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"DIGITAL TRANSFORMATION AND BUSINESS MODEL INNOVATION IN ITALIAN B2B MANUFACTURING COMPANIES. THE METERSIT CASE"

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Introduction

In the last decade, digital transformation is powerfully dominating the business of many Italian manufacturing companies. In particular, the evolution of new technologies can be considered as the propulsive thrust behind this new attitude, moving away from a traditional approach. In fact, Industry 4.0 represents a radical change in the manufacturing sector, transforming the way factories work and influencing the relationship between products and consumers. Consequently, observing the business models of companies at issue, it is clearly evident that these are undergoing significant transformations. This paper highlights how companies in the first place must be able to identify new models and choose the one that best fits their vision, combining the incoming technology development with the primary necessity to keep pace with the everchanging market environment in which they operate.

The cornerstones of Industry 4.0, such as IoT (Internet of Things), Cloud platforms, Big Data and data analytics, induces manufacturing companies to implement customer centric business models, moving from product logic to solution logic and rethinking their strategies towards a service business orientation. In this context, business models are no more fixed, static and closed frameworks but rather open and dynamic structures, where the creation and capture of value is translating into a collaborative effort within the ecosystem. The digital ecosystem generates value for the entire supply chain, offering companies with more possibilities to improve their service propositions. In an ecosystem, it is important to consider the influence and power that ecosystem actors may have and what strategies can be implemented to improve the position of manufacturing companies within the interconnected systems of interdependent activities.

This work goes through the theoretical foundations behind the concepts of Digital Transformation, Servitization, Business Model Innovation and Ecosystem, with the essential aim to assess the impact of positioning strategies on a manufacturing company's ability to move towards a Digital Servitization path.

The thesis is organized into four chapters.

The first chapter introduces the concept of Industry 4.0 and presents its main technological foundations that are driving the digital transformation path of manufacturing companies. In advance, the chapter, through an accurate analysis of the most recent bibliography, investigates the impact of the current pandemic-induced crisis on this pathway, studying which strategies should be implemented to address the new normal.

The second chapter presents the concepts of Business Model and Business Model Innovation, discussing the relationship between Business Model, dynamic capabilities and strategy. Afterwards, it presents the impact of digital technologies (in particular Internet of Things) on Business Model Innovation, addressing the shifting of manufacturer companies from product-oriented to process- and result-oriented business models. The chapter, finally, deals with the transformation of the business model from the perspective of advanced services, considering digital servitization opportunities as the main impacting factor.

The third chapter deals with the concepts of ecosystem and ecosystem strategies. In advance, the chapter investigates how manufacturing companies can capture most of the value created within the ecosystem, and how they can delineate their positioning in respect to other players.

The fourth and final chapter presents the case of MeteRSit, an Italian manufacturing company, based in Padua. After introducing the company and the methodology used in the research, the chapter explores how this company has approached the digital transformation process. Afterwords, a description of the market and MeteRSit's positioning in comparison to other players in the ecosystem is presented. Finally, given the context in which the company operates and given the evidences resulting from the previous chapters three possible future scenarios for MeteRsit's business are proposed.

1 The digital transformation of products, services and production in B2B industries

1.1 Industry 4.0, Internet of Things and Data: how smart products impact the manufacturing scenario

Technological advances lead to substantial increases in industrial productivity since the beginning of the Industrial Revolution (Rüßmann et al., 2015). The first industrial revolution started at the end of the 18th century with the introduction of mechanization in industries. As a result of this mechanization, agriculture started to be replaced by the industry as the pillar of the societal economy. The second industrial revolution started at the end of 19th century with new sources of energy and mass production. The third industrial revolution began in the second half of the 20th century, bringing forth the rise of electronics, telecommunications, computers and Internet (Khan & Turowski, 2016). According to the literature, nowadays we are witnesses of the beginning of a fourth industrial revolution. It began at the turn of this century and it builds on the digital revolution (Schwab, 2016). The fourth industrial revolution is distinct from the first three industrial revolutions since it is characterized by the application of cyber-physical systems (CPS), Internet of Things (IoT) and cloud computing (Liu and Xu, 2017). In analyzing the requirements of each industrial revolution in terms of what portion of the existing production equipment have to be replaced in order to realize the promised potential, McKinsey (2015) states that the fourth industrial revolution will require relatively little replacement. Specifically, in the time of Industry 4.0, companies expect to replace a portion of 40 to 50 percent of the existing installed base of manufacturing equipment. The main requirement that manufacturing companies have to meet is the upgrade of existing tools, mainly in the field of connectivity. Porter & Heppelmann (2015) state that connectivity offered by latest technologies is driving the development of new products and processes, together with new business models. The rationale behind the aforementioned connectivity is that autonomous physical systems will perform operations intelligently, since they are connected with one another and environment (Khan & Turowski, 2016). The intended effect is the creation of a smart network between individuals, products, machines and systems and the aim is to achieve higher value for both customers and the companies' internal processes (Frank et al., 2019).

