Customer-driven supply chain improvement: Evidence from Italian companies

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Abstract:

This paper aims at understanding whether and to what extent companies are facing the challenge of improving their supply chains in order to deliver customer value, according to a customer-driven approach. Improvement initiatives in the field of operations and supply chain management frequently fail due to the poor overall alignment between actual customers' value drivers and the operating conditions of supply chain processes, whose managerial and technological readiness is not always consistent with market challenges. In this paper we discuss the findings of an empirical investigation conducted among Italian companies or Italian subsidiaries of MNCs, in a two-step research, consisting first of 10 in-depth interviews and then of a survey. According to our study, Italian companies seem to be pressured by the need of revising their supply chains in order to cope with specific customers' needs and market trends, in particular those related to the prompt availability of the product in different (but coordinated) distribution channels, with the correct assortment and quantities. This is resulting in the launch of projects related to Demand Forecasting and to Omnichannel strategy adoption. However, in most cases it seems that the managerial and technological readiness of companies following this path is not in line with the relevance of the challenges they are coping with. Another relevant area of improvement consists in the adoption of Industry 4.0 technologies. In this case the major risk undermining project's success consists of the poor ability of companies to correctly understand how the operational improvements obtained through such initiatives can be leveraged to deliver customer value.

Keywords: customer-driven supply chain management; supply chain improvement; demand forecasting; omnichannel logistics; industry 4.0; survey.

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1 Introduction

This paper aims at understanding whether and to what extent companies are facing the challenge of improving their supply chains, according to a customer-driven approach. Academic literature on this topic claims that supply chain design and management should aim at bringing to the clients what they need and expect in terms of product type and quantities, with the required service level (namely speed, dependability, completeness and flexibility of delivery). However, improvement initiatives in this field frequently fail due to a poor overall alignment between actual customers' needs and the operating conditions of supply chain processes, whose managerial and technological readiness is not always consistent with market challenges. In other cases, improvement programs lead to disappointing economic outcomes because they are rooted in the willingness of functional managers to implement up-to-date practices and technologies, regardless of the benefits that these initiatives can bring to the customer. In this paper we discuss the findings of an empirical investigation conducted among leading Italian companies or Italian subsidiaries of MNCs, aimed at identifying which are the most important priorities and challenges faced by these firms in respect to the effective implementation of customer-driven supply chains.

The paper is organized as follows. In section 2 we introduce literature on customer-driven supply chains and in specific we then focalize on such researches that highlight the problem of the alignment among supply chain processes and supply chain actors addressed to get effective performance. In section 3 the research questions and the adopted research methodology are reported. Section 4 presents and discusses the results of the two phases of the research: the Delphi study and the extensive survey. Section 5 contains the major conclusions, the limitations of the research and further research suggestions.

2 Literature review: Customer-driven supply chains

Literature is increasingly debating the topic of customer integration into supply chain processes (Potter, Towill and Christopher, 2015). Such a literature emphasizes the need for the customer to be actively involved into the processes of value creation and value delivery that take place into the supply chain. It is highlighted that supply chain processes are source of value creation and value delivery to customers and that customer satisfaction is tightly connected to the efficiency and effectiveness of the company's supply chain processes (Arajuo, Dubois, Gadde, 1999). In different words, the value processes taking place by and within the interactions into the supply chain can generate the most of their efficiency and effectiveness if they are enacted and focalized on the meeting of customers' value expectations. So that also a tight interaction between marketing and purchasing is requested (Ivens,

Pardo, Tunisini, 2009; Guercini, Woodside, 2012).

Following this view some authors have initially stressed the need for demand-driven supply chains (Cousins, P., Lamming, R., Lawson, B., & Squire, B. 2008). The notion is presented as an original business model capable of providing value in today's marketplace through the combination of the strengths of marketing (i.e. effectiveness) and supply chain management (i.e. efficiency) (Heikkilä, J. 2002; Santos, J. B., and D'Antone, S. 2014). The demand-chain management approach has obtained emphasis as a paradigm in management literature and it has transformed the comprehension of customer demand in actionable strategies and plans for all the firms involved (Langabeer and Rose, 2002).

