How information technologies can support the integration between supply chain and marketing

Franceschetto, S.[a)], Cigolini, R.[a)], Lamberti, L.[a)]

a. *Department of Management, Economics, and Industrial Engineering, Politecnico di Milano*

Via Lambruschini, 4/B, 20156 Milano – Italy

(simone.franceschetto@polimi.it, roberto.cigolini@polimi.it, lucio.lamberti@polimi.it)

Abstract: This paper proposes a way to achieve a customer-centric mindset in organizations; in particular, it shows how companies could adapt processes and culture, in order to promote customer centricity and satisfaction, through the exploitation of IT tools. To achieve this, a basic literature is proposed that highlights the possibilities of improving the performance of companies through supply chain practices, the importance of customer loyalty and retention, and the possible impacts deriving from the use of IT tools. The scientific literature has largely dealt with the most important elements that characterize the Supply Chain Management and Marketing departments, however, there is a lack of scientific articles that analyze how these two fields can be connected. This paper shows the importance of customer expectations in supply chain thinking and the potential use of technology to improve customer satisfaction, also leveraging the results of two practical examples. In the first one, the focus is going to be on the customer's return process, in those situations in which there have been hidden or visible damages during the transportation of goods, in a company operating in the electronic retail industry. On the other hand, the second case will address the development of a smart safety stocks (SS) calculation, improving on one side the level of inventory management and, on the other side, the customer appreciation, given the lower number of stockouts. The company in this example mainly operates in the manufacturing industry, processing brass products.

Keywords: supply chain management, IT tools, robotic process automation, customer centricity, value added activities, customer loyalty

I. INTRODUCTION

In the latest decade, scholars have been challenged to study and develop models for supply chain management (SCM) as a new building block of each company's architecture (Noci, 2019). The process of globalization and the advent of new technologies has caused huge changes in the competitive arena. 21st century's markets competition has been shifted from a company vs company matter to a supply chain (SC) vs supply chain one: each company must be integrated both upstream and downstream in order to satisfy customer needs and requests in all the possible channels offered (Castillo et al., 2020). In this regard, the advent of e-commerce is a challenge that could have both a positive and a negative impact on companies' performance (Bai et al., 2021). "Getting out of silos" is fundamental nowadays in order to create a resilient and sustainable supply chain, creating a competitive advantage over competitors and being responsive to fast-changing customer requests and needs (Cigolini et al., 2021). In this view, this manuscript is going to analyze the link between SCM and Marketing; more precisely, it is aimed at showing how the customer centricity (CC) concept could be achieved and measured as it is one of the most critical drivers of the survivability of each company in the long term. The concept of CC and its centrality in companies has been well-accessed by scholars and researchers in recent years; with this paper, we would like to show how technological development has created solutions to improve the service level delivered to customers. The latest technological trends of Artificial Intelligence (AI) and Big Data are having a pervasive role in companies' process reengineering and thus, they must be embraced by the top management to improve overall performances (Amico et al., 2022a; Baryannis et al., 2019). The COVID-19 pandemic has obliged companies to launch initiatives related to processes' digital transformation, allowing them to reach a higher level of digital maturity and thus, improving overall performances in efficiency and effectiveness. Two practical cases are going to be described and accessed in this paper; the aim is to show how Robotic Process Automation (RPA) and programming languages (in this particular example R Studio has been used) could be beneficial not only in terms of achieving a "leaner" supply chain, but also to improve the image of the company, both in the eyes of customers, improving pre/after-sale

services and the customer loyalty, and of employees, avoiding them to be focused on not-value adding tasks and thus, allowing them to be proactive in the companies' value creation.

