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Knowledge and cultural diffusion along the supply chain as drivers of product quality improvement

The illycaffè case study

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Abstract

Purpose – The purpose of this paper is to widen the knowledge base on supply chain learning by exploring and explaining how an enterprise can compete and win in the international market by integrating quality management practices along its supply chain and, above all, by becoming the coordinator in a supply chain learning (SCL) network.

Design/methodology/approach – The authors conducted an exploratory case study on a group operating in the coffee market that is universally recognised for the high quality of its products: illycaffè.

Findings – This paper illustrates and explains how the illycaffè Group implements, competes and wins in the international market because of its exemplary business strategies, its focus on the competitive priority of quality, and consistent and integrated supply chain management practices that are sustained by an innovative approach: the diffusion of knowledge, know-how and a culture of excellence in coffee quality along the entire value chain. The authors find that the diffusion of a culture of quality orients supply chain learning towards the continuous improvement of product and service quality, and above all, improves results by encouraging an emergent behaviour across different actors that creates a shared culture.

Research limitations/implications – The exploratory nature and use of a single case study are the major limitations of this research. Nevertheless, this study may serve as a significant starting point for future research and analysis related to supply chain learning strategies.

Originality/value – The illycaffè case study contributes to the literature on quality management and on supply chain management suggesting how an enterprise can improve product and service quality using a sustainable SCL strategy based on knowledge/know-how diffusion and a shared culture along the entire supply chain.

Keywords Product quality management, Supply chain learning, Case study, Supply chain management, Quality management

Paper type Case study

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Introduction

Supply chain management (SCM) has gained attention because of the advantages and better performance that businesses can obtain by the adequate integration of their supply chain (Cooper *et al.*, 1997; Lee and Ng, 1997; Tan *et al.*, 1998; Croom *et al.*, 2000).

In the food and beverage industry, leading companies develop and fine tune their SCM strategies to address many of the leading challenges. In fact, food companies are adopting many quality control practices across their supply network to avoid faulty processing and inconsistencies and are integrating management of their networks from the suppliers of their suppliers (second-tier suppliers) to the customers of their customers (end customers).

During the last 30 years, the coffee market has become extremely competitive and achieving the competitive priorities of product and service quality using SCM practices is an issue of clear interest in the industry. In fact, the quality of the coffee is deeply influenced both by process factors, which are related to the distinctive features of the product and transformation activities at every link of the supply chain, and by logistic factors, such as supply criticalities imposed by the geographical distances between the coffee growers' countries and the coffee roasters' countries.

In the 1980s, there was a vertical realignment between operations and business strategy (Hayes and Wheelwright, 1984), while in the 1990s, the primary focus became the horizontal alignment between operations and processes (Ghoshal and Bartlett, 1995). In the last decade, the focus has transitioned to the integration between internal and external supplier and customer processes in a unique supply chain (Frohlich and Westbrook, 2001). Leading-edge companies are not competing against other companies, but rather supply chains are competing against supply chains (Christopher, 1992). A rising theme in the innovative SCM approach is so-called supply chain learning (SCL) (Bessant and Francis, 1999).

The research presented here is meant to widen the knowledge base on SCL by exploring and explaining how an enterprise can compete and win in the international market by integrating quality management practices along its supply chain and, above all, by becoming the coordinator in a SCL network. To answer our research questions, we performed an exploratory case study on a firm operating in the coffee market that is universally recognised for the high quality of its products: illycaffè.

The remainder of the paper is presented in sections. The first section of the paper (theoretical background) depicts the impact of SCM in quality management, underlining the main strengths and opportunities and the competitive advantage deriving from SCL. The second section describes the research methodology. The subsequent sections present the evolution of the coffee supply chain, provide the general background on the illycaffè Group and its supply chain with a focus on quality management practices and the primary techniques of knowledge/know-how and a shared culture (excellence in coffee quality) diffusion. In the last section, these practices are synthesised in a framework that is useful for the analysis and discussion of the case study's academic and managerial implications.

Theoretical background

SCM can provide a sustainable competitive advantage that simultaneously improve product/service quality and reduce costs (Davis, 1993). The main operations that have a strategic role in achieving the competitive priority of quality are integrated logistics and purchasing.

Logistics management can generate and establish unique types of customer value, which creates a competitive advantage (Langley and Holcomb, 1992). According to service response logistics (Manrodt and Davis, 1992), logistic competence is a core activity that is integrated with marketing performance and is aimed at achieving customer satisfaction through product availability, timely delivery, and fewer customer complaints and product returns. Integrated logistics management coordinates all logistics activities to minimise total distribution costs and maintain desired customer service levels (Gopal and Cypress, 1993). Currently, the high quality of the product and service at every level of the supply network through integrated logistics is recognised as being essential for obtaining a successful SCM strategy (Johnson and Wood, 1996; Choi and Rungtusanatham, 1999; Nonino and Panizzolo, 2007). In fact, integrated logistics increase efficiency and productivity (Lambert *et al.*, 1978; Gustin *et al.*, 1995) by reducing stock and improving forecasting, planning and scheduling, which lead to both shorter internal and external lead times and enhancements to customer service (Muller, 1991).

There is a direct relationship between the implementation of quality management principles, firm operational performance and customer satisfaction (Anderson *et al.*, 1994; Choi and Eboch, 1998; Curkovic *et al.*, 2000; Dean and Bowen, 1994; De Toni *et al.*, 2007).

The current literature supports this point of view, and a number of papers have analysed the role of quality management in SCM (e.g. Fynes and Voss, 2002; Salvador *et al.*, 2001; Tan *et al.*, 1999), in logistics (e.g. Anderson *et al.*, 1998; Millen *et al.*, 1999; Tracey, 1998) and in purchasing (e.g. Lambert *et al.*, 1998; Kotabe and Murray, 2004; Sánchez-Rodríguez *et al.*, 2004).

Increasing process quality across the entire supply chain leads to cost reduction, a better use of resources and higher efficiency (Beamon and Ware, 1998). Product quality is the result of quality management actions applied to every link in the supply chain, making every actor responsible for the final result (Romano and Vinelli, 2001). Therefore, to achieve high-quality results, it is necessary to involve every link in the supply chain (Evans *et al.*, 1993; Forza *et al.*, 2000).

At the purchasing level, product and service quality is generally estimated as the supplier's ability to produce reliable, lasting and consistent inputs in compliance with the buyer's specifications (Spekman, 1988; Curkovic and Handfield, 1996; Forker *et al.*, 1996); moreover, quality is the main variable in the supplier selection process (Dickson, 1966; Wilson, 1994; Vonderembse and Tracey, 1999). Empirical evidence also suggests that a greater integration between suppliers and customers produces advantages for both (Lee *et al.*, 1997; Metters, 1997; Anderson and Katz, 1998).

A successful SCM requires a demanding change in operations management (Lambert and Cooper, 2000): moving from an individual perspective to the integration of all activities associated with the key processes of the supply chain. In accordance with this approach, firms do not opportunistically follow a given strategy, ignoring the other components of the supply chain. Rather, they tend to make the overall supply chain more competitive (Romano and Vinelli, 2001), adopting initiatives based on collaboration, integration and transfer to obtain a strategic advantage (Scott and Westbrook, 1991; Kanter, 1994; Bowersox *et al.*, 2000).

To make the overall supply chain more competitive and obtain benefits such as stock reductions, mitigation of the bullwhip effect or minimisation of supply-demand-mismatch costs, supply chain members should enhance cooperation and information sharing (Chen, 2003). Scholars have placed great emphasis on the

value of information sharing in SCM (e.g. Cachon and Fisher 2000; Lee *et al.*, 2000). Anand and Mendelson (1997) explicitly model information flows in a supply chain in terms of acquisition and the extent of dissemination (within the supply chain). Numerous
types of information can be shared between customer and supplier, such as production capacity, inventory levels, technical information or demand forecast. Information integration technologies can support information sharing in supply chain integration and management (Gunasekaran and Ngai, 2004). The literature on supply chains and information sharing typically assumes that information that is shared is truthful, but that sharing is driven by a relevant economic return (e.g. Gavirneni, 2002). For example, Cachon and Lariviere (2001) demonstrate how incentive contracts are used to promote the sharing of demand forecast information from manufacturer to supplier. Non-cooperative and cooperative game theory in static and dynamic settings has also been used as an important tool for supply chain analysis with multiple agents that often have conflicting objectives (see Cachon and Netessine (2004) for an in-depth literature review with careful attention by the authors to techniques that demonstrate the existence and uniqueness of equilibrium in non-cooperative games). Game theory has also been extensively employed in the analysis of the opportunities and criticalities of information sharing. For instance, Cachon and Zipkin (1999) found equilibrium solutions to both competitive (inventory managed independently) and cooperative (inventory managed as a system) settings, while Anand and Goyal (2009) demonstrated that a company should actively manage information flows within the supply chain, controlling what it knows and what its competitors and suppliers know. Cooperative game theory offers a starting point to the resolution of this problem, but reality is much more complicated, involving multiple additional factors and special considerations (Lee and Whang, 2000).