The concept of Industry 4.0 was firstly introduced by the German Government at the 2011 Hanover Fair, and in 2013 the German Government released the Recommendations for Implementing the Strategic Initiative Industry 4.0. In this document, Kagermann et al. (2013) define Industry 4.0 as follows:

"Industry 4.0 will involve the technical integration of Cyber-Physical Production Systems into manufacturing and logistics and the use of the Internet of Things and Services in industrial processes". In line with this definition and according to literature (European Parliament, 2015; Rejikumar et al., 2019; Hermann et al., 2015) it is possible to state that Industry 4.0 depends on four key components: Cyber-physical system (CPS), Internet of Things (IoT), Internet of Service (IoS) and Smart Factories.

It is important to point out that the aforementioned literature does not consider Machine-to-machine communication and smart products as independent components of industry 4.0. Machine-to-machine communication is considered as an enabler of the IoT and smart products are identified as a sub-component of CPS. In addition, Hermann et al. (2015), in line with Kagermann (2014), recognizes big data and cloud computing as data services which utilize the data coming from Industry 4.0 implementations, but not as independent Industry 4.0 components.

The four main components are introduced below and they will be discussed in more detail during the paragraph.

• Cyber-physical systems (CPS)

Monostori (2014) defines CPS as "systems of collaborating computational entities which are in intensive connection with the surrounding physical world and its on-going processes, providing and using, at the same time, data-accessing and data-processing services available on the internet". Another definition of CPS was released by Rajkumar et al. (2010), that defined them as "physical and engineered systems whose operations are monitored, controlled, coordinated, and integrated by a computing and communicating core".

In other words, in CPS, physical objects are required to be matched with their representation in the digital world. Moreover, it is necessary to integrate physical objects with elements equipped with computing, storage and communication capabilities, and to create a network between each other. The term "physical" refers to the object as it is perceived by our five senses, while the term "cyber" refers to the virtual image that reflects the world to which the real object belongs, while providing more information about it.

In the manufacturing environment, CPS embrace smart machines, storage systems and production facilities, having the potential to exchange information between them, trigger actions and control each other (Kagermann et al., 2013).

• Internet of Things (IoT)

Xu, He and Li (2014) defines IoT as a global network infrastructure composed of numerous connected devices that rely on sensory, communication, networking, and information processing technologies. The IoT is the fundamental technological element for passing from stand-alone and isolated "things" to smart and connected products (Fleisch, Weinberger, & Wortmann, 2014). With the progresses in the fields of wireless communication and sensor network, an increasing number of smart objects are being involved in IoT. Meanwhile, these IoT-related technologies also had a substantial impact on ICT and CPS, thus paving the way for the realization of Industry 4.0 (Xu et al., 2018).

• Internet of Services (IoS)

Although it is not addressed in many papers as the IoT theme is, the Internet of Services is considered by many authors (Hermann et al., 2015; Kagermann et al., 2013) as one of the main pillars of Industry 4.0. While IoT deals with tangible objects (i.e. sensors, as an example), the IoS covers a more abstract set of features, carrying the concept of Service-Oriented Architecture (ReisGonçalves, 2018). According to Papazoglou (2003), Service Oriented Architecture is a model that "reorganize software applications and infrastructure into a set of interacting services". The IoS, in fact, describes "an infrastructure that uses the Internet as a medium for offering and selling services, with the result that services become tradable goods" (Cardoso et al., 2008).