II. BACKGROUND

Supply chain management subject has been the focus of many scientific papers and many experiments over the years; as soon as globalization started, companies understood the need to improve the effectiveness of their supply chain in order to better serve the market, while minimizing costs and efforts (Franceschetto et al., 2022). In the second half of 1990s the market power went from manufacturers to retailers (Min et al., 2019), with higher attention on performances such as delivery time, on-time deliveries, and shelf availability. In general, the customer has become more demanding in terms of quality and performance, as well as more sensitive to price changes. As a consequence, there was a high increase in the difficulty of the management of supply chains, leading to the creation of more and more constraints, higher expectations and fewer resources (Amico and Cigolini, 2023). In this new and challenging environment, companies have to integrate the different functions and the linked capabilities, focusing in particular on the reduction of inefficiencies of operational capabilities and on the improvement of efficiency and effectiveness through strategic supply chain management capabilities (Caiado et al., 2020). With a broader perspective, considering also the integration between supply chain management and marketing, the adoption of digital solutions is even more crucial and effective, since this helps in the management of information flows in particular. The information flow should be considered the most important in supply chains (Starostka-Patyk, 2021; Amico et al., 2022b), due to the fact that it helps in adopting each situation with the optimal tool, strategy and behavior. In the latest years, the concept of customer centricity (CC) has been given increasing attention by scholar; CC refers to the practice of putting the customers at the centre of all corporate activities in order to increase their satisfaction and thus, their loyalty (Kreuzer et al., 2020) focusing on the creation of a flawless customer experience (CX). In addition, some other scholars have researched the relationship between CC and knowledge management; in this area, CC can be defined as the result of a process of acquisition and storage of buyer information and knowledge (Cabarcos et al., 2020). One of the most important factors to build a customer centric organization is the involvement of the top management, leaders must inspire the employees to embrace the CX management strategy (Ceesay, 2020). The concept of CC could be opposed to the one of product-centricity: companies following a product-centric mindset are moved, as a first driver, by the technology and the organizational structure (Stegemyr and Thell, 2021). Some researchers suggest that a company may struggle to achieve a high level of customer loyalty; as a matter of fact, the only way to do so is to produce trust and belief in the brand, satisfying the majority of customer needs (Hamzah and Shamsudin, 2020). Companies have to perform a strategic process reorientation aimed at creating value for the end customers (Esper et al., 2021) and, in order to achieve this, they need to understand customers, starting from their needs and expectations. To reach this aim, companies have to shift from the common Customer Relationship Management (CRM) to a more holistic and relational focus on customer experience, creating a managerial role to manage all the links with the customer and implementing new technologies (Ceesay, 2020). In all industries and markets the underlying objective is to create value for the customer while as well generating profits and positive flows to keep the company growing and receiving the proper earnings. Despite the increasing influence of technology, new procedures and revolutionary tools, humans are, and should be, in the center of all companies' operations and processes (Noci, 2019). The primary objective, in order to increase sales and customer base, is to deeply understand customers' expectations and to offer the optimal product or service coherently with the particular needs of each segment. Secondly, it is crucial to find, purchase or create the capabilities and structures required to offer the identified product (Cigolini et. al, 2022a). Indeed, despite the deep study of the market is needed, without the proper structure, it is impossible or inefficient to deliver the product or service. With the focus on supply chain processes, these are strictly linked with marketing actions. In fact, through marketing actions customers are more inclined to purchase and sales increase (Lamberti and Pero, 2019); hence, SCM function need to be prepared to fulfill the new and higher demand, adopting the proper strategy. However, in practice, marketing's demand creation activities are often disconnected from the activities required to fulfill that demand (Gligor and Golgeci, 2017). The reason can be found by looking at each functions' intrinsic objective. On the one hand, the marketing function has the scope of increasing as much as possible sales and product flows; on the

other hand, SCM function needs to optimize material flows, in the production, storage and distribution phases, so that the costs are minimized and the margin for the company increases. Without proper coordination between these two functions the risk of lack of sales or oppositely the risk of stock-outs is not negligible.