More recently literature has addressed its attention to the customer-driven supply chain thus emphasizing the importance of addressing supply chain processes to the satisfaction of the single customer. This is especially important in business-to-business contexts where a few number of customers represent an important part of the company's market and each single customer is to be handled and served following a customized approach (Hakansson et al., 2009; Hakansson, Snehota eds, 2017).

The customer-driven supply chain perspective recognizes the inclusion of the customer inside the supply chain processes and views the customer not solely as destination of supply chain processes but, mostly, as activator of them, as well as active participator to the value creation (Borgström et al., 2011). The supply chain is oriented towards the customer and reconfigures itself in order to meet customer's needs. It integrates the customer into its activities and processes. In these contexts, also, the outcome is co-created by collaboration between customers and all members of the supply chain. In particular, the researches show that customer integration can be increased through tools like customization and tailoring of products/services (Cristiano, Liker and White, 2000) as well as by shared information and flexibility that improve customer closeness (Morash and Lynch, 2002). It is underlined that capabilities and resources are to be aligned in order to reach a customer-driven supply chain. In fact, supply chain actors should be capable of rapidly aligning their collective capabilities to respond to changes in demand and supply.

The customer-driven supply chain perspective leads to the recognition of the company's downstream and upstream counterparts in the supply chain as source of resources and not as costs. Supply chain structures and processes represent for the single company a major source of competitive advantage. So attention is given to competition among supply chains more than to competition among companies (Christopher, 2016). A company that implements a customer-driven supply chain can be capable of differentiating more from the competitors'.

The structure and the dynamics of a company's business relationships within the supply chain, as

well as the company's relational capabilities, can sensibly make the difference between one company's performance and another's in the eye of the customer. Processes of value creation and delivery capable to meet customer expectations are only in part referred to activities performed by a single supplier company. Rather, they are connected to the number of companies that interact and connect their resources and capabilities in the supply chains' contexts (Gadde et al. 2010; Lamming, Cox, 1995; Harland C. M. (1996). Summing up, the customer-driven approach increases and enforces the theme of the importance of the company's relational capabilities and assets .The quality of the actors in the supply chain as well as networking capabilities become distinctive resources.

3 Research questions and methodology

The aim of this study is to understand whether and to what extent companies are facing the challenge of improving their supply chains in order to deliver customer value, which have been pointed out by the most up-to-date literature as relevant areas of interest from the market perspective (Lambert and Enz, 2017; Schonberger and Brown, 2017; Christopher, 2016; Jüttner et al., 2007; Reichhart and Holweg, 2007; Christopher, 2000). In particular, such needs refer not only to the product offering of the company, but also to the logistic service that complements the product and that, in some industries, can be a major driver of customer satisfaction (Christopher, 2016). In both cases, supply chain improvement projects can be a condition to cope with the emerging complexities involved by the above mentioned needs, which mainly refer to the necessity of procuring new components and services, the increasing amount of demand volatility due to product innovation, the enhanced relevance of stock management decisions, the design and management of the physical distribution process as a condition to achieve outstanding levels of speed and dependability of delivery. In order to address this research question, we carried out an empirical investigation made up of two phases.

The first phase aimed at identifying those improvement areas in logistics and SCM that are perceived as the most relevant in the eyes of the companies. This step involved in-depth interviews with ten supply chain managers and opinion leaders, according to a Delphi approach. The former were selected from companies active in one of the following industries: fashion; consumer packaged goods; pharmaceutical; retail. These industries were chosen due to their relevance in the Italian economy.

