The adoption of collaborative practices: a survey on the pharmaceutical supply chain

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Abstract

Purpose of the paper and literature addressed – The aim of this paper, that is the first output of an on-going research project, is to analyse the pharmaceutical supply chain in order to identify how relevant are the collaboration practices and how diffused is the collaborative culture, according to the Barratt model (2004).
Research method – To study each company, we will use the case-based methodology (Yin, 1989). We will refer to a limited set of companies because our primary research goal is not to provide the basis for generalizing a hypothesis, but rather to explore and expand upon the research propositions (Eisenhardt, 1989). For each company, we will gather materials from many different sources and interviewed supply chain and logistics managers.
Research findings – There are some interesting experiences of collaboration among the actors of the supply chain. The bond of trust defined in relevant literature is evidenced both in the relationship between pharmaceutical companies and pre-wholesalers and in the one between wholesalers and pharmacies. On the one hand the pre-wholesaler is the logistical extension of the pharmaceutical company. On the other hand, the wholesaler is a pharmacy's trusted partner as these two figures frequently interact due to the necessity of daily deliveries. The aspect which most greatly characterizes the pharmaceutical distribution chain in Italy is that of information exchange. The informational flow between the actors in the distribution chain allows for the creation of partnerships within the pharmaceutical supply chain which stimulate the optimization of the distribution process. Integration between partners is brought about through the development of electronic data transmission projects which utilize standard EDI and internet. The "collaborative logistics" project, which involves the actors in the distribution chain, has the objective of normalizing the informational flows within the entire distribution chain (also between pharmaceutical company and pre-wholesaler) and identifying physical elements (in particular between pre-wholesaler and wholesaler) according to international standards.
Main contribution – An initial outcome of the research will have a theoretical relapse because it allows to develop a model that enables to check the diffusion of collaborative culture and the adoption of collaborative practices. This model can be applied in many different contexts not only in those analysed in the research.
The research have highlighted that the adoption of some collaborative practices is limited to strictly related supply chain actors characterised by a strong need of efficiency improvement. On the contrary, there are no collaborative projects involving the supply chain as a whole. The research will try to find out the reasons why the diffusion of the collaborative practices among the chain is held back.

Keywords: supply chain, collaboration, pharmaceutical, food, consumer electronic goods.