A. IT tools in supply chain management

The 4th industrial revolution and the advent of the Internet have increased the heterogeneity and the complexity of the SCs; SC managers are struggling to be responsive to customer demand and needs and, at the same time, to avoid inefficiencies in production (Abderahman et al., 2019). Following the work of previous scholars, IT capabilities could be defined as the company's ability to capture, process and share information to support management decision-making (Ganbold et al., 2020). The advances in modern technologies are an enabler to couple business processes, increase the visibility in the SC, reduce the bullwhip effect and to better share the information among different tiers. As a matter of fact, the exploitative use of IT could improve the level of automation in capturing data and thus, it could overcome problems of coordination between actors in the same SC (Gu et al., 2021). Some scholars have tried to access the impact of the use of IT on the performance of the company; the results show that the relationship is not straightforward, and the implementation of new and smart technologies could also impact in a negative way to firm. In summary, IT could be considered a rare resource and it should not be linked with high levels of operational performance since it can be easily imitated. In addition, other research shows that IT is considered to be an intermediary between the SC and the achievement of sustainable competitive advantages; in this view, the real deal is the ability of companies to develop IT tactically exploiting the possible synergies with the SC (Bader et al., 2020; Cigolini et al., 2022a). Regarding the implementation of IT solutions into supply chain processes, previous scholars have highlighted the importance of data consistency, considered a key element in the definition of a data architecture (Mosca et al., 2022b). as a matter of fact, researchers report problems in the consistency of big distributed database of companies and even bigger problems in the consistency of data among different actors of the SC, resulting in coordination issues and lower margins (Ganbold et al., 2021; Franceschetto et al., 2023). The literature proposes a first classification of IT use in SCM: internal and external IT applications. Internal IT implementation focuses on the sharing of information within the company's manufacturing process; in this regard, enterprise resource planning (ERP) is the most common solution used among firms (Gu et al., 2021). On the other hand, the external use of IT refers to the infrastructure that facilitates the transaction of information among SC partners; the literature has deeply analyzed the impact of this second type of IT and its role as a supply chain innovation (SCI) enabler (Ganbold et al., 2021). Among digitalized companies, the external use of IT does not refer solely to one specific IT tool; as a matter of fact, companies are using instruments such as Customer Relationship Management (CRM), Internet or Cloud Computing (CLCO) to digitalize processes beyond the company's boundaries (Gu et al., 2021). Among the new digital solution for SCM, robotic process automation (RPA) is an emerging technology that is steadily increasing its presence in companies' business processes; as estimated by previous scholars, in the next few years, the RPA's market share is going to increase by 25% per year reaching US$ 3,97 billion before 2025 (Axmann and Harmoko, 2021). In addition, Gartner's studies predicted that companies' investments in RPA are going to reach $1 billion (Chiwoon et al., 2021). One possible definition that can be found in the literature refers to RPA as a technology that emulates human interactions in different systems and it is based on the use of a virtual robot; these robots are programmed to perform tedious tasks, resulting to be both faster and more accurate than humans (Dang et al., 2020). Comparing RPA to non-robotic and standard automation, previous scholars stated that RPA is considered a more lightweight solution, focusing on the front-end user rather than the back-end one (Adams et al., 2019). RPA can be considered a recent technology; therefore, the market is far from being saturated and filled by a few pioneers. Among these, there are three major players in the market offering RPA scalable and robust solutions to companies: UiPath, Automation Anywhere and Blue Prism (Axmann and Harmoko, 2021). Supply chain IT applications for SMEs refer to software and tools specifically designed to support and optimize various aspects of supply chain management for small and medium-sized enterprises (Boysen et al., 2019; Mosca et al, 2022a). It's important to note that the specific requirements of SMEs may vary, and it's recommended to evaluate different applications based on the unique needs and scale of your business.

III. RESEARCH FRAMEWORK

The research framework is on two research questions, shown below, that helped this research in focusing the attention in the right way.

RQ1: How strong is the current link between supply chain management and customer centricity?

