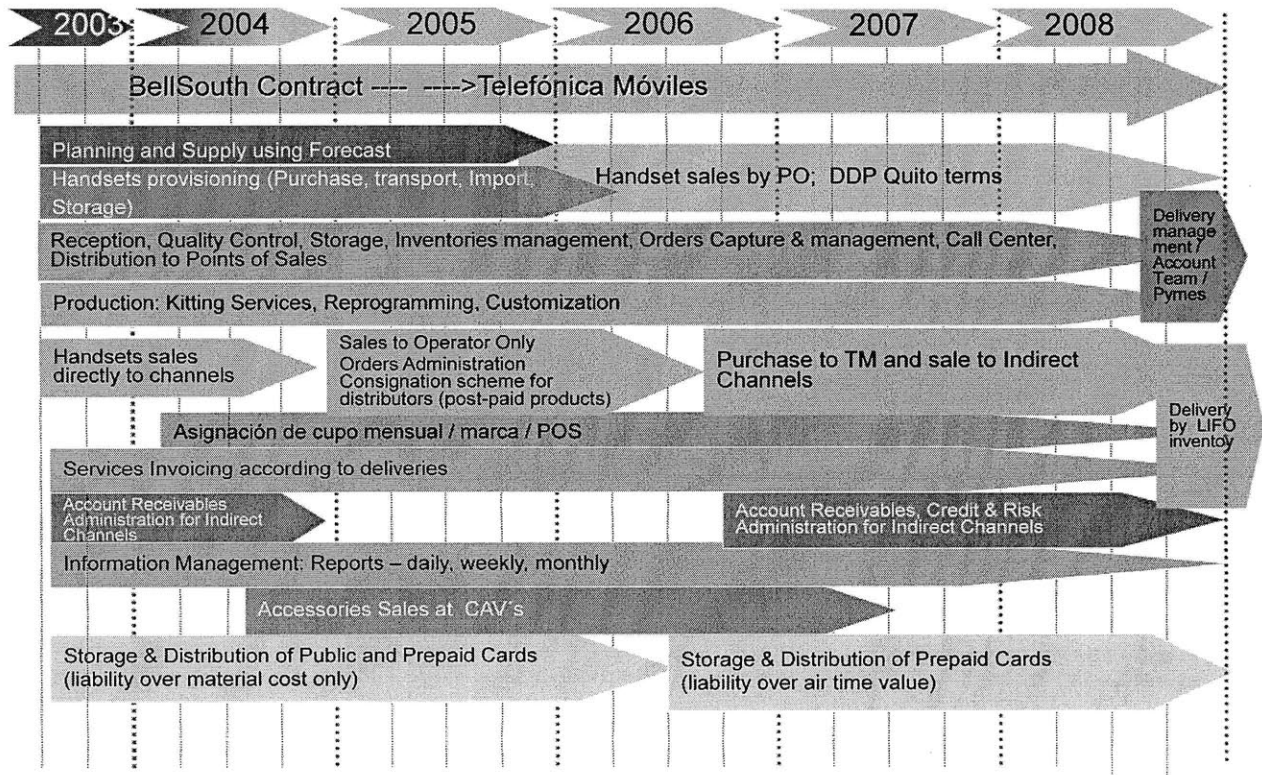


Figure 17 Evolution of the relationship with Brightstar

It is important to note that Brightstar always increased the number of services offered: the downgrade came from Movistar.

## **6. Discussion**

Section 3 exposed two types of challenges: challenges related to the cell phone industry, and challenges related to the emerging market environment. Sections 4 and 5 described the case study, which provides examples of responses to these challenges.

The discussion in this section is divided into two parts. The first part is dedicated to analyzing responses to the emerging market environment in the context of the cell phone industry. The analysis is illustrated by examples collected during site visits across Latin America. The second part of the discussion focuses on the responses to supply chain challenges of the cell phone industry by analyzing the performance of the various supply chain structures adopted in the Brightstar Ecuador case study. The analysis is centered on the notion of responsiveness, which constitutes a critical success factor in the cell phone supply chain.

### **6.1. Overcoming supply chain challenges in emerging markets**

This section examines responses to challenges of emerging markets in the context of the cell phone supply chain. In section 3.3, some specific challenges were identified:

- Volatile business environment
- Lack of capabilities
- Penetrating low income brackets
- Security and trust

Traditional methods may be inappropriate to overcome these challenge: extensive experience in developed regions is no longer enough, and experience needs to be built from business made in similar regions. Therefore, operating a business in several developing regions can accelerate the learning curve and increase the knowledge base on such regions.

In the following section, each challenge is examined in turn, and some responses encountered are described.

### **6.1.1. Mitigating volatility**

One way of mitigating political and economic uncertainty is geographic risk-pooling: assuming that regions are relatively independent, operating in several regions may help mitigate the effects of shocks in one region. If operations are strained in one country, the success of business in another country can help the company weather the storm, and quickly recover when the crisis passes away. Moreover, having a strategic hub may facilitate risk pooling. Brightstar headquarters are in Miami, from which products can easily travel to and from all Latin American destinations, facilitating direct and reverse logistics.

The unpredictability of economic changes necessitates high flexibility from the business, which can be gained by empowering people. Players must have the means to respond rapidly to crises, so as not to be paralyzed by the rules they are following. Although Brightstar Corporation is heading all Brightstar subsidiaries in Latin America, subsidiaries are given considerable leeway in terms of running local operations. This freedom enables each subsidiary to adjust to specificities of their regions, and to react accordingly when unpredictable events occur. For instance, problems often occur at borders with customs; specific solutions need to be developed for these problems, given the interplay of culture, politics, social norms and economics. The risk of too much freedom, however, is to become over-reactive and neglect the development of clear processes and rules.

Developing strong personal relationships with supply chain partners can reinforce the solidity of the supply chain, by facilitating coordination between the partners in case of crisis.



### **6.1.2. Developing capabilities**

The interdependence of players in the supply chain forces them to cooperate in order to ensure a proper flowing of goods and information along the chain.

- Developing capabilities with partners

In Ecuador, Brightstar was able to help its transportation partner improve its capabilities. When Brightstar arrived in Ecuador to open a new supply chain services contract with BellSouth, they needed a transportation provider. They could not afford the services of DHL, but the local transportation company was not capable or reliable enough for their needs. They worked closely with the local transporter and helped to upgrade its level of service: the performance of the courier was measured daily. A few years later, the transporter was reliable enough to get a contract with UPS. Brightstar thus successfully developed an affordable and capable partner in the local market.