Because the aim of this step was to let the interviewees spontaneously identify the areas of concern that they consider as the most relevant and strategic in the field of supply chain management, the interview was conducted by asking first a broad question about the projects already undertaken or already planned for the next 3-5 years in order to soundly improve the processes encompassed in supply chain management, from procurement to physical distribution. After a detailed discussion about current projects and future ones identified by the interviewees, we asked them to deepen the

discussion trying to classify such initiatives on the basis of their "reason why". In this regard, we suggested a classification according to the following categories:

a) Projects aimed at improving operational performance;
b) Projects aimed at exploiting modern technologies;
c) Projects aimed at enhancing supply chain integration;
d) Projects aimed at coping with industry-specific challenges related to emerging market trends and to new distribution strategies;
e) Projects aimed at meeting specific customers' value expectations.

These questions let the interviewee discuss not only on the current and planned projects, but also on those that, in his/her opinion, could be useful for the company. Focusing on such "nice to have" initiatives, we asked for an assessment about the likelihood of having them launched in the next 3-5 years. The outcomes of the interviews were then analyzed by the authors in order to identify those areas of intervention that were more frequently mentioned during the interviews. Then, we distinguished them in two broad categories:

- projects launched, planned or whose future launch is highly likely, which can be considered in line with a **customer-driven** approach to supply chain improvement. We included in such group both projects "aimed at coping with industry-specific challenges", and those "aimed at meeting specific customers' value expectations" (categories "d" and "e" in the above mentioned classification);
- projects launched, planned or whose future launch is highly likely, which are mostly rooted in the willingness of functional managers to adopt up-to-date **practices and technologies** in order to improve the operational performance (categories "a", "b" and "c" in the above mentioned classification).

The evidence of this step of the research let us highlight three main areas of intervention (which will be discussed in Section 4.1), common to most interviewees:

1. Projects aimed at improving demand forecasting;
2. Projects aimed at pursuing the omnichannel strategy;
3. Projects aimed at adopting modern technologies, mostly connected to the Industry 4.0 paradigm.

While the first two were considered customer-driven initiatives, the last was attributed to the category of projects that are technology-driven or practice-driven.

On the basis of such evidence, we launched the second step of the research, which consisted of a survey focused on the three above mentioned areas of intervention.

To carry out the survey, we designed a questionnaire consisting of an initial section, aimed at collecting descriptive information on the respondent, the company and its supply chain. Then, for each of the three areas of improvement identified in the first step of the study we proposed questions aimed at understanding:

- whether the company has already launched any improvement project, or plans to do so in the near future;
- the importance given by the company to the levers necessary to achieve any improvement in the selected area of intervention; these questions aimed at understanding the degree of readiness and maturity of the company in addressing the selected area of improvement. This was the case for customer-driven initiatives. For practice or technology-driven projects we asked about the areas of implementation, in order to understand for which reasons the practice or the technology was implemented. Respondents had to provide their answer on a1 to 5 Lickert scale, where 1 is "not important" and 5 is "very important".

These questions were based on the outcomes of the interviews carried out in the first step of the research and on the extant literature concerning these areas of improvement.
The questionnaire was sent to 600 supply chain managers of leading companies of the above mentioned sectors. After a recall process, we collected 64 usable questionnaires, with a redemption rate of about 10%, which is in line with the result obtained in previous studies that adopted the same procedure.

4 Empirical evidence

4.1 Evidence from the interviews

Data collected through the survey have been provided by 64 companies, 54% of which are industrial while the remaining 46% operate in the retail and distribution sector. Most of them can be classified as large companies. Indeed only in 26% cases an annual turnover lower than 100 million Euros is reported; 31% companies are in the range 101-500 million Euros and in the remaining 41% cases the turnover is higher than 500 million Euros (in 2% cases the data is not available). This distribution is relevant, since we can claim that the evidence stemming out from the survey is mostly based on the experience of medium-large enterprises, which are generally at the frontier of best practices implementation.

Focusing on the questions concerning the above mentioned areas of improvement, at a first glance, it is confirmed that they are actually of major importance for the sampled companies. Figures 1, 2 and 3 report on the frequency of improvement projects in the three areas, classified on the basis of their current state. As can be seen, the frequency of the projects already undertaken ("on-going") and of those "under consideration" is equal to 60% for Omnichannel strategy, and 65% for both Demand Forecasting and Industry 4.0. These numbers witness the relevance of these topics not only among the interviewees, but also in the sample of the survey.