A rising theme in SCM literature on collaboration through knowledge and know-how transfer is SCL. Bessant and Francis (1999) note the necessity of focusing research and managerial practices not only on intra-organisational learning but also on inter-organisational learning as a potential lever for competitive advantage.

Learning is an intangible strategic resource, a competence and a bonding element deeply embedded in the supply relationships (Hult *et al.*, 2003) that drive supply management success, (Das and Teng, 2000) and can create a competitive advantage.

Bessant *et al.* (2003) demonstrate that the competitive performance of the value stream depends on the learning and development of the whole system, not just that of the leading players, and they provide empirical evidence of the benefits of SCL at both the intra-firm and inter-firm level. For the supply chain coordinator (SCC), the coordinating or central firm that takes the lead, benefits accrue in terms of an increase in sales and improvement in quality and the delivery time for materials, which leads to cost savings and cost reductions. Benefits for first-tier and second-tier suppliers are increasing profit margins, decreasing costs and improvements in product quality.

The model of SCL in which the SCC takes the lead is convincing, but further research is needed on SCM practices enabling effective SCL (in the improvement of product and service quality) and on its economic sustainability for SCC.

Hult *et al.* (2003) considered four orientations in SCL: team, systems, learning and memory. Spekman *et al.* (2002) studied the pre-conditions for SCL and found that the most effective are the use of joint decision making, taking a win-win approach to supply chain relationships and having a shared culture. However, despite the initial

assumption of causality, the authors found no significant direct impact from the presence of integrative mechanisms and components of alliance spirit (trust, commitment and communication) on a firm's ability to enable (or support) SCL.

Among the factors enabling SCL are trust and strong efforts by the SCC, while a low-cost culture creates destructive preconceptions and/or cultural differences both among and within companies that can inhibit SCL. Consequently, the diffusion of a shared culture may sustain SCL. In fact, Krause *et al.* (2007) demonstrate the benefit of SCL in terms of buyer performance improvements when the buying firms perceive themselves as sharing values and goals with key suppliers. Moreover, information acquisition, information dissemination, information interpretation and organisational memory can provide a better understanding of the learning culture's role in achieving superior organisational performance (Kandemir and Hult, 2005).

However, Bessant *et al.* (2003) emphasise that "making SCL happen is not easy, especially as we move beyond the initial set-up phase" (p. 178) as a strong commitment to long-term sustainability and that the development of a learning culture is necessary (Kaplinsky *et al.*, 1999). Furthermore, Kaplinsky and Morris (2001) emphasise the voluntary and participative nature of SCL that grows most effectively when a leading partner acts as SCC, ensuring that a learning process occurs throughout the chain. This requires a strong effort and high use of SCC resources, as the learning process should be sustained due to the many risks of failure to sustain the learning process.

Research methodology

The objective of our research was to explore in depth the relationship between product and customer service quality and SCM practices, identifying possible innovative approaches directed towards SCL. The ultimate goal was to explain why and how these practices can facilitate SCL implementation, thereby raising its effectiveness. Our investigation attempts to answer the following questions:

- How can a company improve product and service quality by fostering SCL?
- How can the SCC increase its efficiency and reduce its resource utilisation by moving towards economically sustainable SCL?

Theory and concepts associated with SCL still need significant advancement (Hult *et al.*, 2003; Lee *et al.*, 2000; Bessant *et al.*, 2003). The body of knowledge on SCL is still limited, and the literature highlights both the novelty of the theme and the limited number of previous studies on both its application and the effects of related SCM practices. Moreover, SCL is a difficult phenomenon to investigate in depth because the dynamics of supply chain relationships and the effects of knowledge transfers are characterised by a high degree of complexity (De Toni *et al.*, 2011). Our research methodology is the single case study approach, a method particularly appropriate for exploratory investigations (Meredith, 1998) in exemplar and revelatory organisations (McCutcheon and Meredith, 1993), when posing "why" and "how" questions (Yin, 2003) and for enhancing the comprehension of complex phenomenon in well-described specific situations (Eisenhardt, 1989).

To achieve our research purpose, we identified and selected illycaffè, a well-known firm operating in the coffee market and universally recognised for the high quality of its products. There are multiple motivations for this choice. First, illycaffè prioritises product and service quality. As we will illustrate, their orientation towards producing an outstanding quality coffee product is a cultural factor deeply internalised in the company that drives management decisions in setting corporate policies and the

actions of the entire organisational structure both within the company and in its relationships with suppliers, logistics operators, customers and consumers. Further, illycaffè is an exemplary case of the systematic application of knowledge in the value chain (Kaplinsky and Fitter, 2004). Finally, there is a strong commitment from the CEO and the senior managers to innovation in SCM practices and to the diffusion of knowledge, know-how and a culture of excellence in coffee quality in the supply network.

Our research was designed to ensure the consistency of the data and to maximise the validity and reliability of the analysis and, consequently, the results. Over six months of research, we collected evidence from multiple sources using different data collection processes to grow the knowledge base. The data were obtained from a combination of primary and secondary sources. In fact, the case study was designed to use multiple means of data collection to enhance the validity of the research through triangulation. Data from primary sources were obtained from 14 semi-structured interviews (repeated twice for a total of 28) with the executive directors of research and development, human resources, administration, quality, operations, logistics and purchasing operations and their respective managers. These subjects were selected as key informants because of their involvement in the management of major supply chain, administrative and organisational processes. Data from secondary sources came from internal documents supplied by managers, company archives and the illycaffè intranet.

The research was conducted in four steps preceded by a preliminary period. First, we presented the research objectives, the analysis process and the requirements to the top management. The goal of this step was to involve the top management both directly (in the refinement of themes linked to SCM areas to be explored in the semi-structured interviews and in the selection of key informants) and indirectly (in sponsoring the research to the managers subsequently involved in the semi-structured interviews).

The first step was data collection from semi-structured interviews and internal documents. The framework to guide semi-structured interviews was divided into five sections based on the main areas of SCM and illustrated in Figure 1: purchasing, inbound logistics, internal operations, outbound logistics and sales. Each manager and assistant was involved in an initial interview lasting two hours to investigate illy's business strategy, its SCM practices towards the continuous improvement of product and service quality and the relationship dynamics with supply chain actors. During the interview, we asked the managers and assistants to explain the quality management practices implemented by illy in each of the five macro-processes and any action that has increased their effectiveness. Throughout this step, we also collected data from secondary sources and coded them according to the sections of the framework.

After the analysis of the interviews and the secondary source data (second step), we organised a second interview (third step) with each of the key informants to confirm the results of the first analysis within the three-level framework deduced *ex post* (final version is illustrated in Figure 2). Furthermore, the interviews aimed at investigating the effects of knowledge/know-how and cultural diffusion (second and third level of the framework) on product and service quality, on quality management, on the dynamics of supply chain relationships and on the cost structure.

In the last step of the research, we analysed in depth all of illy's practices for SCM coordination and SCL for the achievement of high-quality products and services. Moreover, we consolidated the practices in the five sections of the framework by

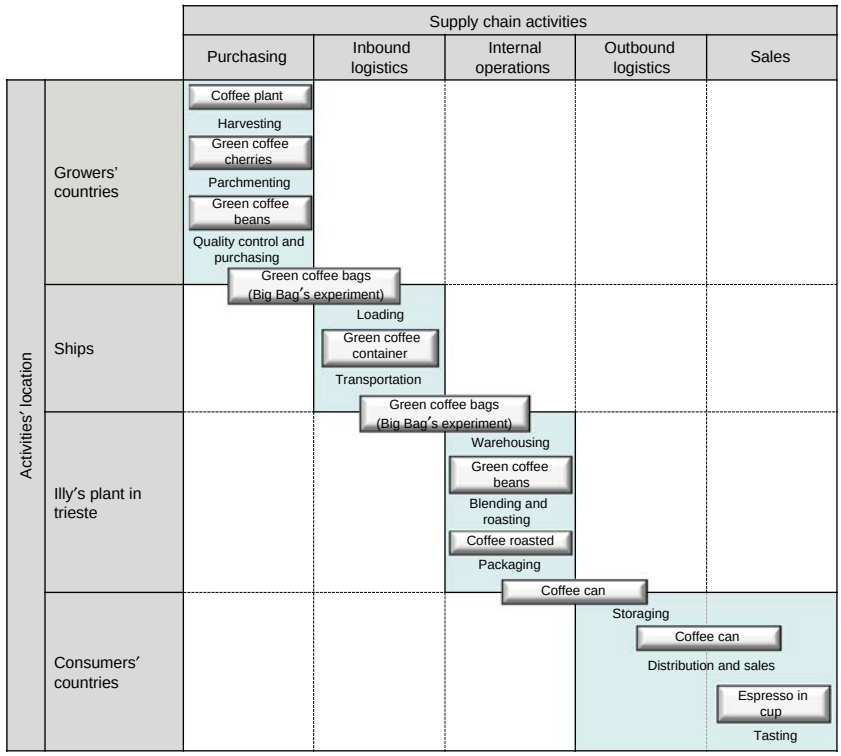

Figure 1.
The illy's coffee supply chain

subdividing them into three typologies of managerial actions: quality management, knowledge/know-how diffusion and cultural diffusion (Figure 2).