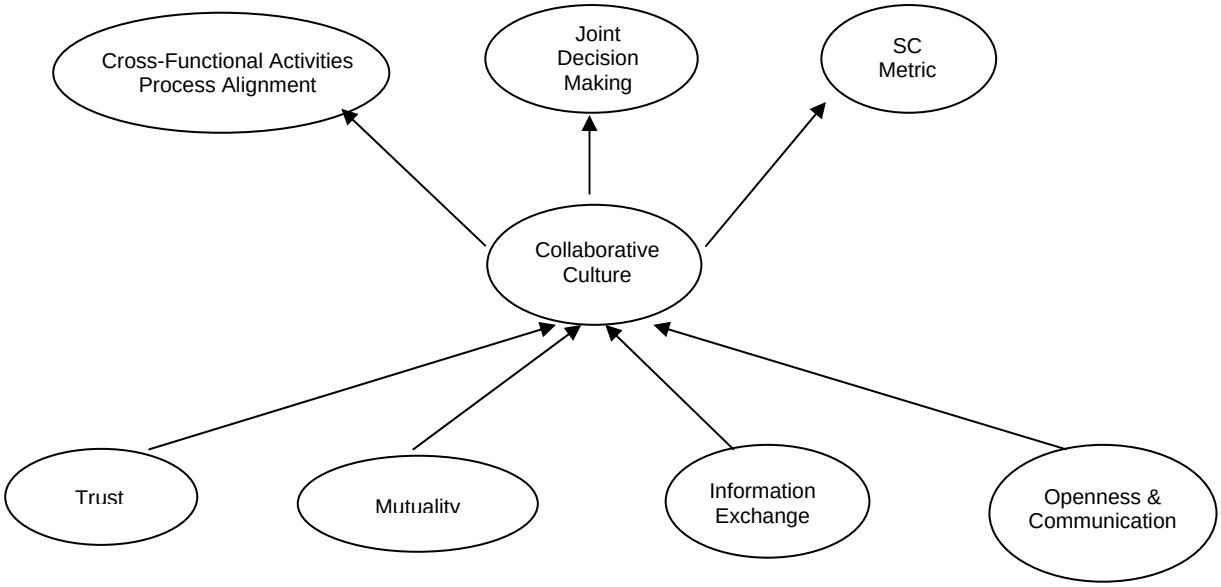
Introduction

Collaboration is one of the most talked about topics in business today (Barratt, 2004; Bowersox et al., 2000). Collaboration is defined as two or more companies sharing the responsibility of exchanging common planning, management, execution, and performance measurement information (Anthony, 2000). The general idea is that much can be gained from collaborating with supply chain partners. Collaboration has been referred to as the driving force behind effective supply chain management (Ellram and Cooper, 1990; Horvath, 2001) and, as such, may be considered the ultimate core capability (Sanders and Premus, 2005). However, there's also fairly widespread belief that few firms and few industries have truly capitalized on the potential of collaboration (Barratt, 2003; Crum and Palmatier, 2004). Managers may talk about collaboration and its potential benefits as if it were part of their organization's value structure, yet it seems that few companies and few industries are actually engaged in the level of integration that collaboration suggests (Fawcett and Magnan, 2004). In order to gain greater insights in the area, a study was undertaken to examine supply chain collaboration through a qualitative research approach. In particular, we intend to focus our attention on three supply chains in order to verify the degree to which collaborative practices have been adopted within different contexts. We have chosen to examine the following supply chains: pharmaceutical, food, and electronic.
The paper is structured in the following manner: in the first paragraph, we will review the current literature about collaboration throughout the supply chain. In the paragraph after that, we will present the research methodology adopted as well as explain the motivations for choosing the three supply chains in question. We will then move on to present the initial results which emerged from the analysis of the pharmaceutical products supply chain. To conclude, we will elaborate on future research goals which will be extended to other supply chains.

Collaboration along the supply chain

Whilst internal process integration has already received some attention over the last decade the real opportunity remains in terms of integrating with external trading partners (Bowersox et al., 2000).
This requires a widespread know-how of collaboration, including the ability to synchronise interdependent processes, to integrate information systems and to cope with distributed learning. Collaboration among independent firms, such as suppliers, manufacturers, distributors, third-party logistics providers and retailers, is the key driver to attaining the flexibility necessary to enable them to progressively improve logistics processes in response to rapidly changing market conditions. Poor collaboration among the chain members can cause dysfunctional operational performance. Some of the negative consequences of poor collaboration include higher inventory costs, longer delivery times, higher transportation costs, higher levels of loss and damage, and lowered customer service (Lee et al., 1997). Though the critical importance of collaboration, few researchers have appeared to develop and test the concept of collaboration in the supply chain. Senge (1990) popularised systems thinking that can be used to understand logistics and coordinate the chain members in order to create collective knowledge. Stank et al. (1999) studied inter-firm coordination processes characterised by effective communication, information exchange, partnering and performance monitoring in food industry supply chains. Lee et al. (1997) suggested channel coordination, operational efficiency and information sharing to improve the overall supply chain performance. A very interesting model that analyses the collaboration from many different points of view is the one suggested by Mark Barratt (2004). According to Barratt there are many elements of collaboration that have been identified in the previous contributions in and around the supply chain management. One of the major supporting elements of collaboration is a "collaborative" culture (see Figure 1). A collaborative culture is supported by organisational structure and performance measures that are aligned to functional activities.

Figure 1. The elements of a collaborative culture within the supply chain



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Source: elaboration from M. Barratt, Understanding the meaning of collaboration in the supply chain, 2004

As we can see in the figure above, the elements that contribute to make up the collaborative culture are:

- Trust;
- Mutuality;
- Information exchange;
- Openness & Communication.

Trust: the consensus in the literature is that trust can contribute significantly to the long-term stability of an organisation (Heide and John, 1990). Lee and Billington (1992) expand on this argument by suggesting that effective coordination of the supply chain is built on a foundation of trust and commitment. However, the implementation of this holistic view of the supply chain requires a degree of trust between all players (Mason-Jones and Towill, 1997; Nesheim, 2001).
Mutuality: McIvor and McHugh (2000) say that there must be mutual risk sharing and respect for the trading partner.
Information exchange: a number of authors have highlighted the fundamental need for information sharing if supply chains are to improve their performance (Lambert and Cooper, 2000; Lau and Lee, 2000). Information, particularly the transparency and quality of information flow, plays an important role in many accounts of supply chain developments and both of the following assumption. First, intermediation is a potential barrier to greater transparency in supply chain because it acts as source of information asymmetry and impactness. Second, intermediation necessarily raises costs and frequently constitutes a non value adding activity (Popp, 2000). The use of information technology to share data between buyers and suppliers is creating a virtual supply chain. Virtual supply chain are information based rather than inventory based. A major problem in most supply chains is their limited visibility of real demand (Christopher and Towill, 2000). Shared information between supply chain partners can only be fully leveraged through process integration. By process integration we mean collaborative working between buyers and suppliers, joint product development, common system and shared information.
Openness & Communication: it is important to open and develop clear and broad lines of communication (Frankel et al., 2002) to foster information sharing and to create a shared understanding (Stank et al, 1999a,b; Ireland and Bruce, 2000).
Figure 1 also sets out the some of the key elements in terms of what has to happen if collaboration is to succeed: Cross-Functional Activities and Process Alignment, Joint Decision Making and Supply Chain Metrics.
Cross-Functional Activities and Process Alignment: boundaries within or between organizations have been shown to restrict the flow of information and development of trust between collaborating partners (Ellinger,

2002). Because supply chain collaboration necessitates adopting a process focus this will involve crossing many functional boundaries and subsequently the management support will be necessary to overcome functional friction (Barratt and Green, 2001).
Joint Decision Making: refers to the propensity of all the actors in a distribution chain towards making group decisions in order to reach shared goals.
Supply Chain Metrics: the vast majority of supply chain metrics are measures of internal logistics performance and can be considered inappropriate for the supply chain as whole (Simatupang and Sirdharan, 2002). The major barriers to developing supply chain measures are the complexity of overlapping supply chains and the sharing of information between organizations. Unless real supply chain metrics can be developed, then the various constituent parts of the supply chain will continue to operate in different directions and will not be aligned.