Going deeper into the analysis of the outcomes of the survey, some interesting results emerge from the average importance values given by the companies to the levers and areas of implementation necessary to achieve any improvement in the selected area of intervention. Such values could range from 1 to 5. We focus our discussion on those levers whose average value is equal to 4 ("important") or to 5 ("very important").

4.1.1 Omnichannel strategy

Concerning the implementation of the omnichannel strategy and its implications from the supply chain management viewpoint, our survey focused on those areas of concern that were more frequently mentioned during the interviews and that are consistent with the extant literature on this topic. In particular, we build on contributions concerning the logistic implications of e-commerce, which pose new challenges to companies due to the high complexity of the physical flows generated by on-line sales, especially for the home delivery process and the related "last mile logistics" and for the management of returns (Hübner et al., 2016a and 2016b; Ishfaq et al., 2016; Morganti et al., 2016; Savelsbergh and Van Woensel, 2016; Brynjolfsson et al., 2013).

We developed 14 statements reported in Table 2, which cover three main areas of potential improvement for companies willing to adopt an omnichannel strategy, with a specific focus on e-commerce solutions. The first area encompasses statements from 1 to 7, which concern the management of warehouse and transportation activities (Hübner et al., 2016a and 2016b; Morganti, 2016; Savelsbergh and Van Woensel, 2016). The second one includes statements 8 and 9, which are specific to the redesign of the logistic network. Namely, through these statements we want to understand whether the number of logistic nodes are expected to increase or decrease due to the adoption of the omnichannel strategy (Hübner et al., 2016a and 2016b). Statements from 10 to 14 aim at understanding whether sampled companies are concerned with the need to increase the coordination of the different channels, and to revise the role of the traditional store in order to increase its suitability for the order fulfillment process and to make it consistent with the new needs of digital shoppers (Ishfaq et al., 2016; Brynjolfsson et al., 2013).

As can be seen in Table 2, among sampled companies only four statements out of fourteen report average values equal to or higher than 4, and three of them belong to the first group (statements from 1 to 7) concerning the design and management warehouse and transportation activities. No specific relevance seems to be given to the two statements (8 and 9) focused on the design of the logistic network. Finally, concerning the third group (statements from 10 to 14) only the statement n.10 reports an average higher than 4, which witnesses an interest toward the necessity of differentiating the logistic service for different products and channels.

This evidence shows a higher interest toward operational levers connected to the implementation of the omnichannel strategy, namely those concerning the reorganization of warehouse lay-out and processes as well as transportation management. On the opposite, more strategic and challenging areas of improvement seem to be overlooked, namely the logistic network design, the coordination of on-line/off-line channels and the role of stores in an omnichannel environment.

TAKE IN TABLE 1

4.1.2 Demand forecasting

Also for demand forecasting, we developed a bundle of statements on the basis of the extant literature on the topic, which have been confirmed also by the outcomes of the interviews. These statements – reported in Table 3 - can be divided into two subgroups. The first (statements from 15 to 20) build on contributions peculiar to the supply chain management literature, which highlight the relevance of information sharing, and internal and external integration in order to improve the overall logistic performance (Chen and Lee, 2009; Gimenez and Ventura, 2005; Frohlich and Westbrook, 2001). Along the supply chain such integration can be achieved through the adoption of ad-hoc practices (including collaborative forecasting), through the implementation of IT solutions that enable the acquisition and the analysis of data (including the recent rise of big data analytics), and through vertical integration projects aimed at reducing manufacturing lead times, being closer to the market and better understanding customers' behavior (Chen and Lee, 2009; Chatfield et al., 2004; Lee et al., 2000; 1997).

The second group (statements 21, 22, 23) encompasses statements grounded in a more recent orientation in demand forecasting, according to which the use of qualitative and contextual information coupled with experts' knowledge about the market can increase forecast accuracy (Seifert et al., 2015; Kerkkänen and Huiskonen, 2014).