The evolution of the coffee supply chain

At the beginning of the twentieth century, the majority of green coffee production (between 75 and 90 per cent) was controlled by Brazil (Lucier, 1988). From 1962 to 1989, the International Coffee Agreement, signed by the main producer and consumer countries (Ponte, 2002), regulated coffee prices and export quotas. Beginning in the 1990s, the market underwent a profound change due mainly to technological development, the entrance of new producer countries (e.g. Vietnam) and the exit of the USA (the first world consumer), which broke the equilibrium previously established by the International Coffee Organisation. The ensuing glut of green coffee in the market (predominantly Arabic coffee) had two effects: first, price collapse and second, a reduction in the average quality due to the poor quality of products from some new actors such as Vietnam (which was growing Robusta rather than Arabic coffee) and to the reduced investment capacity of the growers, which caused them to lose influence over the market (Muradian and Pelupessy, 2005).

There are almost 15 coffee species and approximately 100 varieties, but the Robusta and the Arabic strains are the more important species for production and consumption. The domination of the Robusta species comes from the resistance of the plant to parasites and illnesses. However, this species produces coffee beans that are smaller, contain more caffeine and have a less intense flavour, which are characteristics that

Managerial levels of action		Supply chain activities				
		Purchasing	Inbound logistics	Internal operations	Outbound logistics	Sales
Quality management	People in charge	• Purchasing department • Illy laboratories • Local laboratories • Illy technicians	• Logistics department • Illy technicians	• Employees • Laboratories • Technicians	• Logistics department	• Commercial department • Illy technicians
	Adressed to	• Green coffee growers	• Shipping companies	• Production department • Packaging department	• Express courrier • Specific distributor	• ho.Re.Ca. Customers
	Practices	• Growers' selection • Green coffee selection and quality control • Premium price	• Big bag adoption • Container features	• Quality control of green coffee • Temperature and quality control • Blrnding and roasting • Active packaging	• Distribution strategy aligned with customers' needs	• Set-up espresso machine
Knowledge and know-how diffusion	People in charge	• Purchasing department • Illy technicians	• Logistics department	• R&D department	• Logistics department	• Commercial department • Illy technicians
	Adressed to	• Green coffee growers	• Shipping companies	• R&D department	• Express courier	• ho.Re.Ca. Customers
	Practices	• Training to green coffee growers • Technical assistance to cofee growers • Knowldge /know-how cross fertilization	• Criticalities sharing with shipping companies	• R&D on product and production processes	• Criticalities sharing with express courier	• Training and education to barman • Technical assistance to barman
Cultural diffusion	People in charge	• Purchasing department • Illy technicians • Illy's university of coffee	• Illy top management			• Commercial department • Illy's university of coffee
	Adressed to	• Green coffee growers	• Illy employees			• ho.Re.Ca.. Customers • retail customers • consumers
	Practices	• Cross-cultural fertilization • Brazil coffee award • University of coffee courses	• courses of tasting			• university of coffee courses • "Espressamente illy" coffee house

Figure 2.
The illy's practices for SCM coordination and SCL for coffee's best quality achievement

together create poor green coffee quality. In contrast, the Arabic species comes from a plant that is more delicate and sensible to weather changes but that produces coffee with a more intense and pleasant flavour.

During the first half of the 1990s, the power in the coffee supply chain, which we can subdivide into five groups of actors (growers, local traders, international traders, roasters and retailers), shifted downstream. The producers lost their bargaining power (Talbot, 1997), while the international traders engaged in vertical integration upstream with local traders and the growers (Losch, 1999) (which was made easier by market liberalisation) and sometimes also downstream via the acquisition of roasters. Traders took advantage of the oversupply of green coffee, obtaining a lower purchase price for an inferior end product whose lower quality would not be perceived by the consumer (Kaplinsky and Fitter, 2004).

Beginning in the late 1990s, the winning strategy in the market became coffee de-commoditisation in hotels, restaurants, and cafés (Ho.Re.Ca.) and in big retail. The most important roasters turned their efforts to the quality of the product as perceived by the consumer, suggesting so-called "specialities", coffee types that are not traditional industrial blends because of their high quality (such as espresso coffee) or because of their special flavouring and packaging (Ponte, 2002). In this way, roasters aimed for the creation of a "consumer experience". To support this strategy, these companies implemented "branding" policies (e.g. Nestlé and Kraft) that fostered the diffusion of the coffee culture. With regard to coffee house ownership, one successful strategy has been the creation of a "café atmosphere", as exemplified by Starbucks.

The Italian roasters, which have historically offered espresso as a local speciality (and sometimes internationally), operated in a market that was transformed intensely by these events. Without the financial resources or the appropriate coordination to realise full control over their own coffee supply chain, many of them could not obtain the high profit margins necessary to grow to the size required to penetrate the global market as their main international competitors did. However, there are some successful examples of Italian enterprises in the global espresso coffee market, one of which is the illycaffè Group (illy), universally recognised as an excellent and successful company.

The illycaffè case study

The illycaffè Group (illy), established in 1933, operates in the espresso market and has more than 700 employees with 480 working in the headquarters in Trieste (Italy) and the others in its 11 subsidiaries abroad. The manufacturing plant is located in Trieste, where the coffee is processed and packaged after being shipped from 18 countries located mainly in South and Central America, Africa and India.

Few enterprises have the ability to increase profits and market share while maintaining their own strategic direction as illy has. In fact, the company has always focused its strategy on "dressing up" a product that is normally anonymous and de-commoditising it, offering a high product quality and customer service to give coffee a much greater importance than is typically associated with a commodity (De Toni and Tracogna, 2005).

illycaffè strategy

The competitive priority on which the corporate strategy is based is the high level of product and service quality offered to the consumer. In fact, illy's vision is as follows: "We aim to be the world reference for coffee culture and excellence. An innovative

company offering the finest products in the best places, growing to become the high-end segment leader and creating superior stakeholder value".

Likewise, its mission: "Thanks to our enthusiasm, teamwork and values, we aim to delight people all over the world who value quality of life by offering the best possible coffee nature can provide, enhancing its perfection through the most innovative technologies, and inspiring emotional and intellectual involvement by seeking beauty in everything we do".

It is important to highlight the strategic choice of illy's unique philosophy, "one blend, one brand", a statement that the company seeks to provide high-quality coffee that is identical all over the world at any time (Andriani and De Toni, 2008). Consequently, illy produces and distributes a unique, 100 per cent high-quality Arabic coffee blend. The three pillars of illy's competitive strategy are as follows:

- the creation and development of a global identity for illy's brand as a synonym for quality and excellence;
- a focus on the premium market segment; and
- product differentiation based above all on the qualitative excellence of the coffee in every respect, which allows the consumer a unique experience.

Quality leadership in the espresso market

The Italian espresso coffee market is dominated by medium-to-large-sized roasters that own more than 90 per cent of the market share (one of which is illy) and by many micro-enterprises. illy is a leader in the Italian market thanks to its market share. However, while the international market is characterised by the presence of larger players, illy's brand is famous throughout the world for its high-quality espresso blend. Thus, illy is the global leader of the premium market segment.

The company's success can be evaluated based on its turnover growth (305 million euros in 2010, 7.1 + per cent more than 2009 (283 million euros) and > 400 + per cent in the last 15 years) and its 2010 net profit of 10.675 million euros (3.5 per cent). The illy Group distributes its unique espresso blend in 140 countries (56 per cent of total sales were outside Italy in 2010 and the company is the number one European coffee brand in North America) through three strategic channels:

(1) Ho.Re.Ca (hotels, restaurants, cafés): illy serves 50,000 restaurants and coffee bars where approximately 6 million cups of illy coffee are served per day;

(2) retail (large-scale retail and small-scale traditional retail markets); and

(3) vending machines.