Brightstar also tried to help its transportation partner in Brazil to develop its own capabilities, in an indirect manner. They were fairly capable already, but Brightstar measured their performance and provided them with a set of detailed key performance indicators. They hoped that providing performance data would incentivize the transporter to improve its own operations.

- Developing capabilities with customers

Brightstar also occasionally needed to develop capabilities for its clients. Challenges appear particularly subsequent to the takeover of operations.

When Brightstar began a contract with a wireless operator in Argentina, they inherited a warehousing and invoicing operation with inefficient operations flow and inefficient systems. The operation was housed in a facility intended for office space. The picking and packing areas were on the second floor, and shipments had to be backtracked through the office and down the elevator to exit the building. In

order to create an invoice, workers had to cut and paste from a database into a custom invoicing program, wasting time and inviting mistakes. When Brightstar took over this operation, they wanted to overhaul both the operations flow and the systems. They opened a new warehouse with a more efficient layout to solve the problems with the operations flow. However, the challenges with systems were more difficult to solve. They would have to change with their clients' IT systems in order to make the workflow more efficient. They were optimistic that in a year or two they could create a more efficient IT suite together with the client, but no specific plans were laid. Nevertheless, Brightstar had already helped its customer to improve its warehousing and invoicing operation, and was eager to help them to develop a better IT system. Both capabilities would improve Brightstar's ability to carry out its own business as well.

This example already shed light on the difficulty of collaboration with the client. In Brazil, collaboration was even more complicated. Brightstar took over operations from a customer, and inherited their original warehouse layout and operations process. When Brightstar wanted to make changes, the customer would not allow it. They would not allow Brightstar to integrate its own warehouse management system with the customer's SAP system, so employees were required to scan goods into both systems. The customer also requires detailed KPI reports on a frequent basis, which were so numerous that Brightstar needed 15 people working full time to produce these reports. Brightstar believed the customer wanted too much control over operations, and found it difficult to work with the customer to improve its operations.

### **6.1.3. Penetrating low income brackets**

- Reaching new customers

In order to expand and reach new customers, stakeholders may be pushed to innovate and increase efforts to maximize efficiency. It is the case of Argentina, where cell phone penetration has reached around 120%. An Argentinean carrier sells many low-end phones through telemarketing, a marketing strategy which consists in calling consumers to convince them to buy a phone. However, this carrier faces a high rate of return of around 50%. After investigation, it appeared that these returns are mostly related to cash on delivery strategies, where the customer only pays the transportation partner upon delivery of the phone. According to an Argentinean carrier, the customers often face cash shortage due to their income uncertainty: during the week separating the order from the actual delivery, customers would spend all their available money and find themselves unable to pay for the phone. These unfruitful deliveries induce higher charges from the transportation partner to take into account the uncertainty. Investing in delivery reliability is therefore crucial to reduce uncertainty to a minimum.

- Delivery challenge

The lack of infrastructure is constraining for logistics and necessitates high responsiveness. To reach Amazonian destinations, phones are shipped by air to urban centers and from there to the final destinations. Often, there is only one flight to a city each day, and as one Brightstar manager told us, “If you miss that flight, you miss your KPI.” Some destinations can only be reached by canoe. They needed a flexible and experienced transport provider who knew the region because, as they said, “you’ll never get FedEx to go to canoe!” In order to ensure a smooth running of operations, daily phone calls helped Brightstar managers keep track of their remote employees. They began carefully monitoring their KPIs and reacting in real time to ensure on-time shipments and deliveries. Also, Brightstar managers found a local transportation provider who could handle deliveries in the Amazon.

- Financially empowering dealers

Dealers play a major role in the supply chain since they are the only direct link to the final consumer. However, many dealers are financially constrained, and are unable to pay upfront for phones to build up inventory, which prevents them from selling. At the same time, the banking system does not grant them loans, or are prohibitively expensive, and require a guarantee. The causal loop diagram is given in Figure 18, where SD stands for small dealers: higher profits enable dealers to invest in capital. Small dealers are differentiated from big dealers by their constrained capital, whilst big dealers have enough capital to buy as much inventory as they want. Moreover, big dealers have power over the supplier, whilst small dealers need to win their trust. Small dealers have a fixed capital allocated to inventory, and the level of inventory is the limiting factor for sales. Inventory level directly determines customer service level. Customer service is essential for dealers given the high level of competition: unsatisfied customers are lost sales, since they can easily go to other, more reliable dealers. As customers build trust with the dealer for providing reliable customer service, sales increase, as well as profits.

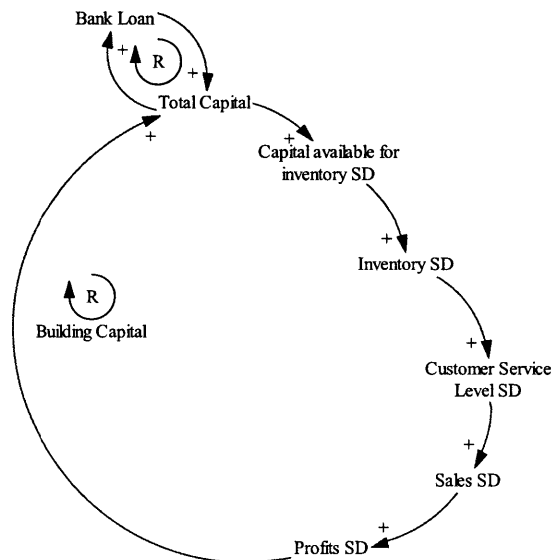


Figure 18 Building capital of small dealers

The dealers therefore need trade credit in order to stay in business: trade credit is necessary for the supply chain to work properly. Dealers are thus able to get inventory and maintain customer service

level without the constraint of capital. The level of credit is limited by the default risk incurred by the supplier, and can be reevaluated over time according to the sales of the dealer, see Figure 19.