Despite supply chain management and customer centricity being well discussed and deepened individually in scientific literature, the link existing between the two has been the subject of limited research (Lamberti, 2013). The marketing function, having the intrinsic objective of increasing sales and customer satisfaction, is the most involved in customer-centric thoughts, at least from the point of view of the customer itself. As well as the previous declaration, also the link between SCM and marketing has not been taken into consideration as it should have been. Nevertheless, these topics and their link are of fundamental importance; one of the most common problems in companies is the misalignment between SCM and marketing functions, leading to inconvenient situations in which sales are boosted way over the company's capabilities to deliver, and orders are not fulfilled, with a consequence represented by unsatisfaction by the customer and a decreased likelihood of future purchases (Pero and Lamberti, 2013). As stated Gligor and Golgeci in their research, these two functions are inextricably intertwined and are viewed as fundamental for firms' performance, they are essential to creating customer value in complex environments. On the other hand, due to the organic nature of firms, each and every function or department has a proper task, with well defined objectives and constraints; this increases the difficulties in integrating efforts between them, especially in the case that is being studied.

RQ2: What is the current digital maturity level in SCM?

As previously stated, by some scholars, the spectrum of studies conducted to explore the impacts of Industry 4.0 in the world of SC is quite scarce (Anosike et al., 2020). In the context of the Industry 4.0 revolution, to reach a satisfying implementation of some new digital technologies in their operation, companies must strive to understand and evaluate their own digital maturity level (Caiado et al., 2021); therefore, companies should not embrace all the possible technologies on the market without having first optimize their present processes and practices. In the literature, several models are proposed to try to classify the overall level of digital maturity and to give the management insights to improve; among the others, this paper is going to focus on the framework proposed by Frederico in 2020. In the model, the four dimensions considered are: managerial and capability supporters, technology levers, processes performance requirements and strategic outcomes.

IV. CASE STUDY

A. *Alpha case*

Alpha is a multinational electronics company. The analysis is going to be made focusing on the Italian department of company Alpha; as a matter of fact, the divisional structure of the company is spread among the 49 countries following two different strategies: some of the countries are managed locally, with autonomous planning and sourcing; on the other hand, the presence in other countries is sustained by exporting and strict relationship with local distributors and wholesalers. Focusing on the SCM function in Alpha, this section is going to access the most important factors and peculiarities of the company's processes and relationships with the other actors of the SC. For decades, the top management of Alpha has been conducting a process of integration of the different activities; this has enabled a high level of vertical integration and an improvement in the control of operation and production, creating a competitive advantage over the main competitors based in Asia. One of the criticalities of the sourcing phase is the fact that the number of SKUs is rather high, since Alpha is operating in different market sectors; the management is trying to exploit the synergies in the inbound flow, merging orders of the different points of sales spread in the country. A SWOT analysis has been performed, focusing on company Alpha both from an internal perspective and an external one (Figure 1)

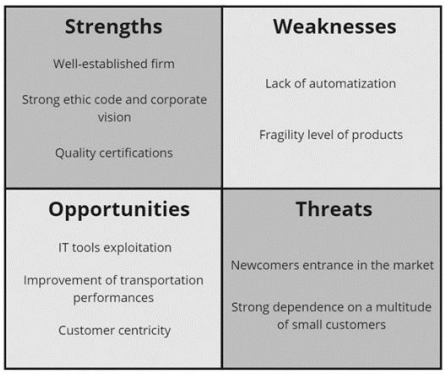

Fig. 1. SWOT analysis of company Alpha

Return management is considered to be a critical part of the processes of Alpha; as a matter of fact, the incidence of customer returns due to defective

products is rather high and it has a negative impact on the company operations. Since RPA (Robotic Process Automation) is about automatizing repetitive tasks, the focus of the practical validation must be on the processes and actions performed by some employees in performing a business process. The management of returns for company Alpha has several criticalities and complexity, increasing the rate of mistakes and low performances offered to customers. The aim of this practical validation is to show how the implementation of an RPA solution could improve significantly the time needed to perform the product returns, achieving almost zero mistakes in managing the process. The possibility to implement a robotic solution to automatize the returns management is aligned with the necessity to relieve the employees from low value-added activities and thus, improve the overall effectiveness of the company. In conclusion, following the work of previous scholars and RPA providers, the final estimation is an overall time reduction of 80%, without considering the strong increase in the overall accuracy and effectiveness.