The illycaffè supply chain

illycaffè directs its efforts to reduce and eliminate the variability in expected product quality in the specific product/process. Product and customer service quality must be in compliance with its standard of excellence. This level of quality is only achievable by controlling all levels of the process, from the upstream supply chain through the downstream value chain.

There are different integration levels in a coffee supply chain, some characterised by strong integration performed by multinational companies and others fragmented with many specialised network actors (growers, local traders, international traders, roasters and retailers) (De Toni and Tracogna, 2005). The large multinational companies in the

food industry use vertical integration to raise profit margins, increase their control of parts of the competitive environment and, especially, to maintain the quality level of the product as requested by the market (a paramount concern to specialty brands).

illy bases its business strategy on product and service quality, obtaining an evident competitive advantage in the espresso market thanks to the careful management of its supply chain from the supply of green coffee and its direct relationship with the growers to distribution and its indirect relationship with consumers. However, it does this without implementing traditional vertical integration, which would be rendered less effective because of the size of the firm. Thus, illy's strategic and operational management of the coffee supply chain (as shown in Figure 1) has distinctive characteristics that are aligned with its business model. However, this strategic choice does not guarantee the quality of the espresso in the cup because the coffee beans can undergo variations in quality from the harvesting phase through the entire supply chain. For this reason, illy has implemented a set of quality management practices and knowledge, expertise and cultural diffusion at every level of the coffee supply chain.

Purchasing

First, to produce coffee of excellent quality requires high-quality raw materials, mainly green coffee. Coffee grows in hot and humid or hot and temperate climates in the regions between the two tropics, where a rainy season follows an arid period. As a result, coffee growers are located in continents far from Italy: Africa, Asia and Latin America.

High-quality green coffee can only be obtained without the direct control of growers through the careful selection of suppliers. Therefore, in recent years, illy has begun a number of initiatives in green coffee-growing countries to select and motivate growers (of which there are almost 4,000 in the illy database) and enhance production quality.

In 1991, illy instituted an award for the best Brazilian green coffee growers with the aim of encouraging a culture of excellence in coffee growing, the "Premio Brasil de Qualidade do Café Para Espresso", which gave $30,000 to the producer of the best Arabica coffee. The prize was intended to combat the problem of poor-quality green coffee in Brazil, the main worldwide producer and exporter, and the country with the highest percentage of batches rejected by illy. As a result, the growers began to research to improve the quality of their own product, collaborating among themselves and transferring knowledge. This initiative was followed by the India Award, the Colombia Award and the Guatemala Award.

illy fosters this cross-fertilisation phenomenon and shares practices and expertise developed in other countries (the cross-fertilisation of knowledge and know-how).

The knowledge and expertise transferred among the different growers allows them to reach illy's quality standards and to, substantially, self-select: growers with poor-quality product decide not to submit green coffee batches for the competition, reducing illy's effort in supplier selection. Moreover, illy guarantees for its best growers (even the ones not awarded prizes) a premium price at least 30 per cent higher than that on the New York Coffee Stock Exchange when they demonstrate that they have attained the requested level of quality.

The knowledge and the know-how accumulated by the enterprise, based on many years of experience and continuous research and development, is transferred to the coffee growers (especially in Brazil and India) through academic courses (University of Coffee).

The University of Coffee, born as a centre of excellence to promote and spread the quality coffee culture, has its main campus in Trieste but also has 18 other campuses in green coffee-growing countries and in illy's most important markets (such as the USA).

The University offers complete theoretical and practical courses for growers, professionals and "coffee lovers" on all subjects connected to coffee. Every year, the University of Coffee trains more than 10,000 people worldwide.

For green coffee growers, the aim of the University of Coffee is to teach the best techniques and technologies for harvesting and post-harvesting as well as business management. An example of the effect of this knowledge sharing has already manifested itself in the first phase of coffee processing: cherry harvesting from the plant. There are two main methods of harvesting: picking and stripping. The first is the process of hand picking only the mature cherries from the branches of the coffee tree, guaranteeing a higher-quality harvest. The second method refers to the mechanised or manual (hand) picking of every cherry on the branch, regardless of its maturity so that the harvesting process is more efficient in terms of time and cost but produces a lower-quality result. Thanks to cultural diffusion and to knowledge-sharing practices, illy technicians have been able to push their growers to adopt the picking technique. Currently, illy obtains handpicked Arabica beans from nine coffee-growing regions around the world.

After the harvest, as shown in Figure 1, the cherries are sent to "parchmenting" factories where the green coffee beans, after a processing phase, are divided from the rest of the cherry, dehydrated and sent to market. During this phase, technicians, selected and trained by illy, pick the first sample (called the "offer sample") from batches that can be potentially bought by the firm and sends it to a laboratory for analysis. There, either a preliminary screening or a final evaluation of the sample (and the corresponding batch) is performed. The labs that perform the preliminary screening are located in the growers' countries and are not owned by illy, and hence have limited responsibility for the sample pre-selection process, testing only for illy's evaluation criteria and parameters. The laboratories commissioned for the final evaluation of the samples have a greater degree of responsibility and are either owned by illy (such as the lab in Trieste) or are engaged in a permanent collaboration with the company (Brazil). When the offer sample is approved by one of these two laboratories, illy signs the supply contract with the grower in question.

Inbound logistics

When the contract is signed, the green coffee is transported under the grower's supervision from the plantation to the dock, where illy takes a second sample, called the "shipping sample", from every batch and tests it in the same manner as the previous sample. If this sample matches the offer sample, the batch is shipped. The process of loading the batch onto the ship represents the transfer of the property from the grower to illy.

Because of the possible degradation of flavour that green coffee beans face, the transportation process is critical for the quality of the final product in two ways:

- through container pollution from, for example, water, light or the remnants of products with other flavours (e.g. cardamom) from the previous transport process; or
- through the position of the container on the ship, including proximity to containers containing flavouring products or positioning over the deck;

the shipping lead time of approximately 3-4 weeks, two of which occur close to the equator, exposes the green coffee to thermal shock, making it taste "woody".

Although illy does not have control over the transport process, it shares its knowledge about these critical potential issues with the shipping companies (diffusion of awareness) to safeguard against the potential negative effects of container type, container position and lead time.

From a technological point of view, illy initiated the use of plastic bags containing one tonne of green coffee that could be moved by machine. These are called "big bags" and offer several advantages:

- a reduction in personnel costs;
- materials handling is less onerous for a healthy individual (with no >60 kg of manual weightlifting required);
- increased materials-handling speed; and
- better thermal insulation from humidity and temperature changes, which permits better product preservation during the transport process.

Internal operations

Once the coffee has arrived at the Trieste seaport, illy conducts a third and final quality test. After the green coffee has passed, it is stored in a suitable warehouse for a period of 7-12 months. For storage, illy has acquired an area of 60,000 square metres near the Trieste port where all of its logistical activities are conducted. Technologically, the warehouse is clean with a high degree of insulation and a steady temperature ($T = 15$°C) and humidity level (50 per cent); this allows for a storage period of 12 months (vs seven months in the previous warehouse) and has produced a 50 per cent reduction in the amount of faulty coffee beans discovered.

When the green coffee is dispatched for the blending, roasting, cooling and milling phases, it undergoes innovative technical processes that are meant to ensure quality (e.g. the process of cooling the air and pressurising the coffee using nitrogen). The most critical phase is blend preparation due to illy's strategic priority of "one blend, one brand" despite any heterogeneous characteristics between batches. For this reason, a tasting test is conducted during this phase. The firm has organised three years of internal tasting courses for this purpose (vs courses with an average duration of only three-six weeks in other companies). As a result, illy has a high number of "internal" experts De Toni and Nonino (2010), involved in the tasting process.

The quality control system implemented by illy is extensive: from the supply to the internal production process, each bean passes 125 checks before final packaging (114 quality control steps from the moment the green coffee arrives at the plant to the time it is shipped out in sealed metal cans).

In the final packaging phase, the quality of the coffee is maintained via so-called "active packaging", the introduction of nitrogen under pressure inside metal cans. This technique has three main objectives:

- preserving quality: the techniques and materials used for the packaging protect the properties of the coffee from atmospheric agents for a longer period of time;
- quality improvement: during the first two months after packaging using nitrogen, there is a notable improvement in the product's qualitative characteristics; and

- image: the fashionable silver design of the can is easily noticed on supermarket shelves.

After packaging, the coffee cans are stored in warehouses both in Trieste and in the cities of the main commercial subsidiaries for approximately three months. In the other 100 countries, the local retailer stores them.