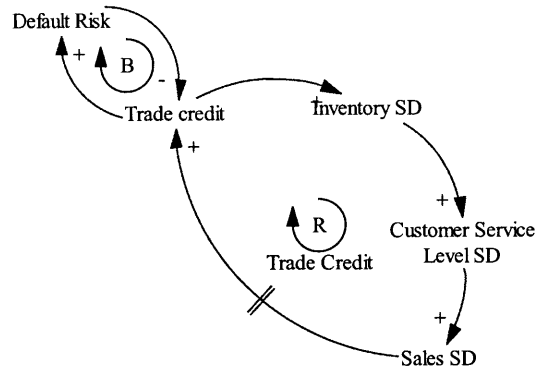


Figure 19 Trade credit for small dealers

Nevertheless, suppliers have a comparative advantage over banks, which enables them to mitigate default risk better. The process of reevaluation of credit level can also take a more informal path based on the level of trust of the supplier in the dealer: good financial behavior on the dealer’s side may generate more laxity on the supplier’s side, see Figure 20. As its profits increase, the dealer is able to pay back its debts and build positive credit history.

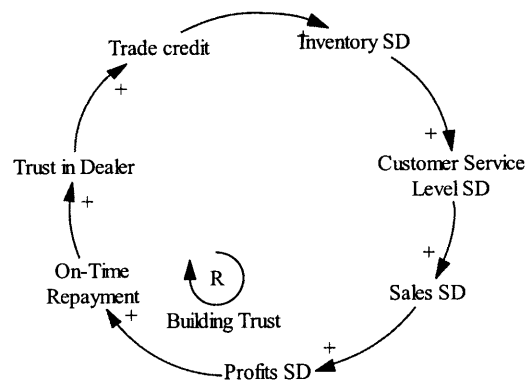


Figure 20 Building trust in small dealers

The global causal loop diagram obtained is given in Figure 21.

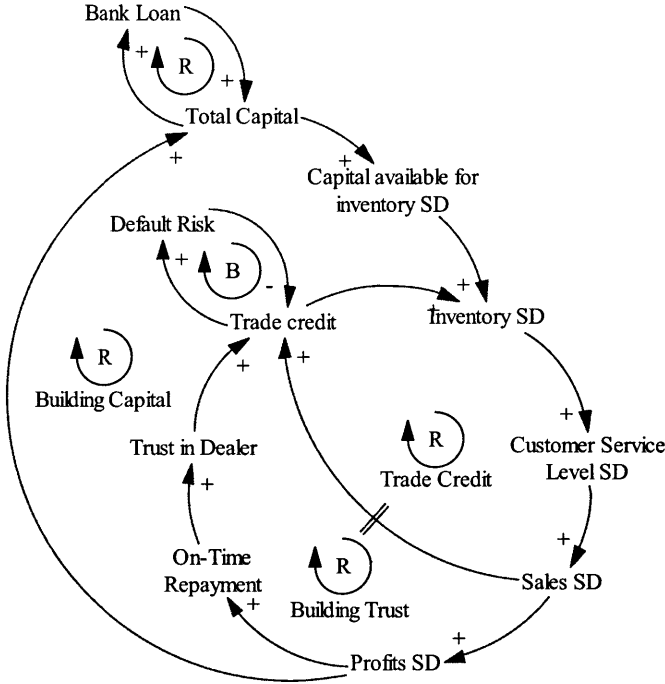


Figure 21 Dynamics of small dealers

More details on dealers and trade credit are given in Section 2.5. of the Literature Review.

In the case of Ecuador, the comparative advantage of suppliers is all the bigger that the fragmented distribution landscape considerably complicates transaction information. Indeed, dealers are differently equipped and standardization of the information exchanged is challenging. Exchanging data over email is not straightforward to all dealers given the limited access to the Internet; phone calls or faxes are sometimes the only communication mean between the dealer and the supplier.

Brightstar acts as a financial intermediary by granting trade credit to its dealers. Trade credit is in the interest of Brightstar since as dealers increase their sales and their subsequent orders from Brightstar, profits of Brightstar increase too.

Brightstar carries out a qualitative and quantitative analysis of the financial situation of dealers. The qualitative analysis looks at commercial references, bank references, qualification given by the carrier and a visit to the dealer. The quantitative analysis includes a financial analysis – examining liquidity, leverage, profitability, cash conversion cycle and efficiency – and a credit risk analysis. According to the results of the analysis, Brightstar may grant the dealer a level of trade credit according to terms determined with the carrier. The cut-off point is 61 days, after which if past due is above a certain level, Brightstar coordinates with the carrier to recuperate the portfolio. Brightstar is entirely responsible for the billing process, as well as the management of payments on a regular basis and in case of judicial procedure.

Four factors were identified as facilitating the trade credit service for Brightstar: (1) transaction information, (2) relationship, (3) existing resources and (4) trade credit insurance.

(1) Brightstar generates transactional data

As supplier, Brightstar accumulates data on orders and repayments, building a database of hard information, which can facilitate the quantitative analysis to set the credit level.

(2) Brightstar builds a relationship with dealers

Although the credit process is quite formal – the system blocks the order if the dealer has not fulfilled its obligations on time – slight variations are allowed. There is one person responsible for the whole indirect channel. Business takes place through frequent direct interaction over the phone between that person and dealers, who therefore develop a relationship. This enables Brightstar to collect ‘soft’ information about the dealer, regarding their financial behavior. Furthermore, Brightstar’s geographical proximity to dealers and local knowledge facilitates relations with and understanding of dealers. This soft information can in turn be used to determine the flexibility in the trade credit level.

(3) Brightstar uses preexisting capacity and skill

The level of trade credit is directly integrated into the systems of Brightstar which manages orders, so the system shows directly whether the order can be fulfilled. The person responsible for handling orders can thus be responsible for analyzing credit status, and no additional staff or resources are needed.

(4) Brightstar takes on trade credit insurance

In order to maximize the level of trade credit that Brightstar can give out to its dealers, Brightstar takes trade credit insurance. It is collaborating with COFACE, a credit insurance company which carries out financial analyses for each client, delivering a line of credit to each dealer. The country risk rating of COFACE for Ecuador is C, which refers to a very unsteady political and economic environment, with frequently bad payment record. Moreover, given the low potential return of small dealers, there is little incentive for COFACE to work individually with them. However, collaborating with 500 dealers is more attractive. The value-added of Brightstar lies in its ability to pool small actors together and make the group attractive to other partners.

The question naturally arises as to why carriers did not play the role of financial intermediary as a supplier. The main explanation is that financial intermediation is not the core competency of the carrier.

#### **6.1.4. Security and trust**

- Theft

Security issues call for creative solutions, and leads in some instances to additional investment in equipment. For instance, warehouses in Argentina and Brazil are equipped with double-doors: at the gates used for deliveries, the truck waits until the external door is closed before the second door opens,



to prevent outsiders from peeking in the warehouse. Such advanced security measures are not implemented in the United States for instance, since they are not deemed necessary.