• Smart factory

According to Kagermann et al. (2013), smart factories constitute a key feature of Industry 4.0 because they have the potential to manage complexity and to manufacture goods more efficiently. In the smart factory, people, machines and assets communicate with each other. In other words, taking into consideration the definitions given for CPS and for the IoT, the Smart Factory can be defined as a factory where CPS interface with the IoT and assist people and machines in the execution of their tasks (Hermann et al., 2015).

Looking at the current scenario of manufacturing industries, two of the most important technology progresses are IoT and big data (Rüßmann et al., 2015) since they enable the sharing of information and improve the flexibility of the production chain (Costa et al., 2018).

The concept of the Internet of Things was initiated by the British entrepreneur Kevin Ashto, that in 1999 described a system in which the material world exchanges data with computers with a network of sensors (Witkowski, 2017). Ten years later, with the rapid growth of smartphones and tablet PCs, the number of devices connected to the network exceeded the number of world's inhabitants (1.84 devices per person). This moment, according to Evans (2011), represents the birth of the "Internet of Things". As already mentioned, Internet of Things (IoT), together with the digitalization and automation of industrial manufacturing, are considered as the factors that have initiated the fourth industrial revolution (Lampropoulos et al., 2019). Atzori et al. (2010) define IoT as "a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols". Nowadays, the term IoT is used to indicate "a network of entities that are connected through any form of sensor, enabling these entities to be located, identified, and even operated upon without any human interference" (Falkenreck & Wagner, 2017). What is implied in Internet of Things, according to Vermesan et al. (2009), is a symbiotic interaction between the real/physical world and the digital/virtual world. This means that things become context-aware and they can exchange information, data and knowledge "anytime, anyplace, with anything and anyone, ideally using any network and any service" (Vermesan et al., 2009). In relation to this, Witkowski (2017) states that there are three distinguishing features of the Internet of things: context, omnipresence and optimization. The context describes the capability of IoT to provide real-time information (i.e. location and physical condition) and to enable an instant response to change. Omnipresence illustrates the pervasiveness of the technology and its wide applicability. Optimization refers to the functionality that each object has.

IoT technologies seem to be widely implemented in mainstream business use. The number of businesses adopting IoT technologies is increasing, as well as the number of IoT-connected devices, predicted to reach 43 billion by 2023 all over the world (McKinsey & Company, 2019) Internet of things might assist companies in increasing their competitiveness by conceiving new ways for improving existing processes or transactions with the aim to transform their products and services into digital business opportunities (Sestino et al., 2020; Krotov, 2017). More in particular, in the management field, the benefits of IoT are spread to both consumers and businesses: for the first ones by giving support to their choices in consumption and use of products and services; for the second ones by regulating and monitoring industrial systems (Sestino et al., 2020), leading to improve machine efficiency and save maintenance costs (Falkenreck & Wagner, 2017). In this regard, the literature has defined a specific category of IoT, focused on its applications in modern industries and intelligent manufacturing, called Industrial Internet of things (IIoT).

In all its applications, IoT engages in the continuous exchange of a huge quantity of data, commonly referred to as Big Data. According to Manyika et al. (2011) Big Data simply refers to "datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze". De Mauro et al., in 2016, propose a new formal definition for the term: "Big Data is the information asset characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value". In advance, according to the literature (Lampropoulos et al., 2019; Sestino et al. 2020; Lycett, 2013; McAfee & Brynjolfsson, 2012), there are at least five key factors that differentiate Big data from traditional data: velocity, volume, variety, veracity, and value. Velocity indicates the speediness at which data are generated. Real-time or nearly real-time information allows companies to be able to make business decisions as quickly as possible (McAfee & Brynjolfsson, 2012). With regards to Volume, it refers to the fact that the quantity of data is very large, reaching the measure of Zettabyte (a billion Terabyte). Instead, Variety refers to the different types of data available today, coming from an increasing number of heterogeneous sources, not only business management systems, but also sensors, social networks, open data. Veracity indicates data reliability, which is a synonym of data quality. The data must tell the truth, and with Big Data, this challenge is even more difficult to face. In fact, since data management technologies change, the speed at which data is collected changes and sources increase. However, the quality and integrity of the information remains essential pillars to create useful and reliable analysis. The last factor is Value, which refers to how useful the data is in decision making (Gutta, 2020). Big Data has been defined in recent years as the new oil or the new gold, an invaluable source of value. The extraction of the value from a great quantity of data through powerful algorithms is the key to improve competitiveness (Qi & Tao, 2018), because it enables companies to create new products and services, enhance existing ones, and develop new business models (Manyika et al., 2011).