Outbound logistics

The two channels on which illy focuses its major efforts are the Ho.Re.Ca. channel (with significant attention to the needs of café owners) and retail. These channels require different modalities based on the specific needs of the customer. The Ho.Re.Ca. channel is characterised by its selling network and the capillarity of the service offered. Therefore the illy strategy, besides offering high-quality blends, is to assure a high level of service through a high rate of visits and deliveries, technical and commercial customer support and precise payment terms for the rent of coffee machines. To satisfy the need for efficient and reliable deliveries, illy uses an express courier even if this method is more expensive; this choice allows for knowledge sharing of the measures the courier must take to guarantee the service level requested by the customer (diffusion of awareness).

The retailers' requests are very different. illy uses retailer distributors who offer a tailored and less expensive service than express couriers. For example:

- The express courier delivers the product in 24 hours, but delivery speed is not a priority of the retailer; therefore, the arrival of the material is scheduled for three-four days after order confirmation.
- The multi-product trucks deliver to the multi-product retailer warehouse so that the customer enjoys logistical and operational advantages in managing a smaller number of trucks.
- Costs are one-third less than the express courier, thereby permitting economic compensation.

Sales

Finally, illy not only employs a typical branding strategy but also diffuses the culture of its coffee on a downstream network level. In the opinion of the firm, the quality of a final cup of its coffee is 50 per cent due to the blend quality and the transformation/packaging processes, and 50 per cent due to the way in which the drink is prepared and consumed. In fact, consumer-perceived quality is partly a result of objective factors such as the water used, the cleanliness of the cup, the ability to properly use the espresso machine and the pre-existing flavours in the consumer's mouth. However, it is also partly a result of perceptual factors such as the kindness of the personnel and the café's ambiance. Though some factors can be overseen by the café owner, others depend on the consumer. There are three initiatives that illy has implemented to help the customer (i.e. the café owner) and the consumer understand product quality:

- Illy's specialised technicians visit cafés to teach their owners "the art" of making good coffee and the importance of kindness and professionalism in satisfying the consumer.

- Illy has developed the University of Coffee, intended not only for the café owners (professionals) but also for anyone interested in deepening their knowledge of the coffee world (coffee lovers). For professionals, courses range from theory on coffee (history, botany and physiology) and business (economic-financial aspects, organisation, human resources and service management) to practice (perfect espresso and cappuccino preparation, coffee machine maintenance and fine-tuning). For coffee lovers, the university organises tasting events and mini-courses or dinners for a "coffee experience".
- "Espressamente illy", the 230 café concept, created by illy and implemented in over 30 countries, is intended to produce a particular atmosphere in which consumers can have a pleasant "experience". Finally, the Artisti del Gusto (Taste artist) partnership programme works to assist the best coffee shops to improve their professional competences and quality levels and to assist their development and maintenance over time.

Discussion

Figure 2 synthesises the practices implemented by illy in a framework that illustrates the SCM areas (purchasing, inbound logistics, internal operations, outbound logistics and sales) and managerial actions (quality management, knowledge/know-how and cultural diffusion) that the company focuses on to achieve its strategic goals of high product and service quality.

Illy's quality management and the effects of knowledge/know-how diffusion along the supply chain

As highlighted in the theoretical background, many researchers have already proven how the overall integration of quality management practices along the supply chain has a positive effect on the quality of products and services. This topic is important in the food industry and particularly so in the espresso coffee market. Consequently, it is necessary to implement quality management practices at every link in the supply chain from the producer (in our case, the green coffee grower) to the consumer. However, to manage quality efficiently and effectively, it is necessary to control and coordinate the entire supply chain.

In the coffee sector, firms encounter significant challenges in obtaining this type of control because of the practical unfeasibility of vertical integration for large but still not "global 500"-sized companies; in fact, the traditional challenges of vertical integration are heightened by geographical distances, the great number of potential suppliers and the barriers created by international traders. The illy case study shows how an enterprise can overcome all of the issues above by becoming a SCC and controlling quality at every link through the adoption of quality management practices (such as the 125 checks illy performs from supplier to final shipment) and the systematic application of knowledge to the entire supply chain.

During the last 20 years, illy exposed its entire supply chain to the knowledge/know-how developed inside the company and in numerous countries (via the cross-fertilisation of knowledge and know-how) to obtain the best-quality green coffee possible. Moreover, the courses focused on Ho.Re.Ca. customers have noticeably enhanced the quality of the final product: the espresso. In relationships with shipping firms and express couriers, the diffusion of expertise is translated into the sharing of awareness, which indirectly guarantees high quality.

Through the synthesis of our data on the illy case, we provide sufficient evidence for the following proposition concerning the effect of knowledge/know-how diffusion along the supply chain that confirms the literature on SCL:

P1. The continuous and systematic diffusion of knowledge and know-how to the entire supply chain network enhances the expertise of suppliers, logistic operators and customers, consequently improving the quality of supplies and final product.

Effects of the diffusion of a culture of quality on SCL

The research on SCL notes that the diffusion of a shared culture across supply chain actors can sustain learning processes but also notes the need for a real effort and the extended use of SCC resources. In the illy case, the diffusion of a culture of quality (even with non-essential suppliers) is fundamental for the coordination of the supply chain and the improvement of product and service quality. As a matter of fact, the cultural initiatives implemented by the company have a positive effect on quality output along the entire supply chain, from the quality of the raw material to the final product as perceived by the consumer. Furthermore, cultural diffusion mitigates the effort illy must expend to maintain continuous improvement because it creates emergent behaviour in the many different actors that become self-aligned with the illy vision (Figure 3).

As described in the previous section, the diffusion of knowledge and expertise has been sustained by many cultural initiatives (e.g. the guidance regarding hand-picking methods, awards such as the "Premio Brasil de Qualidade do Café Para Espresso" in Brazil, and the foundation of the "University of Coffee") and has allowed the emergence of virtuous behaviour among green coffee growers such as supplier self-selection, self-alignment of suppliers and logistic operators to desired quality standards and generative learning, thereby considerably improving coffee quality. Bessant *et al.* (2003) advocate the need for simultaneous development in both supply chain complexity and the learning ability of an organisation. This is consistent with the double-loop learning process (Argyris and Schon, 1978) that requires questioning, challenging and often changing existing practices (Senge, 1990). If adaptive learning is "doing what we do better", then illy's cultural strategy has gone a step further: it has created generative learning. Bessant and

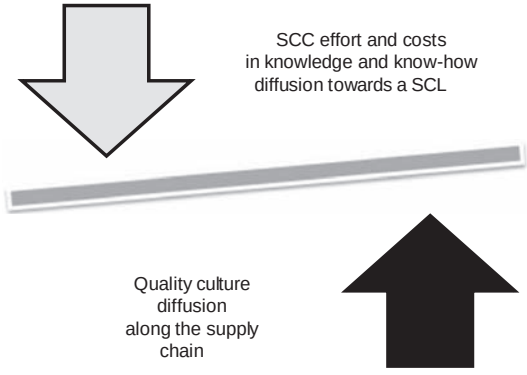

Figure 3.
The impact of culture diffusion along the SC on SCC effort and costs

Buckingham (1993) defined generative learning as the ability to step back and reframe the problem based on a search for innovative solutions that may be transferred or modified to fit a new context (e.g. picking vs stripping). The second proposition is:

P2. The company's diffusion of a culture of quality to its supply chain network enables the emergence of virtuous behaviours such as supplier self-selection, self-alignment to desired quality standards and generative learning.

The coordination of SCL requires financial and organisational investments that can make the SCL strategy for quality improvement unsustainable on both supply and market sides.

On the supply side, the disintermediation strategy (as in the illy case) and direct relationships with suppliers requires a company to incur purchasing costs for the identification and consolidation of purchasing channels and for supplier selection. Moreover, costs and criticalities are amplified when a company searches for high quality materials and components and pays price differentials. Typical methods to reduce the purchasing cost of poor quality materials are based on rating/ranking techniques, periodic vendor reviews and surveys. The illy case teaches that a company can pass from the sole typical supplier and third logistic party selection based on rating/ranking techniques such as the use of quality control practices, the diffusion of knowledge/know-how and a shared culture that can lead to economically sustainable SCL. This is possible thanks to the reduction of selection costs from potential suppliers self-selecting, and aligning of existing suppliers with customers to high standards of quality through learning. Moreover, innovative solutions coming from generative learning are transferred by illy among suppliers and help to improve and sustain the knowledge diffusion processes performed by the company from an SCL perspective. From the above discussion the following propositions emerge:

P3a. The self-selection of potential suppliers reduces the supply chain coordination efforts and resource utilisation resulting in quality improvement through knowledge and know-how diffusion (SCL).

P3b. The self-alignment of existing suppliers, logistic operators and customers to high standard of quality through learning reduces the supply chain coordination efforts and resource utilisation resulting in quality improvement through knowledge and know-how diffusion (SCL).