As can be seen in Table 3, only three statements report an average higher than 4, and all of them belong to the first group, related to the conventional approach to demand forecasting. This evidence seems to highlight a lack of knowledge on the newest frontiers in this field.

TAKE IN TABLE 2

4.1.3 Industry 4.0

Concerning the Industry 4.0 paradigm, we divided our survey into 3 sections, focused on the following areas (Kagermann et al., 2013; 2011; McAfee et al., 2012; LaValle et al., 2011):

- Robotics and digitalization;
- Internet of Things (IoT);
- Big data analytics.

Concerning "robotics and digitalization", Table 4 shows the average values reported by the seven questions asked on this topics, aimed at identifying the main areas of implementation preferred by the samples companies. As can be seen, only two statements report an average higher than 4, namely statements 24 and 26. These values confirm an evidence already observed in the interviews, which refers to the preference of the firms toward manufacturing and logistics activities as areas of implementation for such Industry 4.0 solutions.

TAKE IN TABLE 3

Concerning IoT, averages summarized in Table 5 point out the moderate interest of the sampled companies toward these solutions. Although they are acknowledge as a lever to improve several performances, the only type of implementation that reaches an average value higher than 4 is the one related to the adoption of wearable technologies, as a means to improve workers' safety (statement 37). On the opposite, all applications that could actually transform the business model of the company, e.g. enabling the evolution toward servitization (Vendrell-Herrero et al., 2017; Rymaszewska et al., 2017; Baines et al., 2009a; 2009b), seem to be overlooked. This can be considered another demonstration of the "inward" attitude of functional managers.

TAKE IN TABLE 4

Finally, concerning Big Data Analytics, Table 6 highlights some interesting results. Indeed, five statements out of 8 report average values higher than 4. Furthermore, all such statements do not refer to internal activities (Waller and Fawcett, 2013), rather to the market and to the clients (Järvinen and Karjaluoto, 2015; McAfee et al., 2012; LaValle et al., 2011). It is worthwhile noticing that this evidence is remarkably different from the previous ones (in Tables 4 and 5), in that this is the only one in the "Industry 4.0" section of the questionnaire where sampled companies showed an outward orientation, peculiar to a customer-driven approach.

TAKE IN TABLE 5

5. Conclusions and managerial implications

The empirical study reported in this paper aimed at understanding whether and to what extent companies are facing the challenge of improving their supply chains in order to deliver customer value. As widely discussed in the extant literature on this topic, an overall alignment between customers' value requirements and the operating processes of the firm is a condition for the effective design and management of the supply chain. However, as reported in the literature review, such a condition is not always met, due to a lack of market orientation and knowledge of functional managers, their technical background and poorly designed PMS.

This study shows that supply chain managers involved in our analysis are actually aware of the most relevant market trends that are taking place in their sectors and of the urgency of improving supply chain processes accordingly, with a customer-driven approach. In particular, their main interest is on the adoption of an omnichannel strategy and on the improvement of the forecasting process to better cope with the increasing number of digital shoppers and the higher and higher volatility of market demand. This evidence stems out from both steps of our study, i.e. interviews and the survey. However, in this regard the survey shows a weakness that could impair the effectiveness of any improvement project undertaken to cope with the above trends, which relates to the poor awareness of managers about the operational levers that must be used to achieve remarkable results.

This study also highlights another area of improvement perceived as relevant by both the interviewees and the sampled companies, which refers to the implementation of Industry 4.0 technologies. As already claimed in extant contributions, the risk underlying this type of technology-driven projects refers to the difficulty with which functional managers understand how such initiatives can result into

enhanced customers' value. This is confirmed by the results of our survey, with the only exception of investments in Big Data Analytics. This is used not so much to improve operational performances, but to enhance the ability of capturing, understanding and satisfying customers' needs.