A good example is provided by manufacturing companies. With the aim of better matching customer needs, they analyze the data obtained from the use of their products to improve future products' features, but also to create innovative after-sales service offerings.

Nevertheless, nowadays the concept of Data Management is increasingly widespread. Data Management comprises all disciplines related to managing data as a valuable resource, i.e. the development, execution and supervision of plans, policies, programs and practices that control, protect and enhance the value of data and information activities. Currently, a correct Data Management strategy should take into account some important considerations. At first, Big Data sources continue to evolve and grow: a huge amount of new data continues to be generated not only from internal business sources, but also from public resources (such as web and social media), mobile platforms and, as already said, from things and sensors. In line with a logic of continuous improvement, for companies it becomes essential to identify new sources and incorporate them into data management platforms. It also becomes fundamental to be able to collect all the data useful for the company. But since their usefulness is not often assessable a priori, it is necessary (and challenging) to store all the data (even those that are not useful) and make them available where needed. Then, it is necessary to define the meaning of big data collected, that consists in adopting approaches that generate 'insights' useful for decision-making processes through analytics tools. According to Souza (2014), it is possible to classify analytics techniques into three types: descriptive, predictive, and prescriptive. Descriptive analytics is the set of tools oriented to describe the current and past situation of business processes and/or functional areas. These tools allow companies to access data according to flexible logical views and to display the main performance indicators. Instantaneous information about the position of goods in the supply chain, for example, allow managers to make adjustments to delivery schedules, transportation modes, place replenishment orders, and so forth. (Souza, 2014). Predictive analytics is the set of advanced tools that, through the analysis of data, try to predict what might happen in the future. They are characterized by mathematical techniques such as regression and forecasting. Lastly, prescriptive analytics, entails advanced mathematical and computational applications with the aim to propose to the decision maker operational/strategic solutions based on the results of descriptive and predictive analytics.

According to the survey of the Politecnico di Milano Observatory (Di Deo et al., 2019), the Italian market of Big Data Analytics is dynamic and increasingly mature, with companies that show an advanced level of technology use, complex experimentation and Data Science skills. In 2019 the Analytics market reached a value of 1.7 billion euros, with an increase of 23% compared to the past year and more than double that of 2015 (790 million), from which it grew at an average annual rate of 21.3%.

In this context, Cloud computing is playing a significant role in the storage and management of an enormous amount of data. Cloud computing (or simply "Cloud") is "a kind of outsourcing that combines large numbers of compute servers and resources so as to offer, in real time, computer programs, high-level services and resources on an on-demand or pay-per-cycle basis" (Lampropoulos et al., 2018). Wang et al. (2010) provide another definition of Cloud computing, which is "a set of network enabled services, providing scalable, QoS guaranteed, normally personalized, inexpensive computing infrastructure on demand, which could be accessed in a simple and pervasive way".

According to Bhardwaj et al. (2010), there are three types of services that can be provided using cloud facilities: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a service (IaaS). The first type of service is a model that contains applications and software systems, accessible from any type of device (computer, smartphone, tablet, etc.), through the use of an interface. In this way, the user does not have to care about managing resources and infrastructure, as they are controlled by the provider. Examples of Saas are iCloud, Microsoft Office 365 and Oracle. In the case of Platform as a Service (PaaS) the provider furnish of the hardware infrastructure, while the user will have to install the operating system and develop its application. Infrastructure-as-a-Service (IaaS) is a model in which virtualized hardware resources are provided, so that users can create and manage, according to their needs, their own

infrastructure in the cloud, without worrying about where the resources are allocated.
The main difference between IaaS, PaaS and SaaS essentially consists in the level of management detained by the company with respect to the service provider (Figure 1). Every business may prefer one solution over another according to its need for flexibility and customization. For example, IaaS are standard solutions that require more monitoring and management than SaaS applications, but at the same time they allow higher level of control and flexibility (INAP, 2020).