Research method

As mentioned, the aim of this study is to understand the level of diffusion of collaborative culture and practices in some specific supply chains according to Baratt's model. In order to do this, we followed three steps:

- the supply chains mapping;
- the analysis of the similarities of the supply chains;
- the definition of a structured method of analyzing the relationships between the internal actors of the different supply chains

For the first point, we conducted a concentrated literature review along with a series of interviews directed toward representative companies. The results of this activity are summarized in the figures below. As it can be noted, we are dealing with complex supply chains involving numerous actors who determine very well-articulated flows. In terms of flow structure, the three supply chains are very similar in that they both involve two intermediate stages (if not three) between the upstream part of the supply chain (manufacturers) and the downstream part (clients.)

Figure 2. The Pharmaceutical Supply Chain

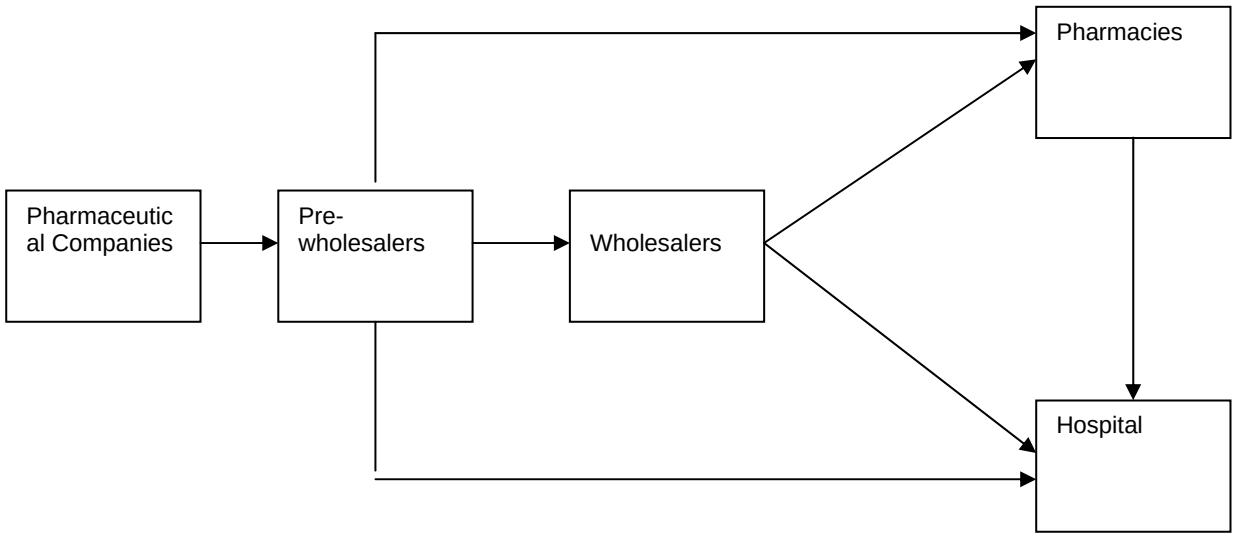


Figure 3. The Food Supply Chain

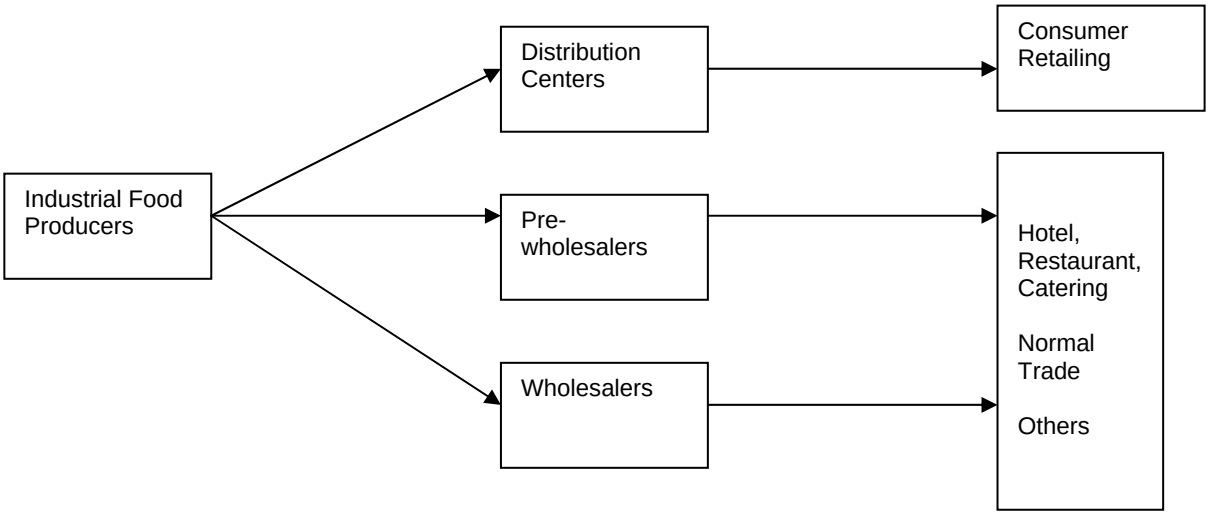
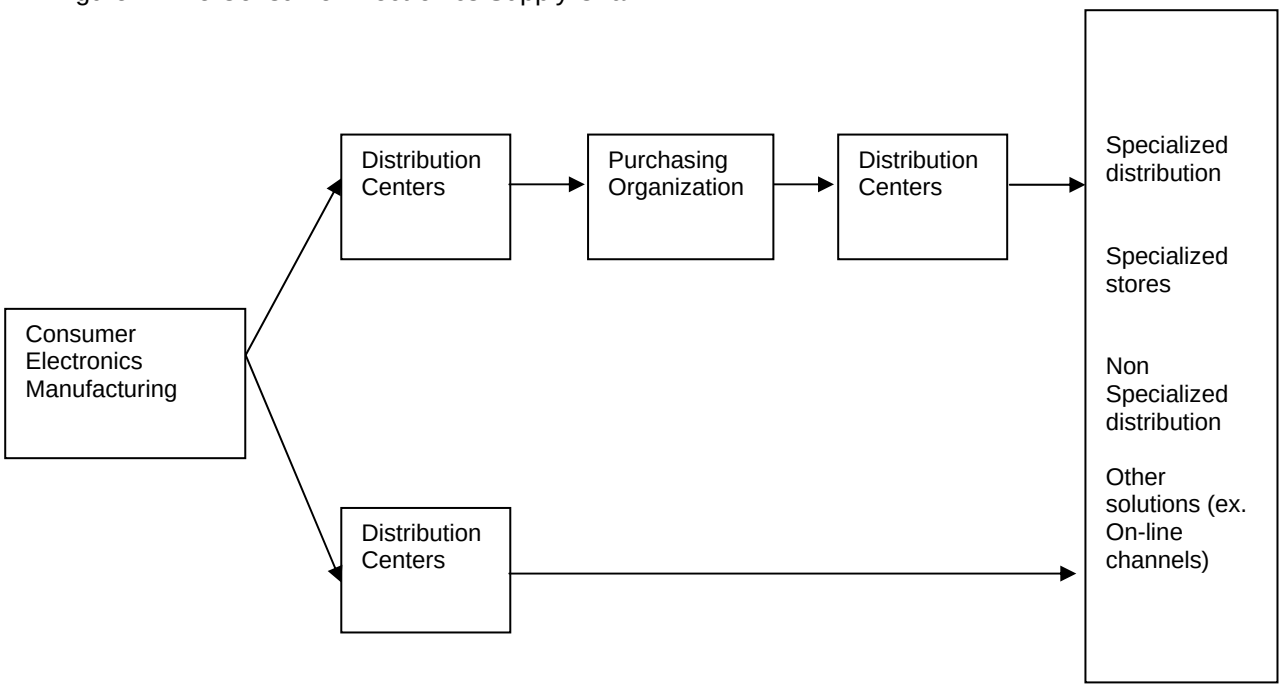


Figure 4. The Consumer Electronics Supply Chain



The analysis of the similarities, which will first be compared in terms of structure and flow articulation, must also be extended to the products. In order to do so, we identified specific comparative elements which insist upon certain critical dimensions:

- Value density: value of goods in relation to weight/volume. This element represents one of the principal aspects in terms of logistics management because it has a decisive impact on cost and service tradeoffs;
- Perishableness: Indicates the amount of time it takes for the products to become unusable;
- Criticalness of Transport: Existence of particular transport conditions linked to dimension, necessity of paying attention to movements, (for example, risk of damaging the product) and/or temperature (transport at controlled temperatures);
- Life Cycle: Average length of a product's life cycle. This information is also important in evaluating the speed at which new products are introduced into the supply chain and, consequently, determining impacts on the ways in which the introduction is handled.

We conducted interviews for the study based on the criteria outlined above. Specific key informants were chosen for these interviews in order to ensure that we gathered all of the information necessary to structure a comparative analysis. The results of this activity are summarized in table 1.