TABLE I
REQUESTED TIME BEFORE AND
AFTER RPA IMPLEMENTATION

TASK	*TIME without RPA*	*TIME with RPA*
Customer request input	*60 second/request*	*10 second/request*
Research of invoice	*60 second/request*	*20 second/request*
Damage typology input	*10 second/request*	*10 second/request*
Freight costs input	*10 second/request*	*2 second/request*
Final remarks input	*90 second/request*	*2 second/request*
Total time per invoice	*230 second/request*	*44 second/request*
Total time per day	*190 minute/day*	*36 minutes/day*

The model proposed can be considered as a good example to show how a company could improve its performance, keeping a customer-centric approach and focusing on the continuous improvement of the customer experience offered, increasing customer loyalty and retention, and being able to create a sustainable competitive advantage over competitors in the market. Summarizing the previous section of the practical validation, the starting point of the analysis has been the discovery of the common pains suffered by customers in their touchpoints with company Alpha; one of the most critical phases of the relationship is the returns. As a matter of fact, Alpha is seeing an increasing rate of mistakes in the internal management of return processes, which is leading to delays and customer dissatisfaction. In the current way of working Alpha, the routine to manage a single customer return request requires the task performed by one full-time employee, with the ERP interfaces. The tasks performed by the operator are quite simple and repetitive and, in addition, they require some time to input all the necessary data about the damaged product and the related customer into the system. To address the situation, this practical validation has proposed the implementation of an RPA solution to improve the overall performance of the company in the management of returns.

B. Beta case

Beta is a global manufacturer of components and systems of heating, air conditioning and sanitary water. The supply chain in which Beta is involved includes actors and companies operating in different phases, beginning with the supply of the main raw materials – brass and plastic – and ending with the distribution of finished products to customers. Between suppliers and customers, Beta finds its collocation, by covering the entire manufacturing process and by managing all the distribution channels. To proceed with the analysis of the supply chain, it is possible to exploit a SWOT analysis (Figure 2). Beta has a strong purchasing power over brass and plastic suppliers, being the critical ones and those that mainly affect the company's performance in the purchasing process, they also exploit long term contracts that require following minimum service levels, both considering the delivery activities and the quality of the materials.

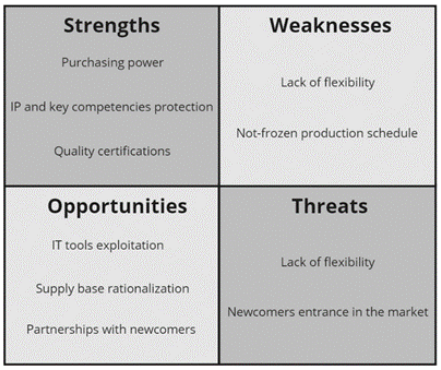

Fig. 2. SWOT analysis of company Beta

Beta is a vertically integrated company, thus the production represents at the same time both its strength and its weakness. Among the six business lines offered, the one which retains the highest number of issues in this respect was the Fire Protection one, which had a service level lower than 20% and a significant portion of stockouts was exceeding three weeks of delay. The relevant cause identified while analyzing the company was safety stock levels, in particular, these were not aligned with market trends and were determined considering out-of-date historical data. Too often