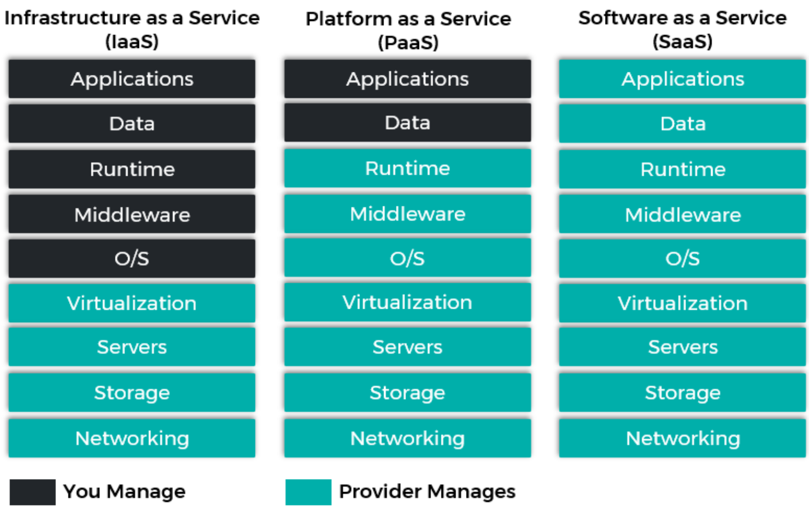

Figure 1 - Differences Between IaaS, PaaS and SaaS

Source: INAP, 2020

In addition to technologies, what companies need are talents with "critical analytical and IT skills, business and domain knowledge, and communication skills" (Chen et al., 2012). Then, a cultural evolution should go along with this process, involving all the company's people and encouraging them to integrate data management into decision-making processes. In other words, according to McAfee and Brynjolfsson (2012), decision-making culture of enterprise have to take into consideration that even if the potential of big data and analytic tools increase exponentially, the need for human insight should not be underrated. In order to capture the full potential of Big data, it is necessary to take into account another factor: the industry structure. Sectors in which there is a low competitive intensity and low transparency of performance are inclined to be slow to take advantage from big data. In other words, lack of competitive pressure limits the efficiency and productivity (Manyika et al., 2011) and leads to difficulties in capturing the potential value from using big data.
Once the key components of Industry 4.0 have been listed, according to the literature (Hermann et al., 2015; Mrugalska & Wyrwicka, 2017), it is useful to define the following set of principles,

underlying the realization of Industry 4.0 (design principles). These concepts assist professionals in the ideation and creation of solutions within their company:

• Interoperability

Ability of systems to interact and communicate with other systems to exchange data and coordinate activities;

• Virtualization

Realization of a virtual copy of physical objects;

• Real time capability

Ability to collect and analyze data in real time;

• Modularity

Ability to adapt to changing requirements by replacing or expanding individual module (Swisslog, 2018);

• Service orientation

The services of companies are available over the Internet of Service and can be used by other contributors;

• Decentralization

The increasing demand for individual products makes it difficult to control systems centrally.

The analysis of the most recent publications has highlighted some interesting links between these principles. Virtualization and real time capability are extremely connected, since Industry 4.0 is based on cumulative data obtained in real time and, on the other hand, the real time capability is deeply supported by the Industry 4.0 technologies such as the Internet of Things. With the final goal of responding dynamically to changes in the market, modularity is a necessary condition for the personalization of the product. Modularity consists in shifting from rigid systems and inflexible production models to an agile system that can flexibly adapt to an ever-changing circumstances (Gilchrist, 2016).

Going back to a more general vision of the fourth industrial revolution, it is interesting to underline that for the first time in history, an industrial revolution is predicted a-priori, not observed ex-post (Drath, 2014 in Hermann et al. 2015). This gives companies a very important opportunity to shape the future. Moreover, the economic impact of the fourth industrial revolution is expected to be remarkable. For this reason, companies should invest in Industry 4.0 not only for the achievement of a short-term economic advantage, but also to enhance their competitive model (Porter & Heppelmann, 2014).

1.2 Digital transformation and new business models in B2B industries: from smart product to smart services

Changing social and market contexts are leading organizations to a fundamental change in business logic. Nowadays, there are only few companies that do not feel the urgency of acquiring a higher level of agility to meet customer expectations and to face the challenges and opportunities offered by digital technologies. These technologies are capable of upsetting existing business models, competitive advantage or established best practice, altering the way entire markets operate. More specifically, global competition, access to information and industrial imitation contribute to levelling competitive differences, requiring companies to innovate products, services and solutions (Töytäri, 2018).