Table 1. The analysis of the similarities

	Pharma	**Food**	**Consumer Electronics**
Value Density	Relatively high	Relatively high (focus on fresh products)	Relatively high (focus on PC, digital cameras, mobile phones)
Perishabilty	Variable	Variable	None (dictated by the market)
Criticalness of Transport	High (Transportation at controlled temperatures)	High (Transportation at controlled temperatures)	Relatively high (risk of product damaging)
Life Cycle	Relatively long in relation to the product and relatively short in relation to packaging	Relatively long in relation to the product and relatively short in relation to packaging	Relatively short

Once we confirmed the comparability of the three supply chains under both the structural and product characteristics profiles, to go ahead with the last step we defined a structured method of analyzing the relationships between the internal actors of the different supply chains.
The most effective means was determined after breaking down the flows between the various tiers of the supply chain following a client-supplier logic. For every actor, we prepared an analysis chart that would help us to map the processes involved in the receipt of goods from the upstream actor (handling on goods receipt orders, goods receipt, and stocking) and the process of orders fulfilment towards the final players (managing the shipping orders, preparing the goods for shipping and transport). The same analysis criteria were used for procedures already in practice, procedures still being developed (but still in the implementation process), and future procedures practices (which would possibly be launched but only after completing the necessary technical analyses and economic evaluations). An example of the described analysis mode can be found in table 2.
In order to test the proposed method of analyzing the collaborative culture and practices observed by the various actors in the supply chain, we decided to begin our research by focusing on the pharmaceutical supply chain. The analysis conducted involved some companies (ranging from 3 to 4) present in each link of the supply chain (producers, pre-wholesalers, wholesalers and pharmacies). In this first phase, we opted to concentrate the analysis on a limited number of business cases which could have provided us a deeper understanding of the relationship existing within the pharmaceutical industry. The companies were chosen based on their relevance in relation to each link of the supply chain. We received valuable input from different companies which operate in the distribution chain and then combined this input with our own objectives. This lead to the selection of companies with the following characteristics:

- Able to express all of the complex elements that characterize relationships between their type of company and the actors at the top and bottom of the supply chain;
- Having a large product range—in order to be sure that all types of possible managerial situations were taken into account

To study each company, we used the case-based methodology (Yin, 1994). We referred to a limited set of companies because our primary research goal was not to provide the basis for generalizing a hypothesis, but rather to explore and expand upon the research propositions (Eisenhardt, 1989). For each company, we gathered materials from many different sources and interviewed supply chain and logistics managers. The results of this initial study of the pharmaceutical products supply chain are described in the following paragraph.

Table 2. A schematic example of collaborative procedures mapping between the actors of the supply chains

Towards which actor…		From which actor…		NOTE	Towards which actor…
	Entrance	Order receipt	•		
		Goods receipt	•		
		Stocking	•		
	Exit	Order management → Goods to be shipped	•		
		Order preparation → Goods to be shipped	•		
		Transport	•		

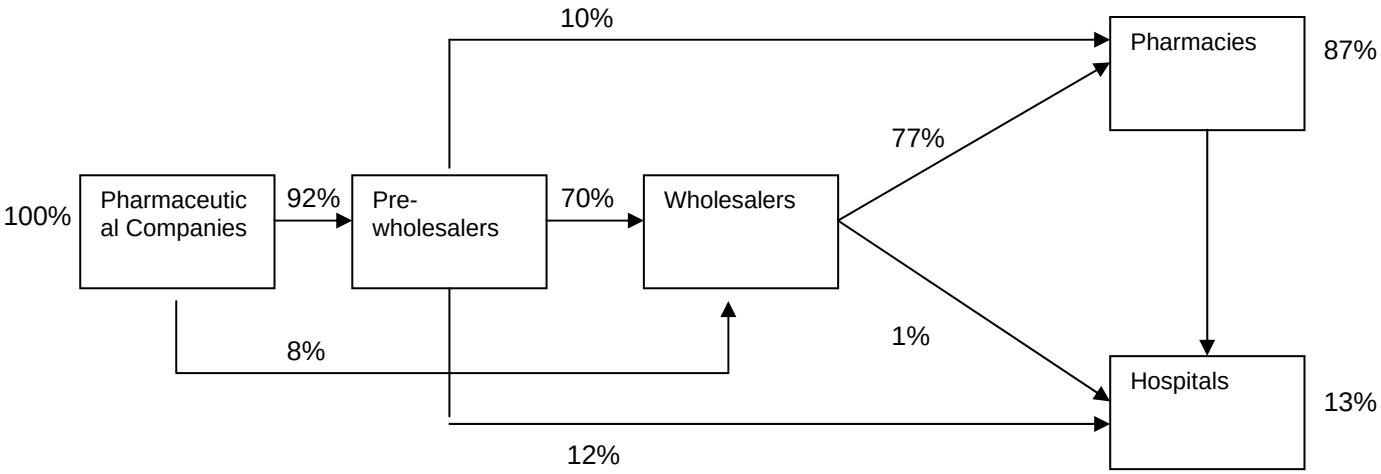
The supply chain of pharmaceutical products