Since theft is an issue all along the supply chain, partners also need to be up to speed regarding security. This may mean working with non-traditional transportation partners. In Ecuador, the transportation partner of Brightstar in charge of deliveries to dealers is a transporter of valuables such as cash. This company seemed the most appropriate to Brightstar for the job given the high level of insecurity: the transporter has highly trained staff, a fleet of armored trucks and a strict security protocol. The company also has developed decades of experience in Ecuador dealing with valuables.

- Smuggling

The first step against smuggling is implementing penalties for illegal sales, but such measures are particularly tricky in a spread out environment such as Ecuador. Moreover, smugglers are often powerful and resourceful, and corruption is rampant.

One possible solution against smuggling is to prevent the functioning of illegal phones or pre-paid cards by blocking them, which can be done through the phones' serial numbers. However, this policy may damage the image of the carrier in the eyes of innocent customers unable to differentiate legal from illegal phones. Nonconforming or nonfunctioning products may thus harm sales of a carrier, since customers might consider it a reason to change carrier.

Another possibility is to incentivize dealers to sell legal phones as opposed to smuggled, cheaper phones. The key advantages of legal phones over smuggled phones, besides the potential legal prejudice that smuggling may bring to the dealer, are the reliability of supply and the quality of the products. The impact of unreliable supply and defective products on customer level might be devastating for a dealer whose business is extremely reliant on the relationship with customers. A breach in the trust that a

customer placed in the dealer may damage the reputation of the dealer and snowball into a loss of clientele in very tight-knit communities where word-of-mouth spreads fast.

Brightstar is dedicated to making sure that products ordered through and delivered by its system constitute a predictable and reliable supply. Indeed, Brightstar has a strict policy of control for nonconforming products at arrival: products are meticulously checked for any flaws, according to a carefully laid out process and a checklist built in collaboration with carriers. Deliveries are also strictly controlled: besides signing the delivery paper, dealers get a call from Brightstar to confirm reception of the right products.

The importance of the problem of security is reflected in the high cost of insurance. The insurance cost is sensitive to economies of scale: pooling costly security equipment and resources leads to significant decreases in unit cost.

#### - Trust

Absence of trust between the different actors along the supply chain leads to additional complex logistics processes. In Brazil, a slip of paper confirming the delivery needs to get all the way back to the Brazilian carrier before the latter activates the phone, evidencing a lack of trust in the transport partner. Nevertheless, the Brazilian carrier criticized the high trust placed by Brightstar in its transportation partners. Indeed, the carrier asserted that although they were not looking for state-of-the-art services, they expected good control on the chain, and Brightstar did not seem to fulfill its expectations in service quality.

In Ecuador, Brightstar strives to win the trust of its partners and customers through a rigorous metrics culture. The results are measured in a strong culture of performance, with key performance indicators (KPIs) communicated in rigorously written reports. Transparency is critical and processes should be

immediately accessible. Repetitive mistakes causes mistrust; the definition and clear documentation of processes minimizes this risk. Thus, several KPIs are used. Some are given in Table 4.

KPI	%
Orders with no problems	>98%
Complete orders	100%
Delivery on time	>98%
Inventories accuracy	100%

Table 4 Key performance indicators of Brightstar

### 6.1.5. Concluding remark

Although experience in other countries can often be leveraged when dealing with a new region, the transfer might be more complicated than it seems. In spite of all these similarities, emerging markets retain local specificities that companies have to be sensitive to in order to thrive.

## 6.2. Cell phone supply chain responsiveness

This section analyzes the responses to supply chain challenges of the cell phone industry by examining the performance of the supply chain. As described in Section 3.2, the fast growth of the industry combined with rapid technological innovation brutally increased the complexity of supply chain management in the cell phone industry, and the necessity for higher supply chain performance was reinforced by increased competition.

A key measure of performance of the cell phone supply chain is responsiveness. According to Catalan (2003), responsiveness is a “useful analysis variable and a critical success factor” for the cell phone supply chain.

The analysis of the responsiveness of the cell phone supply chain is based on Catalan’s (2003) model. Responsiveness is defined as the “ability to read and understand actual market signals in real-time

backwards the chain according to changes in end-user demand". Responsiveness is based on two components: the time taken by the flow of information and the flow of goods along the chain, and product demand transparency in the chain. Based on the model of Catalan, five responsiveness assessment indicators were developed for the analysis of supply chain performance: lead time, information exchange, number of echelons, trust and postponement strategies. All indicators contribute to the supply chain responsiveness on two levels, as depicted in Figure 22.

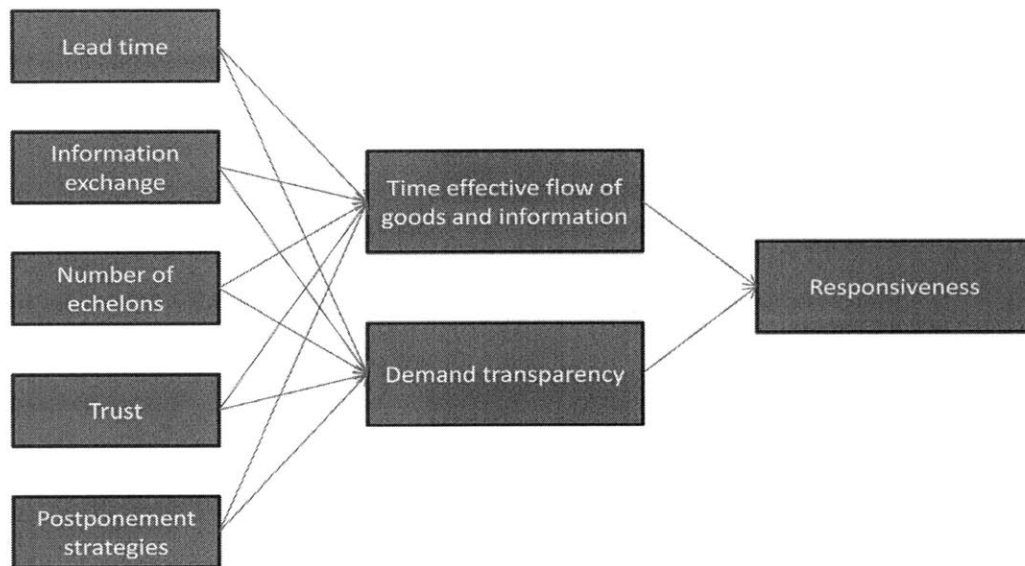


Figure 22 Responsiveness assessment model

The five indicators are described in Table 5.