P3c. Generative learning (emergence of new practices to be transferred among supply chain actors, i.e. cross-fertilisation) improves and sustains the supply chain coordination efforts and resource utilisation resulting in quality improvement through knowledge and know-how diffusion (SCL).

On the market side, a premium price (in the illy case, higher than the competitors in the retail channel) should be justified by excellence both in product and service quality and by a strong brand. The enhancements in product quality are recognised by the consumers themselves involved in the cultural diffusion and learning process through courses and "coffee experiences". Although all decisions and practices of quality management and dissemination of knowledge, expertise and culture implemented by

illycaffè have certainly resulted in higher business costs, the benefits derived both in terms of commercial return and in terms of competitive advantages sustainable over time are so significant as to make the "cost of quality" negligible. The high quality of the product is indeed an element of coffee de-commoditisation and diversification within the market that creates differentiation and competitive advantage, which translate into a significant premium price: illy can sell the coffee through the retail channel at a price approximately two times higher than its competitors. Our research results extend and confirm the studies on the positive effects of the consumer experience on perceived quality of products. The fourth proposition:

P4. The diffusion of a culture of quality to consumers enhances the perceived quality of the final product.

Conclusion

The key to illy's success can be found not only in its strategy of marketing an excellent coffee that is identical all over the world (exemplified by the "one blend, one brand" philosophy) but also in the careful integration and coordination of quality management practices along the entire supply chain. This coordination allows illy to obtain a very high standard of product quality, from green coffee to the cup and is sustained by the combined effects of the many practices implemented by the company at two different managerial levels: the systematic diffusion of knowledge and know-how and, above all, the diffusion of a culture of excellence in coffee quality along the entire value chain.

An analysis of the literature shows that internal and external quality management practices and cultural diffusion in the downstream network (above all, to the café and consumers) are typical of the espresso coffee sector, but their extension to the entire supply chain, and the joint effect of knowledge and cultural diffusion, provides a persuasive and innovative explanation for the success of illycaffè, suggesting how a company can become a SCC and manage the relationships inside its supply network effectively to compete and win in the international market.

The academic and managerial lessons are illustrated through the answers to the questions that guided our research. The first is that a company can improve product and service quality by fostering SCL based on the implementation of practices for the diffusion of knowledge/know-how at every level of its supply network. In our case, illycaffè changed the traditional way of handling suppliers, third party logistics, distributors and customers. illy has shaped a "knowledge ecosystem" based on a common quality culture and a dynamic flow of knowledge in which it is the focal point (the SCC). In this context, as described above, other SC members also gain an advantage. Learning from their suppliers, customers and competitors is essential to the development of new innovative processes and to enhancing the quality of their own products to meet customers' requests.

Nevertheless, as discussed in the previous section, the coordination of SCL requires substantial effort and a level of resource commitment that can make the SCL strategy unsustainable. To overcome this criticality, a company should create a shared culture of excellence in product and service quality within "organisational walls" and along the entire supply network through the implementation of cultural initiatives (second answer).

However, it is within the walls of the firm that knowledge, expertise and a quality coffee culture originate, develop and are diffused. A competitive advantage and good supply chain coordination can only be maintained through constant renewal. The real

"engine" of this diffusion of knowledge, expertise and coffee culture is illy's effort to deepen comprehension of product and production processes.

In this regard, the company has two research labs (the Aroma Lab and the Sensory Lab) and has promoted many research and development projects in collaboration with Italian and international universities (Trieste, Udine, Florence, Milan, Budapest and Manchester). For example, some projects are focused on the relationships between taste, perception and genetics, seeking to ascertain how coffee's features arise from its genes.

As synthesised by the proposed model in Figure 4 (thin arrows highlight the causal relationships we found in previous studies and large arrows the original results of our research), the overall effects of the cultural diffusion are:

- the quality improvement of the supplies (raw materials, components, etc.) and final products;
- the quality improvement of the logistic process which may affect supplies and products;
- the quality improvement of the final products in the final consumers' perception, which can be converted into a premium price; and
- the reduction of effort and resource utilisation through quality management and knowledge/know-how creation and diffusion due to: first, the self-selection of potential suppliers and customers, second, the self-alignment of existing suppliers, logistic operators and customers to a new standard of quality through learning and lastly, the emergence of new practices for quality improvement to be transferred among SC actors (cross-fertilisation).

Finally, the contribution of illy to the supply chain as SCC can be observed both from the customers' and the suppliers' perspective. The customers (café owners) improved their professional, technical and managerial competences, enhancing their levels of quality and consumer satisfaction. Suppliers improved the quality of their processes, methods and technologies because of the high risk of not being selected by illycaffè. They were motivated and stimulated by above-market price and by the awareness of the importance of producing high-quality products, leading them to innovate their production process. The improvement in their product and production processes leads these suppliers to a new competitive advantage in the market and illy's practices helped reduce their investments in acquiring this new knowledge. This process satisfied needs on both sides: illy needed to find high quality green coffee, growers needed to differentiate their product from worldwide competitors to meet their other customers' high-quality requests. After 20 years, more than 600 Brazilian producers take part in the illy award competition, and today Brazilian coffee is some of the best in the international market. The country sells approximately 40 million coffee bags, up from the 16 million bags sold in 1990, before the illy award and training programmes for growers began.

The risk of suppliers' opportunistic behaviour is reduced by the above-market price and by taking a leading role in the supply chain knowledge ecosystem. As described above, illy's knowledge represents a resource (i.e. a competence) that is difficult for competitors to imitate due not only to the knowledge but also to the brand and its role in the SCL network.

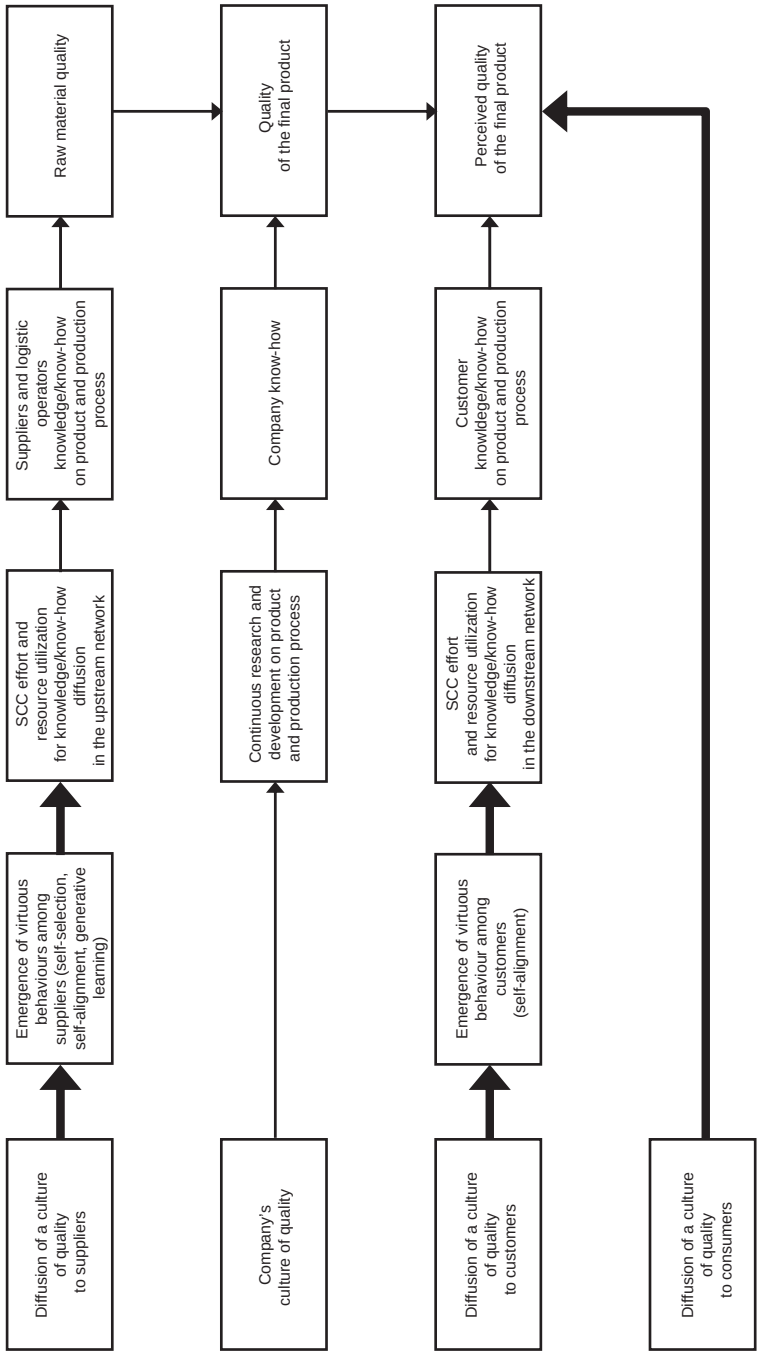

Figure 4.
The proposed model of sustainable supply chain learning coordination for product quality improvement

On the basis of the research findings and of the literature on SCL, we propose the following final proposition:

P5. The joint effect of the diffusion of knowledge/know-how on product and process and of the diffusion of a shared culture of quality along the entire supply chain can lead to economically sustainable SCL.