As evidenced in Figure 2, the main actors in the pharmaceutical distribution chain are: the pharmaceutical companies, the pre-wholesalers, the wholesalers, the pharmacies and hospitals.
The Italian pharmaceutical sector is one of notable dimension. In fact, Italy is the sixth largest market in the world and the fourth largest in Europe[1]. Italian pharmaceutical companies hold 30.1% of the market share; Germany is the only country in Europe with a higher domestic market share. The remaining 69.9% of the market share is held by multinational corporations mainly from the US, Switzerland, and the UK. The pharmaceutical industry in Italy is made up of 340 companies: 241 specialize in the production of pharmaceuticals for human use, 89 produce active ingredients, and 40 specialize in the production of goods for veterinary use. Italy is number three in Europe in terms of the number of operators (after Germany and France) and is ranked fifth worldwide (the US and Japan are the first two). The total pharmaceutical goods market is worth about 19.62 billion euro which is divided into 4.06 billion (20.7%) for active ingredients and 15.56 billion (79.3%) for medicinal goods (for human and veterinary use).
The pre-wholesalers usually carry out the following activities on behalf of the pharmaceutical companies: order receipt, stocking, order picking and goods delivery. The pre-wholesaler never takes ownership of the goods it handles and generally works for many pharmaceutical companies at the same time. The pre-wholesalers deal with activities related to the products labelling and packaging, and make OTC exhibitors that have to be located into the pharmacies. To date there are about 150 pre-wholesalers in Italy.
Wholesalers assure pharmacies a rapid supply service which is continuous and complete in terms of assortment. Wholesalers notably reduce stock immobilization costs for their clients, the pharmacies. The wholesalers' role in distribution is one of public interest. These companies understand that: delivery times for pharmaceutical products are of critical importance, great care must be taken to ensure that product quality is maintained during delivery, and procedures to ensure that goods do not undergo any damaging alterations

[1] Source: Farmindustria, Fatti e Cifre 2005, www.farmindustria.it

must be put into place. They also recognize the risks associated with collecting harmful drugs and hazardous pharmaceutical materials. To date in Italy there are about 128 wholesalers and 126 branches.
Pharmacies and hospital occupy the point in the channel where drugs are dispensed to patients. In Italy, there are 17,352 pharmacies[2]. As shown in Figure 5, most pharmaceuticals reach pharmacies through wholesale distributors. However, many pharmaceuticals are brought to pharmacies and hospital directly from pre-wholesalers. In fact, there are some types of pharmaceuticals, such as OTC and generic products, which are normally distributed to pharmacies directly from the companies that produce them through pre-wholesalers.

Figure 5. Flow of pharmaceuticals distribution.



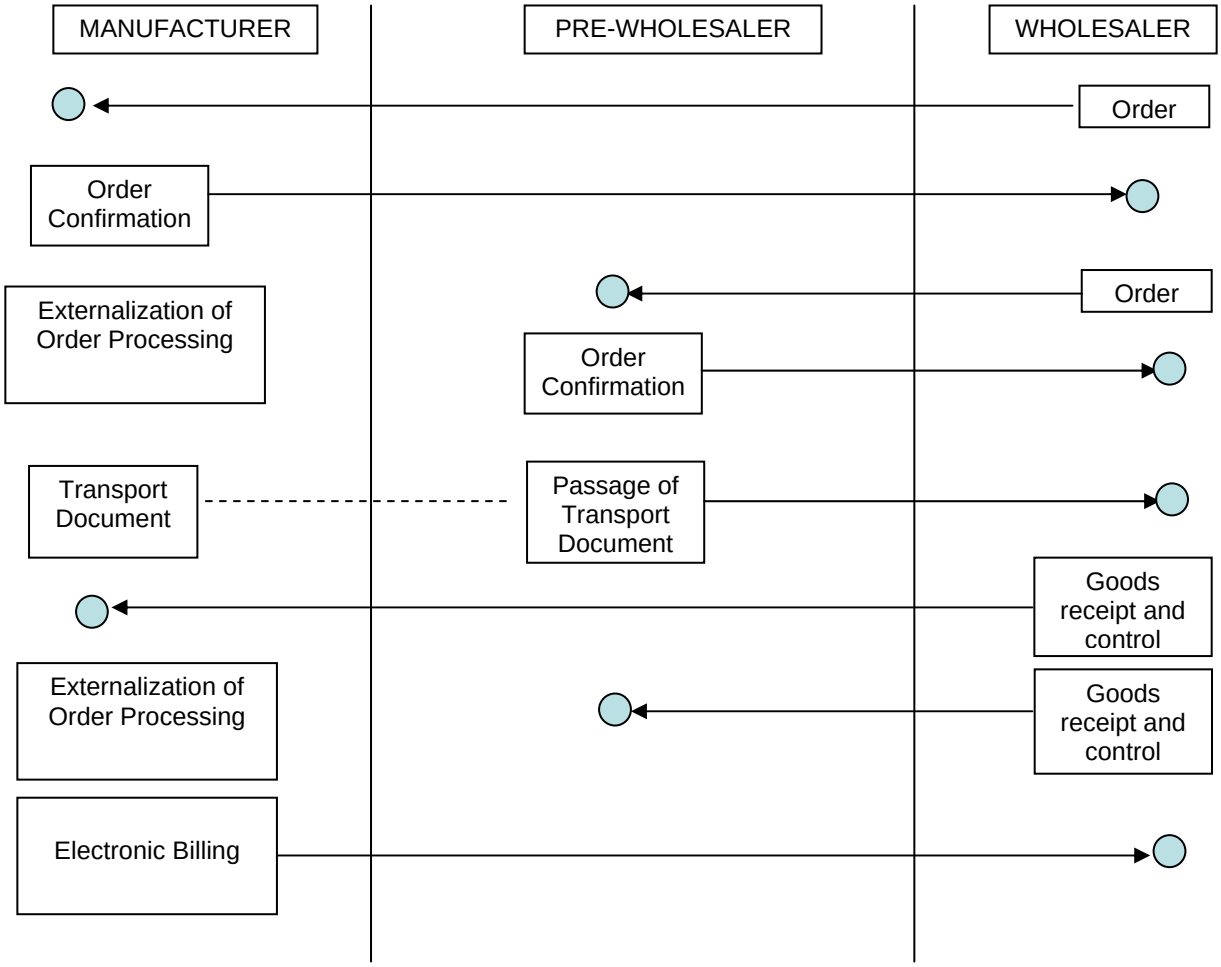
Source: L. Garattini, *La distribuzione dei farmaci nei principali paesi europei*, Kailash Editore, Milano, 1996