Overall, the outcomes of this paper witness a positive attitude of supply chain managers towards market trends and towards a customer-driven approach in the identification of their improvement priorities. However, it is also evident that a higher internal integration among departments could bring favorable results in terms a higher success rate of the improvement initiatives. Indeed, supply chain processes encompass a wide variety of activities, from sourcing, to manufacturing and physical distribution, which are generally under the control of ad-hoc managers. Supply chain professionals, even though aware of specific market trends and customers' needs, have to deploy their customer-driven projects into specific areas of intervention, which relate to the overall range of supply chain activities. In this regard, a stronger interaction with colleagues from Procurement, Production and Logistics could lead to a deeper understanding of the internal determinants of the logistic service and of customers' value.

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Table 1 – Levers for the omnichannel strategy: average importance

	Levers for the implementation of the omnichannel strategy	***Average***
1	Improvement of internal warehouse processes (receiving, picking, etc.)	**4,39**
2	Warehouse lay-out redesign	**4,15**
3	Product and packaging redesign to allow more efficient warehouse and transportation activities	3,98
4	Adoption of WMS	**4,15**
5	Adoption of TMS	3,81
6	Adoption of outsourcing solutions for warehouse and transportation activities	3,80
7	Adoption of insourcing of warehouse and transportation activities previously outsourced	2,77
8	Decentralization of the logistic network	3,26
9	Centralization of the logistic network	3,76
10	Redesign of the logistic service based on different products and channels typologies	**4,39**
11	Ad-hoc management policies of on-line and off-line channels to prevent cannibalization	3,43
12	Differentiated assortment for on-line and off-line channels	3,45
13	Store redesign to increase its logistic efficiency for return and delivery processes generated by on-line sales	3,26
14	Adoption of in-store technologies (e.g. kiosk, interactive windows etc.)	3,28

Table 2 – Levers for demand forecasting: average importance

	Levers for improving demand forecasting	***Average***
15	Adoption of collaborative forecasting with supply chain partners (suppliers and clients)	**4,39**
16	Increase visibility of data along the supply chain (e.g. available stock at the client site)	**4,26**
17	Increase internal integration among departments, to share market knowledge	**4,31**
18	Adoption of IT tools that support demand forecasting	3,94
19	Downstream integration along the supply chain through the creation of directly operated stores to understand consumer behavior	3,39
20	Use of big data analytics to predict sales	3,59
21	Leverage social media to collect qualitative information about consumers' preferences	3,09
22	Leverage market knowledge of sales personnel to improve demand forecasts	3,74
23	Integrate quantitative forecasts with relevant qualitative information	3,93

Table34 – Areas of implementation of robotics and digitalization: average importance

	Areas of implementation of robotics and digitalization	***Average***
24	Production (e.g. robots)	**4,09**
25	Warehouse (e.g. autamated guided vehicles)	3,89
26	Transportation (e.g. RFID)	**4,02**
27	Transportation (e.g. drones)	2,85
28	Sales (e-commerce)	3,98
29	After sales (e.g. augmented reality)	3,28
30	Procurement (e.g. marketplace, e-procurement)	3,75

Table 4 – Areas of implementation of Iot: average importance

	Areas of implementation of IoT	***Average***
31	Change the behaviour of the product depending on the environment (e.g. smart cartridges)	3,50
32	Embed products with some sort of "intelligence" that enables servitization (e.g. pay-per-use tyres)	3,48
33	Embed products with some sort of "intelligence" that enhances visibility along the supply chain (e.g. pallets with sensors)	3,89
34	Use of in-store technologies to enhance interaction with the customer(e.g. beacons that interact with smart-phones)	3,87
35	Use of IoT solution to monitor the operating conditions of production equipment	3,96
36	Use of 3D printers for remote production (e.g. spare parts)	3,51
37	Use of wearable technologies to increase employees safety	**4,00**

Table 5 – Areas of implementation of Big Data Analytics: average importance

	Areas of implementation of Big Data Analytics	***Average***
38	Understand consumer behaviour	**4,00**
39	Product customization	**4,00**
40	Market trends identification	**4,11**
41	Predictive maintenance	3,89
42	Improve sales forecasts	**4,11**
43	Assess suppliers' risk	3,68
44	Cut transportation costs	3,94
45	Increase service level to the customer	**4,17**