The exploratory nature and the use of a single case study are the major limitations of this research. Nevertheless, the single case study is an excellent methodology for theory building so this study may serve as a starting point for future research and analysis related to SCL strategy. In particular, a future direction of research could be:

- The identification of other companies that have adopted practices similar to illycaffè but that operate in different industries, for a cross-case analysis aimed at investigating the efficacy of the SCL strategy in a different context.
- The generalisation of our results through the validation of the causal relation between cultural diffusion and the positive effects found in the illycaffè case study by performing a survey of a large set of companies operating in different industries.

References

Anand, K.S. and Goyal, M. (2009), "Strategic information management under leakage in a supply chain", *Management Science*, Vol. 55 No. 3, pp. 438-52.

Anand, K.S. and Mendelson, H. (1997), "Information and organization for horizontal multi-market coordination", *Management Science*, Vol. 43 No. 1, pp. 1609-27.

Anderson, J.C., Rungtusanatham, M. and Schroeder, R.G. (1994), "A theory of quality management underlying the Deming management method", *Academy of Management Review*, Vol. 19 No. 3, pp. 472-509.

Anderson, M.G. and Katz, P.B. (1998), "Strategic sourcing", *International Journal of Logistics Management*, Vol. 9 No. 1, pp. 1-13.

Anderson, R.D., Jerman, R.E. and Crum, M.R. (1998), "Quality management influences on logistics performance", *Transportation Research E: Logistics and Transportation Review*, Vol. 34 No. 2, pp. 137-48.

Andriani, P. and De Toni, A.F 2008, "Scientist and entrepreneur: a chat with Ernesto Illy on coffee, complexity and Prigogine", *Emergence: Complexity & Organization*, Vol. 10 No. 1, pp. 84-8.

Argyris, C. and Schon, D.A. (1978), *Organizational Learning: A Theory of Action Perspectives*, Addison-Wesley, Reading, MA.

Beamon, B.M. and Ware, T.M. (1998), "A process quality model for the analysis, improvement and control of supply chain systems", *Logistics Information Management*, Vol. 11 No. 2, pp. 105-13.

Bessant, J. and Buckingham, J. (1993), "Organisational learning for effective use of CAPM", *British Journal of Management*, Vol. 4 No. 4, pp. 219-34.

Bessant, J. and Francis, D. (1999), "Using learning networks to help improve manufacturing competitiveness", *Technovation*, Vol. 19 Nos 6-7, pp. 373-81.

Bessant, J., Kaplinsky, R. and Lamming, R. (2003), "Putting supply chain learning into practice", *International Journal of Operations & Production Management*, Vol. 23 No. 2, pp. 167-84.

Bowersox, D.J., Closs, D.J. and Stank, T.P. (2000), "Ten mega trends that will revolutionize supply chain logistics", *Journal of Business Logistics*, Vol. 21 No. 2, pp. 1-15.

Cachon, G. and Lariviere, M.A. (2001), "Contracting to assure supply: how to share demand forecasts in a supply chain", *Management Science*, Vol. 47 No. 5, pp. 629-46.

Cachon, G. and Netessine, S. (2004), "Game theory in supply chain analysis", in Simchi-Levi, D., Wu, S.D. and Shen, M. (Eds), *Handbook of quantitative Supply Chain Analysis: Modeling in the E-Business Era*, Kluwer Academic Publishers, Boston, MA, pp. 13-66.

Cachon, G. and Zipkin, P.H. (1999), "Competitive and cooperative inventory policies in a two-stage supply chain", *Management Science*, Vol. 45 No. 7, pp. 936-53.

Cachon, G.P. and Fisher, M. (2000), "Supply chain inventory management and the value of shared information", *Management Science*, Vol. 46 No. 8, pp. 1032-48.

Chen, F. (2003), "Information sharing and supply chain coordination", in Graves, S. and de Kok, T. (Eds), *Handbooks in Operations Research and Management Science: Supply Chain Management*, North Holland, Amsterdam, pp. 341-422.

Choi, T.Y. and Eboch, K. (1998), "The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction", *Journal of Operations Management*, Vol. 17 No. 1, pp. 59-75.

Choi, T.Y. and Rungtusanatham, M. (1999), "Comparisons of quality management practices: across the supply chain and industries", *The Journal of Supply Chain Management*, Vol. 35 No. 1, pp. 20-7.

Christopher, M. (1992), *Logistics and Supply Chain Management*, Pitman Publishing, London.

Cooper, M.C., Lambert, D.M. and Pagh, J.D. (1997), "Supply chain management: more than a new name for logistics", *The International Journal of Logistics Management*, Vol. 8 No. 1, pp. 1-13.

Croom, S., Romano, P. and Giannakis, M. (2000), "SCM: an analytic framework for critical literature review", *European Journal of Purchasing & Supply Management*, Vol. 6 No. 1, pp. 67-83.

Curkovic, S. and Handfield, R. (1996), "Use of ISO-9000 and Baldrige award criteria in supplier quality evaluation", *International Journal of Purchasing and Materials Management*, Vol. 32 No. 2, pp. 2-11.

Curkovic, S., Vickery, S. and Droge, C. (2000), "Quality-related elements: their impact on quality performance and firm performance", *Decision Sciences*, Vol. 31 No. 4, pp. 885-905.

Das, T.K. and Teng, B.S. (2000), "A resource-based theory of strategic alliances", *Journal of Management*, Vol. 26 No. 1, pp. 31-61.

Davis, T. (1993), "Effective supply chain management", *Sloan Management Review*, Vol. 34 No. 4, pp. 35-46.

Dean, J.W. and Bowen, D.E. (1994), "Management theory and total quality: improving research and practice through theory development", *Academy of Management Review*, Vol. 19 No. 3, pp. 392-418.

De Toni, A.F. and Tracogna, A. (2005), *The Coffee Industry (in Italian)*, Il Sole 24 Ore, Milan.

De Toni, A.F. and Nonino, F. (2010), "The key roles in the informal organization: a network analysis perspective", *The Learning Organization*, Vol. 17 No. 1, pp. 86-103.

De Toni, A.F., Nonino, F. and Pivetta, M. (2011), "A model for assessing the coherence of companies' knowledge strategy", *Knowledge Management Research & Practice*, Vol. 9 No. 4, pp. 327-41.

De Toni, A.F., Fornasier, A., Montagner, M. and Nonino, F. (2007), "A performance measurement system for facility management: the case study of a medical service authority", *International Journal of Productivity and Performance Management*, Vol. 56 Nos 5/6, pp. 417-35.

Dickson, G.W. (1966), "An analysis of vendor selection systems and decisions", *Journal of Purchasing*, Vol. 2 No. 1, pp. 5-17.

Eisenhardt, K.M. (1989), "Building theories from case study research", *Academy of Management Review*, Vol. 14 No. 4, pp. 532-50.

Evans, G.N., Naim, M.M. and Towill, D.R. (1993), "Dynamic supply chain performance: assessing the impact of information system", *Logistic Information Management*, Vol. 6 No. 4, pp. 15-25.

Forker, L.B., Vickery, S.K. and Droge, C.L.M. (1996), "The contribution of quality to business performance", *International Journal of Operations & Production Management*, Vol. 16 No. 8, pp. 44-56.

Forza, C., Romano, P. and Vinelli, A. (2000), "Information technology for managing the textile apparel chain: current use, shortcomings and development directions", *International Journal of Logistics: Research and Applications*, Vol. 3 No. 3, pp. 227-43.

Frohlich, M.T. and Westbrook, R. (2001), "Arcs of integration: an international study of supply chain strategies", *Journal of Operations Management*, Vol. 19 No. 2, pp. 185-200.

Fynes, B. and Voss, C. (2002), "The moderating effect of buyer-supplier relationships on quality practices and performance", *International Journal of Operations & Production Management*, Vol. 22 No. 6, pp. 589-613.

Gavirneni, S. (2002), "Information flows in capacitated supply chains with fixed ordering costs", *Management Science*, Vol. 48 No. 5, pp. 644-51.

Ghoshal, S. and Bartlett, C. (1995), "Changing the role of top management: beyond structure to processes", *Harvard Business Review*, January-February, pp. 75-87.