The pharmaceutical chain's structure is influenced both by the type of pharmaceutical being distributed (OTC or generic) and by the size of the manufacturer. In general, large manufacturers can reach the market using both traditional distribution channels (which involve pre-wholesalers and wholesalers) and direct distribution channels through only the pre-wholesalers actor, particularly for the hospitals.
At this time, we will attempt to analyze the pharmaceutical distribution chain's most complex and relevant elements by examining the actors' standard management practices, making particular reference to the coordination of physical and informational flows.
The manufacturer usually tends to centrally control orders and provides the pre-wholesaler with order and consignment information when necessary. In this case, the order received by the pre-wholesaler is normally electronically forwarded to the manufacturer who, in turn, provides authorization for delivery of all of the orders received the previous day. The pre-wholesaler's delivery lead time (from order to shipping) is usually around 24-36 hours. The manufacturer's remuneration of pre-wholesalers for restocking and delivery can assume various forms such as: percentage of total net industrial profits, fixed quotas for each piece consigned, or fixed quotas per shipping note. For pharmaceutical deliveries to wholesalers, pharmacies, and hospitals, pre-wholesalers usually rely on third party ground transport companies. In order to maximize transport saturation, carriers frequently organize loads according to groupage methods. This means that the carriers make one or more collections from the pre-wholesalers. Carriers collect the goods from the transportation platforms and then decide how to organize shipments according to the specific destination, such as areas, provinces or regions. In short, they make one or more deliveries to one or more recipients. From a logistics point of view, adopting a groupage organizational method could bring about a change in the pallet configuration received from the pre-wholesaler as goods must be manipulated one box at a time in order to maximize the use of space within the truck. In this way, it is possible to obtain consistent savings in the routes, without which, there would be no margin for the carriers. Transfer from the packaging plant to the storage unit is the financial responsibility of the manufacturer. However, as mentioned, not all pharmaceuticals pass through wholesaler intermediaries. When goods don't pass through wholesaler intermediaries, there is a direct channel between pre-wholesalers and pharmacies. In this case, the margin normally earned by the wholesalers is passed on to the pharmacies. Because pharmacies must frequently order in small quantities due to limited stocking space, the extra earnings gained by eliminating the