Table 5 Characterization of responsiveness indicators

Responsiveness Indicator	Characterization
Lead time	Time from the moment the customer places an order to the moment it is received by the customer
Information exchange	Sharing information on real customer demand through transparency in the information system
Number of echelons	Number of warehouses. An echelon is different from the number of

---

	players: an additional player does not necessarily correspond to an additional inventory site.
Trust	Higher trust in supply chain partners leads to savings in security investment and time
Postponement	Push-pull boundary. As configuration is pushed closer to demand, it reduces uncertainties about actual demand and mismatched capacity costs

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Each indicator is used in turn to compare the responsiveness of the three different supply chains. The supply chains are designated as follow:

- SC1: Bellsouth model
- SC2: Bellsouth – Brightstar model
- SC3: Telefónica – Brightstar model
  
- Assessing delivery time efficiency

The first component of delivery time efficiency is the length of time necessary to move a phone from the manufacturer’s warehouse to the dealer. Since the ordering process from the manufacturer by Brightstar and the delivery process from Brightstar to dealers are two separate processes, the lead times need to be considered separately.

Delivery time efficiency also refers to delivery time uncertainty. Indeed, lead time uncertainty leads to a higher inventory level downstream of the chain. In other words, an unreliable delivery service, which means that the supplier is unable to deliver on time, pushes distributors to keep a higher level of inventory. The dynamics in play between the supplier and the distributor can be explained by a simple system dynamics model. Delivery delay is defined as the delay compared to the stated lead time: if the

supplier sticks to a commitment (e.g. 24 hour delivery service), this is considered as no delay. The final consumer order rate received by the distributor is considered exogenous.

The delivery rate of products to the distributor depends on the supplier's ability to ship. Delays in the response of the supplier to changes in demand might now limit products' inventories and constrain the sales of the distributor. The supplier's forecasts are based on the orders it receives (not on the actual sales of the distributor).

The inability of the supplier to deliver on time causes a large drop in the distributor's products inventory and a consequent increase in distributor orders. The corresponding diagram is given in Figure 23.

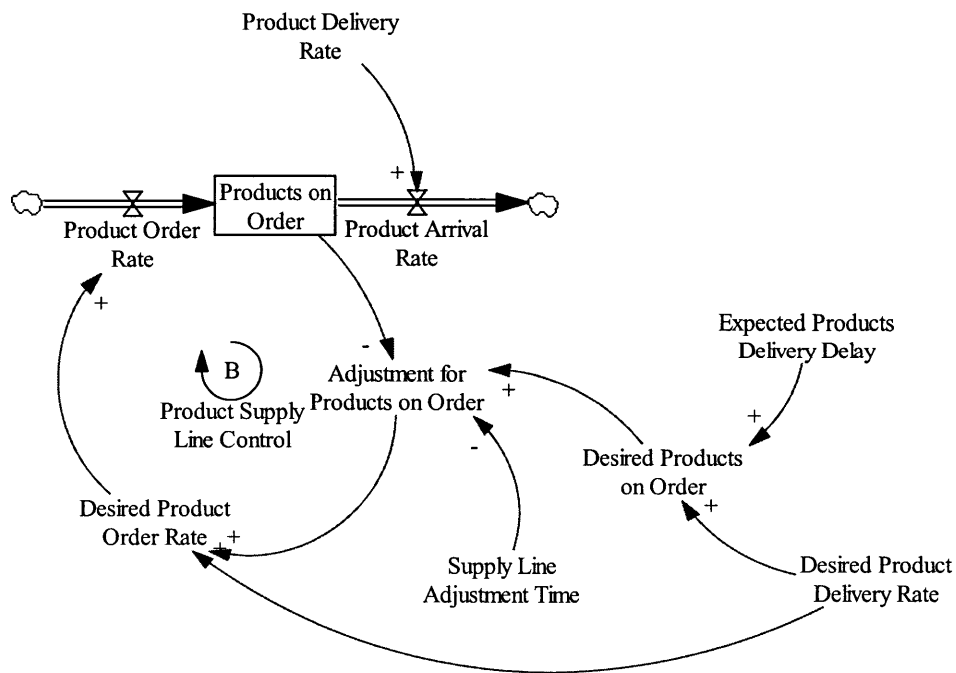


Figure 23 Impact of unreliable delivery on inventory level (Adapted from Sterman, 2000)

This analysis demonstrates the importance of predictable delivery time. The reasoning is summarized in the dynamics diagram in Figure 24.

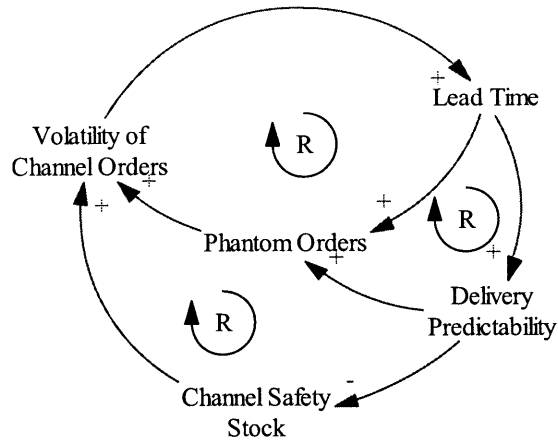


Figure 24 Delivery predictability (Source: Sterman, 2000)

Regarding the lead time between the supplier and dealers, Bellsouth did not take responsibility for delivery and for each order according to the decision of the dealer and Bellsouth the delivery time would vary, usually taking more than one day to reach the dealer. Moreover, the emergency of the decision and the importance of the time factor were bound to unnecessarily increase logistics costs. As a comparison, Brightstar commits to its clients a delivery the next day.

Regarding the lead time between the manufacturer and the supplier, differences between the supply chains are less obvious. Intuitively, the high purchasing power of Brightstar may enable it to get better delivery terms – particularly when products get scarce – than a single carrier, which may decrease delivery time.

Therefore, SC2 and SC3 have higher delivery time efficiency than SC1.

- Assessing information exchange

Forecasts based on actual sales data are more accurate than when only based on orders, and reduce the Bullwhip effect. The information exchange is particularly important in the relationship between the supplier and dealers in order to maximize forecast accuracy and reduce excess or leftover inventory.