safety stocks are used to cope with stockouts, with a consequently negative effect on customer service level. The intrinsic characteristics of safety stocks, being the ability to cover exceptional variations in demand, were no more valid since the stock was used without any criteria or approach, leading to the consumption of safety stocks even during a period in which demand was steady. The company already knew that the causes were linked to a wrong forecast system and an uncoherent safety stock assessment and management model. To deal with the misalignment between the current safety stock level and the current market trends, it was fundamental to assess again safety stock levels and subsequently automatize the assessment so that the resources and time needed are lower. With an easier and quicker safety stock assessment system the company should be able to iterate the activity with a much higher frequency, avoiding this inconvenient situation. Given this, the proposed solution is oriented to offer a valid and scalable method to cope with safety stock inaccuracy and improve its level, exploiting the use of IT tools, in particular consisting of the implementation of a code to be run in RStudio. The first step that every company should do in this process is the data gathering, analysis and cleaning, to avoid a "Garbage In-Garbage Out" process. Then, the process could actually start, defining the assessment model for safety stock and identifying the KPIs used to monitor the effectiveness and efficiency of the project. With safety stock levels constantly updated companies can offer an improved service level to customers and consequently improved revenues for future operations. Using manual and long processes could lead to a situation in which the assessment is periodically postponed, with the assumption that the effect of these on the company's performance is lower than other more tangible and direct attributes. In the case proposed, SS optimization has led to a reduction of stockouts, identified by comparing the orders in the period analyzed and the sum of available stock and safety stock. Through the new safety stocks level assessment, Beta will also be more flexible and able to face possible demand surges for some products, being more proactive and serving better the market. Companies have the need to monitor IT tools developments and innovations and exploit these to increase their effectiveness and competitiveness in the market. By recognizing that a specific tool could decrease resources invested, or time demanded an activity, firms should be able to constantly improve performances and offer an improved customer experience. IT tools, paired with a customer-centric perspective, are one of the major drivers in the future of many industries.

V. CONCLUSIONS

To conclude this document, it is possible to analyse the overall situations represented in the two practical examples proposed. With the objective of analysing the phases immediately before and after product delivery to the customer, we proposed the first example to show how company Alpha has been able to improve customer satisfaction, while the second to show how Beta managed to increase service level toward the customer. These two examples highlighted the importance of a broader view in a company's operations and decisions, in facts the focus has to be not only on effectiveness and on cost minimization, but the most important aspect to look at is the service toward the customer. Optimizing processes strictly considering internal metrics would lead to efficient and effective companies, but this does not mean that the service level is high. To wrap up the results of the two examples it is possible to look at the following table.

TABLE II
COMPARISON OF IMPROVEMENTS IN THE TWO PRACTICAL EXAMPLES

	Alpha	Beta
Scalability of the system	The RPA created in this example can be used in similar ones, by changing the inputs given.	The overall time requested to fulfil the operation is substantially lower.
Automatization level	The tool performs almost all the operations previously performed by employees, except for the preliminary subjective reading of the e-mail.	Once the input is given, the program proceeds with the assessment of all the values and KPIs.
IT complexity	Once defined the structure of the process and the requirements of the tool, the creation and implementation requested around 3 to 4 working weeks.	The code is a simple example of adoption of programming languages, with a basic safety stocks assessment model.
Cost	Due to a relatively high level of analysis, the cost can be assessed at around 3 to 4 working weeks equivalent.	The overall time requested to analyse the case and create the code has been below a working week, due to the low complexity.
Service level improvement	With a reduction of the time needed to perform the activity of around 70%, employees are now free to focus on value-adding activities.	The service level set as input in the program is now 95%, with an item fill rate increased by 50%.

Through the adoption of IT tools, oriented at the improvement of customer service and customer centricity in the supply chain function, these two companies managed to obtain scalable results, an higher automatization level with a relatively low complexity level. These two firms strongly improved the service level offered to the customer, while at the same time they managed to have a lighter organization and so a more responsive and flexible system. To conclude, nowadays firms should simultaneously monitor the industries to spot any useful IT tool, practice or structure, while re-building the organizational structure considering the customer in the centre of the thoughts. By doing this, customer experience and satisfaction will

increase, and as a result, companies will build bigger and stronger customer base, with consequent improvements in long-term results, also in financial and economic terms.

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