Gopal, C. and Cypress, H. (1993), *Integrated Distribution Management: Competing on Customer Service, Time and Cost*, Irwin, Burr Ridge, IL.

Gunasekaran, A. and Ngai, E.W.T. (2004), "Information systems in supply chain integration and management", *European Journal of Operational Research*, Vol. 159 No. 2, pp. 269-95.

Gustin, C.M., Daugherty, P.J. and Stank, T.P. (1995), "The effects of information availability on logistics integration", *Journal of Business Logistics*, Vol. 16 No. 1, pp. 1-21.

Hayes, R.H. and Wheelwright, S.C. (1984), *Restoring our Competitive Advantage*, John Wiley and Sons, New York, NY.

Hult, G.T.M., Ketchen, D.J. and Nichols, E.L. (2003), "Organizational learning as a strategic resource in supply management", *Journal of Operations Management*, Vol. 21 No. 5, pp. 541-56.

Johnson, J.C. and Wood, D.F. (1996), *Contemporary Logistics*, Prentice-Hall, Upple Saddle Creek, NJ.

Kandemir, D. and Hult, G.T.M. (2005), "A conceptualization of an organizational learning culture in international joint ventures", *Industrial Marketing Management*, Vol. 34 No. 5, pp. 430-9.

Kanter, R.M. (1994), "Collaborative advantage: the art of alliances", *Harvard Business Review*, Vol. 72 July-August, pp. 96-108.

Kaplinsky, R. and Fitter, R. (2004), "Technology and globalisation: who gains when commodities are de-commodified?", *International Journal of Technology and Globalization*, Vol. 1 No. 1, pp. 1-28.

Kaplinsky, R. and Morris, M. (2001), "A handbook for value chain research", available at: www.ids.ac/global (accessed November 12, 2007).

Kaplinsky, R., Bessant, J. and Lamming, R. (1999), *Using Supply Chains to Diffuse 'Best Practice'*, Centre for Research in Innovation Management, Brighton.

Kotabe, M. and Murray, J. (2004), "Global sourcing strategy and sustainable competitive advantage", *Industrial Marketing Management*, Vol. 33 No. 1, pp. 7-14.

Krause, D.R., Handfield, R.B. and Tyler, B.B. (2007), "The relationships between supplier development, commitment, social capital accumulation and performance improvement", *Journal of Operations Management*, Vol. 25 No. 2, pp. 528-45.

Lambert, D., Cooper, M.C. and Pagh, J.D. (1998), "Supply chain management: implementation issues and research opportunities", *International Journal of Logistics Management*, Vol. 8 No. 1, pp. 1-19.

Lambert, D.M. and Cooper, M.C. (2000), "Issues in supply chain management", *Industrial Marketing Management*, Vol. 29 No. 1, pp. 65-83.

Lambert, D.M., Robeson, J.F. and Stock, J.R. (1978), "An appraisal of the integrated physical distribution management concept", *International Journal of Physical Distribution and Materials Management*, Vol. 9 No. 1, pp. 74-88.

Langley, C.J. and Holcomb, M.C. (1992), "Creating logistics customer value", *Journal of Business Logistics*, Vol. 13 No. 2, pp. 1-27.

Lee, H.L. and Ng, S.M. (1997), "Introduction to the special issue on global supply chain management", *Production and Operations Management*, Vol. 6 No. 3, pp. 191-2.

Lee, H.L. and Whang, S. (2000), "Information sharing in a supply chain", *International Journal of Manufacturing Technology and Management*, Vol. 1 No. 1, pp. 79-93.

Lee, H.L., Padmanabhan, V. and Whang, S. (1997), "Information distortion in a supply chain: the bullwhip effect", *Management Science*, Vol. 43 No. 4, pp. 546-58.

Lee, H.L., So, K.C. and Tang, C.S. (2000), "The value of information sharing in a two-level supply chain", *Management Science*, Vol. 46 No. 5, pp. 626-43.

Losch, B. (1999), "Le complexe café-cacao de la Côte d'Ivoire", PhD thesis, Université Montpellier I, Montpellier.

Lucier, R.L. (1988), *The International Political Economy of Coffee: From Juan Valdez to Yank's Diner*, Praeger, New York, NY.

McCutcheon, D.M. and Meredith, J.R. (1993), "Conducting case study research in operations management", *Journal of Operations Management*, Vol. 3 No. 11, pp. 239-56.

Manrodt, K.B. and Davis, F.W. (1992), "The evolution to service response logistics", *International Journal of Physical Distribution & Logistics Management*, Vol. 22 No. 9, pp. 3-10.

Meredith, J. (1998), "Building operations management theory through case and field research", *Journal of Operations Management*, Vol. 16 No. 4, pp. 441-54.

Metters, R. (1997), "Quantifying the bullwhip effect in supply chains", *Journal of Operations Management*, Vol. 15 No. 2, pp. 89-100.

Millen, R., Sohal, A. and Moss, S. (1999), "Quality management in the logistics function: an empirical study", *International Journal of Quality & Reliability Management*, Vol. 16 No. 2, pp. 166-80.

Muller, W. (1991), "Gaining competitive advantage through customer satisfaction", *European Management Journal*, Vol. 9 No. 2, pp. 201-11.

Muradian, R. and Pelupessy, W. (2005), "Governing the coffee chain: the role of voluntary regulatory systems", *World Development*, Vol. 33 No. 12, pp. 2029-44.

Nonino, F. and Panizzolo, R. (2007), "Integrated production/distribution planning in the supply chain: the Febal case study", *Supply Chain Management: An International Journal*, Vol. 12 No. 2, pp. 150-63.

Ponte, S. (2002), "The 'Latte revolution'? Regulation, markets and consumption in the global coffee chain", *Word Development*, Vol. 30 No. 7, pp. 1099-122.

Romano, P. and Vinelli, A. (2001), "Quality management in a supply chain perspective", *International Journal of Operations & Production Management*, Vol. 21 No. 4, pp. 446-60.

Salvador, F., Forza, C., Rungtusanatham, M. and Choi, T.Y. (2001), "Supply chain interactions and time-related performances", *International Journal of Operations & Production Management*, Vol. 21 No. 4, pp. 461-75.

Sánchez-Rodríguez, C., Hemsworth, D. and Martínez-Lorente, A. (2004), "Quality management practices in purchasing and its effect on purchasing's operational performance and internal customer satisfaction", *International Journal of Logistics Research and Applications*, Vol. 7 No. 4, pp. 325-44.

Scott, C. and Westbrook, R. (1991), "New strategic tools for supply chain management", *International Journal of Physical Distribution & Logistics Management*, Vol. 21 No. 1, pp. 23-33.

Senge, P. (1990), "The leaders' new work: building learning organizations", *Sloan Management Review*, Vol. 32 No. 1, pp. 7-23.

Spekman, R.E. (1988), "Perceptions of strategic vulnerability among industrial buyers and its effect on information search and supplier evaluation", *Journal of Business Research*, Vol. 17 No. 4, pp. 313-26.

Spekman, R.E., Spear, J. and Kamauff, J. (2002), "Supply chain competence: learning as a key component", *Supply Chain Management*, Vol. 7 No. 1, pp. 41-55.

Talbot, J.M. (1997), "Where does your coffee dollar go? The division of income and surplus along the coffee commodity chain", *Studies in Comparative International Development*, Vol. 32 No. 1, pp. 56-91.

Tan, K.C., Kannan, V.R. and Handfield, R.B. (1998), "Supply chain management: supplier performance and firm performance", *International Journal of Purchasing and Materials Management*, Vol. 34 No. 3, pp. 2-9.

Tan, K.C., Kannan, V.R., Handfield, R.B. and Ghosh, S. (1999), "Supply chain management: an empirical study of its impact on performance", *International Journal of Operations & Production Management*, Vol. 19 No. 10, pp. 1034-52.

Tracey, M. (1998), "The importance of logistics efficiency to customer service and firm performance", *International Journal of Logistics Management*, Vol. 9 No. 2, pp. 65-80.

Vonderembse, M.A. and Tracey, M. (1999), "The impact of supplier selection criteria and supplier involvement on manufacturing performance", *The Journal of Supply Chain Management*, Vol. 35 No. 3, pp. 33-9.

Wilson, E.J. (1994), "The relative importance of supplier selection criteria: a review and update", *International Journal of Purchasing and Materials Management*, Vol. 30 No. 3, pp. 35-41.

Yin, R.K. (2003), *Case Study Research: Design and Methods*, Sage Publications, Thousand Oaks, CA.

Further reading

Dane, F.C. (1990), *Research Methods*, Brokers/Cole, Pacific Grove, CA.

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