[2] Source: Associazione Distribuzione Intermedia, www.adfsalute.it

wholesaler are therefore consumed. It is, however, necessary to keep in mind that also in this case the distribution costs are all the financial responsibility of the manufacturers.
Wholesaler's function is a sort of zipper between industrial production and final dispensation of pharmaceuticals to the public. The distribution made by the wholesalers in the pharmaceuticals sector is characterized by a low concentration in Italy. In Italy there are about 128 wholesalers; on average, about one for every 130 pharmacies. Because of this low market concentration pre-wholesalers maintain a significant importance. In contrast, there are many European countries where these actors have been consistently losing influence due to substitution by wholesalers. Even though the market of wholesalers is segmented in Italy, the first 4 wholesalers cover about 60% of the market. This reveals a tendency towards concentration due to the wholesalers' need to obtain ever-increasing economies of scale since pharmacies require not only rapid and frequent deliveries but also a large range of products.
In Italy, wholesalers decide on both the mix of products which should be sent to the pharmacies (based on their access to sell-out data) and the number of products to be shipped according to pre-defined ideal stock levels determined by factors such as season. The wholesaler provides the industry with information regarding: sell-in, inventory, and the service level offered by pre-wholesalers and couriers. Transport from the wholesalers to the pharmacies can either be handled internally, using the distributor's own vehicles, or externally with an outsourced service. This last group is paid based on various parameters. For example, the number of deliveries, a percentage of the deliveries invoices, or a fixed amount per kilometer. Fifty percent of the time, pharmacies place their orders through data transmission systems, which offer a dual advantage. It is possible to both save time and reduce a large part of manual errors. Even though the advantages of electronic orders are clear, the computerization of the orders between a company and its wholesalers is developing at a rather slow pace—many orders continue to arrive via fax. In terms of electronic orders, it is important to note that Italy has a pharmaceutical consortium called Dafne made up of pharmaceutical companies and wholesalers. Pre-wholesalers are also allowed to participate. Dafne's mission is to create partnerships within the pharmaceutical distribution chain that would optimize pharmaceutical distribution processes. Integration between the partners occurs through the development of joint interest projects dealing with managerial (document informational flows) and logistics (flow of physical goods) optimization. Links to theses electronic systems are based on EDI and internet standards.
In order to strengthen the integration process throughout the pharmaceutical distribution chain, Dafne has dedicated itself to a project regarding the implementation of order tracking systems. The project's main objectives are achieving the complete visibility of the order cycle and providing quality guarantees in terms of both service and informational exchanges. The tracking project involves the interchange of certain documents and informational flows as shown in Figure 6.
The various phases of the tracking project are described below:
Order: the wholesaler sends the order to the pharmaceutical companies that are into the Consortium through EDI or the internet.
Order Confimation: occurs after the order has been placed; before sending a confirmation, the manufacturer verifies the presence of goods requested and the possibility of sending a complete shipment. Thanks to the confirmation, the wholesaler is able to know much in advance which products are missing.
Transport Document: contains data relative to the lot, expiration, number of product confections and, in the case of mixed pallets, information about their composition.
Passage of the Transport Document: a summary which gathers the data and information that accompany a certain load.
Goods receipt and control: these two documents are sent by the wholesaler. The first reports information regarding the time and date of delivery and the quality of transportation (controlled temperature). The second reports the time and date of the control, the state of the goods received and eventual qualitative differences.
Electronic Billing: This document closes the cycle begun with order emission.
This exchange of information allows for a reduction in errors associated with order emission and follow-through. It also permits pharmaceutical companies to more easily view order cycles and control the service levels being offered to the client. In addition, information on missing products, lots, and expiration dates can be seen in real-time which allows for the better handling of stocks and procurements. Finally, it permits the company to know ahead of time when the carrier will come to collect the goods.

Figure 6. The Dafne order tracking systems.



Source: www.consorziodafne.com

In conclusion, it is important to highlight the behaviors of the different actors in the pharmaceutical supply chain in relation to the elements which define the collaborative culture, with reference to the Barratt model presented at the beginning of this paper. The bond of trust defined in relevant literature is evidenced both in the relationship between pharmaceutical companies and pre-wholesalers and in the one between wholesalers and pharmacies. On the one hand the pre-wholesaler is the logistical extension of the pharmaceutical company. On the other hand, the wholesaler is a pharmacy's trusted partner as these two players frequently interact due to the necessity of daily deliveries. However, the bond between pre-wholesalers and wholesalers is a weakness because these two actors maintain a business relationship which is potentially conflictual. In terms of mutuality, there is no risk sharing between the actors in the supply chain due to the fact that the risk is covered by the presence of a large quantity of stock in the distribution chain. The stock represents a type of "insurance" against the risk of not satisfying the downstream demand. The supply buffer between the various actors substitutes more structured forms of risk sharing. The aspect which most greatly characterizes the pharmaceutical distribution chain in Italy is that of information exchange. The informational flow between the actors in the distribution chain allows for the creation of partnerships within the pharmaceutical supply chain which stimulate the optimization of the distribution process. Integration between partners is brought about through the development of electronic data transmission projects which utilize standard EDI and internet. The "collaborative logistics" project, which involves the actors in the distribution chain, has the objective of normalizing the informational flows within the entire distribution chain (also between pharmaceutical company and pre-wholesaler) and identifying physical elements (in particular between pre-wholesaler and wholesaler) according to international standards.

Conclusions

According to what has been analysed in this paper, we have ascertained that within the Italian pharmaceutical supply chain there are many possibilities for improving collaboration between the different actors. In fact, it seems clear that the diffusion of the collaborative culture and practices is currently limited to actors who are closely linked to each other within the supply chain. For this reason, they are in strong need of efficiency improvement. On the contrary, there are no collaborative projects involving the supply chain as a whole.
As a next step, we will extend our research to the other two supply chains briefly mentioned in the introduction (food and consumer electronic goods) in order to understand the degree of diffusion of collaborative culture and practices within the chain. We also wish to analyse certain factors which might either enable collaboration or hinder it.

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