Initially, Bellsouth only received order information from its dealers. The consignment system led big dealers to order more: since there was no penalty for excess inventory, they had incentive to order more to avoid lost sales

In the current supply chain, dealers are reporting to a regional chief of sales, who communicates directly to Movistar. Dealers send daily their sales numbers, and monthly send information on their chosen portfolio of products, the strategy planned for each, and the profitability of each product.

Brightstar is collaborating with dealers and using points of sales data to manage orders and allocate inventory. The sales data also enable Brightstar to grant a credit quota to the dealers.

- Assessing the number of echelons

The introduction of a new actor in the supply chain, Celistics, may create coordination problems in terms of communication and compatibility of IT systems.

In terms of echelons, SC1 is superior to SC2 which is itself preferable to the current supply chain SC3.

- Assessing trust

The level of trust the supplier has in dealers influences the level of credit granted. Furthermore, as dealers trust the supplier more, they are more willing to share information and collaborate. This is particularly important in the case of big dealers who have negotiating power with the supplier and are financially independent.

Trust gets built first through the reliability of the services promised by the supplier. The fulfillment of promises by Brightstar contributes to building a strong relationship with the dealers. The commitment of Brightstar in providing a 24-hour delivery service, and permanently controlling and improving its processes using key performance indicators, helps in building trust. Furthermore, a personal interaction



between Brightstar and dealers is maintained by regular phone calls during the order taking process or delivery check. These interactions provide opportunities for both players to share concerns and jointly find solutions. Such a relationship did not exist between Bellsouth and its dealers initially.

Thus, the level of trust is higher in SC2 and SC3 than in SC1.

- Assessing postponement

Brightstar's hub in Miami is an effective postponement strategy both geographically and physically: the inventory kept there has a risk-pooling effect by enabling Brightstar to pull out excess products from the inventory of one subsidiary and send it to another subsidiary where it is actually needed. The geographical advantage is significant given the frequency of flights serving Latin American destinations. Moreover, the physical postponement advantage stems from the fact that the inventory waiting in Miami, although reserved for each subsidiary, is not customized and thus easily modifiable.

Bellsouth initially did not have this option since it did not own subsidiaries in other Latin American countries. The current supply chain introduced a different actor for international logistics, Celistics, and restricted Brightstar's role to national logistics. Although it is unclear whether Celistics is using a hub similar to Brightstar's, the extension of the services provided by Celistics to Telefónica in terms of international logistics management in Latin America makes the use of physical postponement likely.

Therefore, SC2 and SC3 have better postponement than SC1.

- Recapitulation

The results of the analysis are recapitulated in Table 6.

Table 6 Analysis results

<b>Responsiveness indicator</b>	<b>Comparison</b>	<b>Description</b>
Lead time	SC2 and SC3 > SC1	24-hour delivery commitment vs. ad hoc delivery
Information exchange	SC2 > SC1	Sharing of points of sales data
Number of echelons	SC1 > SC2 > SC3	Higher number of warehouses
Trust	SC2 and SC3 > SC1	Personal relationship, reliable service
Postponement	SC2 and SC3 > SC1	Miami or other hub as geographical and physical postponement

Where:

- SC1: Bellsouth model
- SC2: Bellsouth – Brightstar model
- SC3: Telefónica – Brightstar model

## **7. Conclusions and Recommendations**

### **7.1. Conclusions**

Generic strategies of responsiveness are applicable to the cell phone supply chain in Ecuador. However, in addition to these traditional strategies other specific constraints need to be taken into account. From the examination of the different configurations of the cell phone supply chain, three characteristics emerged as successful factors for responsiveness that took well into account the constraints of the environment: (1) trade credit, (2) reliable delivery, and (3) empowered people.

First of all, the trade credit structure provided by the supplier, consolidated by the subscription to trade credit insurance, is critical in empowering dealers to overcome the financial hurdle reinforced by a weak banking system. More precisely, a distinction in the credit structure needs to be made between small dealers – with limited capital – and large dealers – with access to other, more traditional sources of credit: trade credit should focus on and be tailored to small dealers. Furthermore, the additional resources needed to run the financial relationship with dealers is minimal when taken on by the supplier, and minimizes the burden on the supply chain of handling a very fragmented distribution landscape.

Second, ensuring a short – 24-hour – and reliable lead time is vital for a fast-moving consumption good with short life cycle. The reliability of delivery minimizes the level of inventory in the distribution channel, relaxing their financial constraint, and builds trust between supply chain players. Trust in the supply chain is all the more powerful that it often makes up for the high level of uncertainty related to the volatility of the business environment. The criticality of reliable delivery should overcome obstacles

such as the inexistence of an appropriate transportation partner, and justifies investment in developing capabilities through close collaboration with potential partners.

Finally, empowering people is essential when working in a volatile environment, such as that encountered in emerging markets. Supply chain players need the freedom to customize their tasks to the specificities of the environment and the ability to react to crises. Flexibility does not exclude the solid building of clear and transparent processes to construct supply chain resilience.

## **7.2. Recommendations**

The identification of success factors in the various supply chain structures leads to couple of recommendations regarding the current supply chain.

First, the number of echelons should be reduced. The additional difficulty of building collaboration between two logistics partners reduces the benefits of outsourcing by eliminating opportunities for leveraging economies of scale and knowledge base. Carriers should clearly evaluate the strengths of weaknesses of each logistics partner and make a rational decision to maximize supply chain performance. One major factor to consider in this analysis is the ability to leverage local knowledge to tailor supply chain strategies appropriately.

Second, location postponement is a significant supply chain strength for a high-value, short life cycle good such as cell phones. The choice of a hub deservng all subsidiaries is a traditional method of location postponement which increases the responsiveness of the supply chain. The choice of Miami as a hub to serve Latin America is critically strategic in geographic as well as cultural terms. The risk pooling impact of the hub is even more important given the high variability of demand and the volatility of the political and economic environment of Latin American countries. Thus, maintaining the use of a Miami hub is recommended.

### **7.3. Suggestions for further research**

Regarding the supply chain considered in this study, additional interviews with supply chain stakeholders, especially dealers, may shed light on other key aspects of the supply chain that have not been identified here.

In this study, responsiveness was deemed to be a critical success factor of supply chain performance. Nevertheless, performance could be evaluated through other means, and analyzing the supply chain from other perspectives may provide additional insight. In particular, a quantitative analysis of the supply chain performance is desirable. Other viewpoints may also consolidate or contradict the importance of supply chain characteristics identified, providing elements for further analysis.

Finally, case studies in other industries in similar environments should be carried out to build a more robust list of constraints faced by supply chains. The refinement of constants across supply chains in emerging markets will allow further generalization of the analysis by determining more accurately the applicability of results. Indeed, another case study was carried out in the course of this thesis, on the food supply chain in Colombia. The lack of data prevented the study to be fully carried out, but the preliminary analysis highlighted some characteristics shared with the cell phone supply chain, such as the fragmented distribution landscape.

# Appendices

## Cell phone supply chain process

The supply chain examined during the extensive study in Ecuador is depicted in Figure 25.

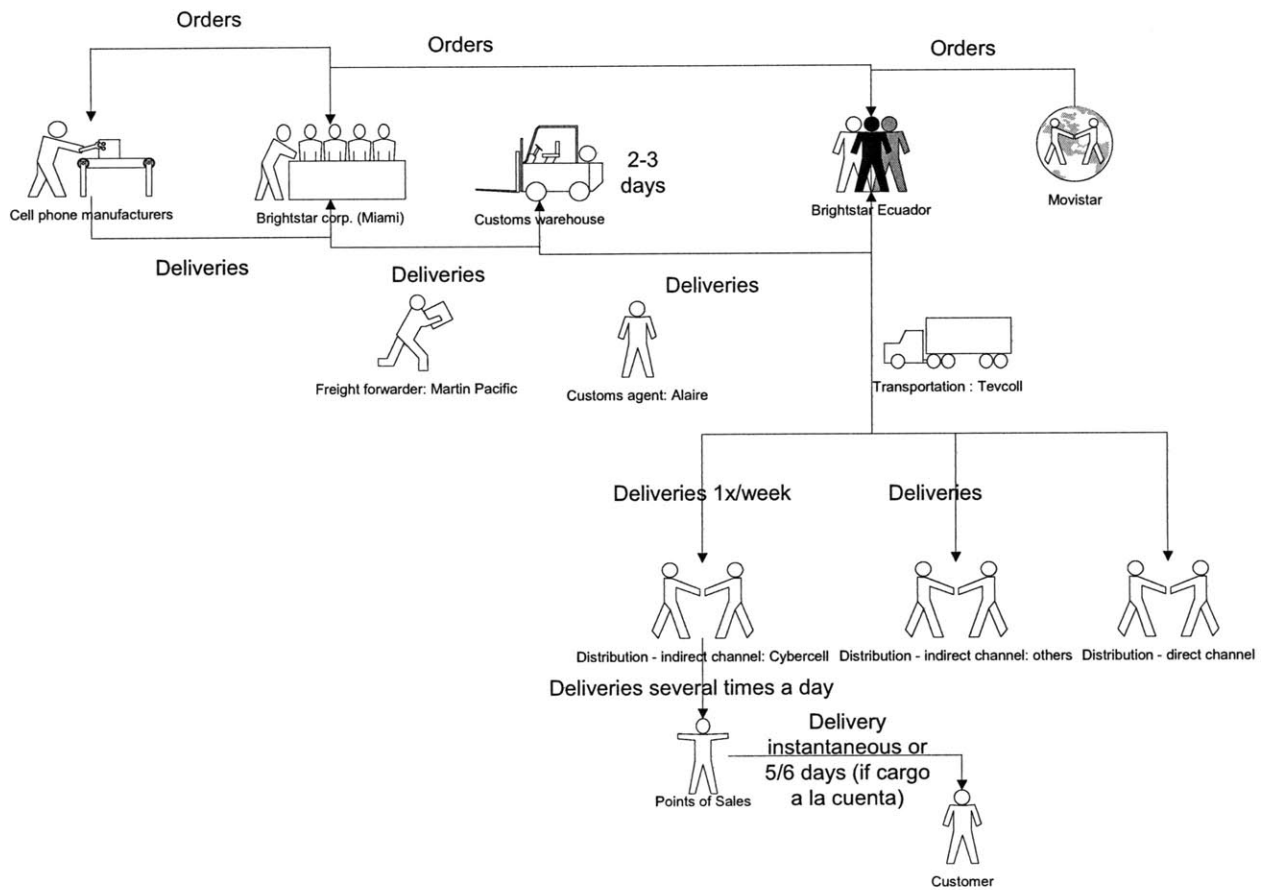


Figure 25 Detailed cell phone supply chain examined in Ecuador

The different actors interviewed were:

- Brightstar corp.
- Brightstar subsidiary: Brightstar Ecuador

- Freight forwarder: Martin Pacific
- Customs agent: Alaire
- Network service provider: Telefónica - Movistar, Telecsa – Alegro, América Móvil - Porta
- Transporter: Tevcoll
- Retailer: Cybercell

For each actor, three aspects were examined:

1. Physical flow: what physical products do they receive? What do they do with it (tasks)?
2. Information flow: what information do they share? Who do they share it with? How do they share it (meetings, emails, reports...)? How often do they share it (frequency)?
3. Financial flow: Who do they owe money to (other actors)? When do they pay (frequency)? How do they pay (directly to bank account...)? Are they allowed credit? Build the cash conversion cycle.

### **Interview guide**

This interview guide was prepared for and used during the second trip in Ecuador, for the round of structured interviews of various stakeholders in the supply chain.

Note: This interview guide was prepared in collaboration with Erica Gralla, PhD student in Engineering Systems Division at MIT.

#### **1) Presentation of the project**

##### Project background

Last year, MIT launched the “Center for Latin American Logistics Innovation” (CLI) in Bogota, Colombia. The model for this Center is a similar venture, the Zaragoza Logistics Center (ZLC) launched by MIT in Zaragoza, Spain about five years ago. The CLI wants to develop research and cases on Latin American logistics excellence.

Case studies can provide visibility for the featured companies, and insights and ideas for others. One example of a world-famous case study is Zara, the fashion clothing retailer, which is now recognized as a great innovator in supply chain management. However, we do not have any cases showing great supply chain innovation originating in Latin America. We are hoping to find such a case in the mobile phone supply chain in Ecuador.

In the past several months, we have written a case study about Brightstar, documenting some of the supply chain innovations in the company. The two of us, along with Professor Charles Fine and Dr. Edgar Blanco (the Executive Director of CLI), visited Brightstar operations in five countries to collect information for the case. We interviewed key managers and leaders to understand the operations, and visited one of the customers (wireless operators) in each country to understand the customer’s perspective.

From our previous visit, we have a good understanding of Brightstar, but we have returned in order to study the entire mobile phone supply chain in Ecuador. We realized that successful supply chain innovations were being developed by many of the actors along the supply chain. Our goal is to develop an in-depth understanding of the end-to-end mobile phone supply chain in Ecuador, with a view toward highlighting innovations and achievements from all the companies along the supply chain. We hope to develop a new case study that will highlight Latin American successes and also provide ideas and insights into solving the unique challenges faced by companies in Latin America.

## **2) Interview questions**



## Introductory

1. Please describe briefly what your company does.
  - a. (How does your company fit into the mobile phone supply chain? Who do you work with directly?)
2. Please describe briefly your position and responsibilities.
  - a. What do you do on a day-to-day basis?

Now, we want to understand some of the basic information about your business.

3. What are your main areas of business? Core capabilities?
  - a. What are you known for? i.e. how do other see you?
4. We want to understand your place in the supply chain. Can you tell us how you fit into the mobile phone supply chain? Who you work with?
  - a. (Maybe diagram)
5. (What do you think your company does well?)
  - a. Follow up on anything interesting
6. What are your major challenges?
  - a. What are you working towards? E.g. IT

We want to understand how you manage your inventory.

7. How do you make ordering decisions?
  - a. What is your ordering policy?
  - b. What do you order?

- c. How often?
  - d. What are the lead times?
  - e. Do you get deals, like volume discounts? How do you use these?
- 8. How much inventory do you usually have on hand?
  - a. Are you happy with this amount, or are you trying to change it?
- 9. Who owns the inventory?
- 10. How do you forecast sales?
  - a. How do you use these forecasts?
- 11. What do you do when you have inventory that doesn't move?
- 12. How often do you have stock-outs? How do you handle them?
- 13. What happens when a phone gets returned?
  - a. Who pays for it?

We want to understand how you manage your fleet and operations.

- 14. Do you own vehicles (trucks)? Are they outsourced?
- 15. How do you manage your fleet?
  - a. How do you decide how many trucks are needed?
  - b. How do you maintain them?
  - c. Do you have problems with theft or fraud?
- 16. How do you plan routes and schedules?
- 17. Do you have any problems making deliveries?
  - a. How do you reach customers? (e.g. no cell phone?)
- 18. Are there particularly challenging areas of the country?
  - a. What are the challenges and how do you deal with them?

A little more basic information.

19. How does your company get paid?
  - a. (e.g. per unit, per (successful) delivery, per contract, etc.)
20. How do you manage your employees?
  - a. Are they outsourced?
  - b. How are they paid?
  - c. Any problems? (e.g. unions)
21. How do you measure performance?
  - a. How do you use that information?
22. Do you deal with the low-income markets or hard-to-reach areas?
  - a. How critical are these markets?
  - b. Any specific problems?
23. How do you finance your business?
  - a. For example, loans, or venture capital, or consignment? (debt)
24. Do you provide credit to your partners?
25. What is your structure of costs?
  - a. In which areas do you spend the most money?
  - b. How much money do you spend on distribution? Infrastructure? Etc

We want to understand how information is used along the supply chain.

26. What information, or data, do you collect about your business?
  - a. What records do you keep? (e.g. sales data)
  - b. (What do you report to your clients?)

27. How do you use the data you collect about your business?
28. How do you “see” or “track” what is happening in your business?
  - a. E.g. Stock levels, truck deliveries, etc.
29. What information would you like to have, in order to make better decisions?
  - a. (e.g. forecasts)
30. What tools/technology do you use to collect/store/share information?
  - a. Do you have slips of paper that need to travel back and forth?
31. Who do you share information with? What kind of information?

We want to understand risk along the supply chain. (Explain?)

32. What are the major areas of risk in your business?
  - a. (In what ways are you afraid you might lose money?)
  - b. (Have you made any big investments that you are or were worried about?)
  - c. (Are there any problems that disrupt your business, such as late deliveries, theft, non-payment, etc?)
33. How do you manage these risks?
  - d. What strategies do you use to protect your investments? (insurance)
  - e. How do you mitigate operational and supplier risks?
34. How do you share risk with other companies?

We want to understand relationships along the supply chain.

35. What other companies do you work with?
  - f. For each company... Is this company a partner? A contractor? A client?
36. How did you select your *partners/contractors*?

- g. (e.g. RFQs, personal relationships, other – suggest only if necessary)
- h. How difficult was it to find good partners? Were there lots of options? (Did you help them develop capabilities they needed?)

37. How do you evaluate your *partners/contractors*?

- i. Do you have any performance indicators?
- j. How often are they evaluated? In what format?
- k. How do you provide feedback to each other?

38. How do you find your *clients*?

39. Do you receive feedback from your *clients*?

- l. How do you receive feedback? (e.g. reports, KPIs, personal, etc)

40. What is your relationship like with *each company*?

- m. How do you manage your relationship with them?
- n. (How much do you have to monitor their activities in order to ensure they are doing what they should do?)
- o. (How do you feel about how much they monitor your activities?)
- p. (Do you see this company more as a partner or a competitor? Only ask if necessary!)
- q. (Do you think they see you more as a partner or a competitor? Only ask if necessary!)

41. How do you share risk with *each company*?

42. Do you interact with any other organizations? For example, government offices?

- r. How is your relationship with them?
- s. What do you need from them? What do they need from you?

We want to understand how the environment impacts your business.

43. Do you see this industry as fast-changing? How do you deal with that?

- t. Can you think of some recent challenges you faced because of outside changes? How did you deal with them?
44. Can you think of any government policies that drove or changed the way you do business?
- u. Please tell us about them. Were they helpful or harmful?
  - v. (If examples are needed: tax policies, import restrictions, labor laws)
45. Can you think of any economic situations that drove or changed the way you do business?
- w. Please tell us about them. Were they helpful or harmful?
  - x. (If examples are needed: currency fluctuations, black market competition, low-income areas)

**3) Time for interviewee to ask questions or expand on another topic**

- Is there anything that we left out or overlooked and that you think might be important for us to know for our research?
- Do you have any questions about the project?

**4) Closure / Thanks / Follow up**

- Thank you for your time, your patience and candidness in answering our questions.
- Would you mind answering a couple more questions, by e-mail or over the phone, if we find out that we left something out?

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