Digital technologies also imply consequences for people working within organizations, since they need to learn new skills, change attitudes, or even the corporate culture. In this regard, Fitzgerald et al. (2014) define digital transformation as "the use of new digital technologies (social media, mobile, analytics or embedded devices) to enable major business improvements such as enhancing customer experience, streamlining operations, or creating new business models".

Industry 4.0 promotes a substantial improvement in operational effectiveness and also the implementation of new business models (Kagermann et al., 2013; Falkenreck & Wagner, 2017), migrating from the ordinary product-centric approaches to (digitally-based) service-oriented ones (Paiola & Gebauer, 2020). Nowadays, in fact, design and delivery of services are key capabilities to compete in complex manufacturing markets (Baines et al., 2017). Product-related services are implemented to enrich the value offering, with the aim to achieve competitive advantage and to distinguish from the competitors (Kryvinska et al., 2014).

In this regard David L. Rogers, in his book "The digital transformation playbook" (2016), identified five key domains of strategy that digital forces are remodeling: customers, competition, data, innovation, and value. This analysis is presented below and in figure 2.

The first area of digital transformation regards customers. In the digital age, customers are dynamically connected and the ways in which they interact are changing their relationships to business. According to Berman (2012), the customer is very knowledgeable by social networks, where personal and business contacts, but also many information about products are easily shared. The same is true for B2B purchases, since also business buyers are going to seek independent information and advices before making a purchase.

	From	To
Customers (chapter 2)	Customers as mass market	Customers as dynamic network
	Communications are broadcast to customers	Communications are two-way
	Firm is the key influencer	Customers are the key influencer
	Marketing to persuade purchase	Marketing to inspire purchase, loyalty, advocacy
	One-way value flows	Reciprocal value flows
	Economies of (firm) scale	Economies of (customer) value
Competition (chapter 3)	Competition within defined industries	Competition across fluid industries
	Clear distinctions between partners and rivals	Blurred distinctions between partners and rivals
	Competition is a zero-sum game	Competitors cooperate in key areas
	Key assets are held inside the firm	Key assets reside in outside networks
	Products with unique features and benefits	Platforms with partners who exchange value
	A few dominant competitors per category	Winner-takes-all due to network effects
Data (chapter 4)	Data is expensive to generate in firm	Data is continuously generated everywhere
	Challenge of data is storing and managing it	Challenge of data is turning it into valuable information
	Firms make use only of structured data	Unstructured data is increasingly usable and valuable
	Data is managed in operational silos	Value of data is in connecting it across silos
	Data is a tool for optimizing processes	Data is a key intangible asset for value creation
Innovation (chapter 5)	Decisions made based on intuition and seniority	Decisions made based on testing and validating
	Testing ideas is expensive, slow, and difficult	Testing ideas is cheap, fast, and easy
	Experiments conducted infrequently, by experts	Experiments conducted constantly, by everyone
	Challenge of innovation is to find the right solution	Challenge of innovation is to solve the right problem
	Failure is avoided at all cost	Failures are learned from, early and cheaply
	Focus is on the "finished" product	Focus is on minimum viable prototypes and iteration after launch
Value (chapter 6)	Value proposition defined by industry	Value proposition defined by changing customer needs
	Execute your current value proposition	Uncover the next opportunity for customer value
	Optimize your business model as long as possible	Evolve before you must, to stay ahead of the curve
	Judge change by how it impacts your current business	Judge change by how it could create your next business
	Market success allows for complacency	"Only the paranoid survive"

Figure 2 - Changes in Strategic Assumptions from the Analog to the Digital Age

Source: Rogers, 2016

According to Salesforce (2018), the 82% of corporate buyers want a quality shopping experience equal to that of their personal purchases. In addition, the 78% are looking for commercial employees able to operate as trusted advisors. Finally, the 73% think that their standards for interacting with other companies are at the highest levels than ever and the 72% expect that suppliers will customize their engagement according to their needs. In relation to this, the role of buyers is becoming more and more articulated, looking for greater efficiency and larger suppliers. B2B customers measure and analyze their purchasing practices in a timely manner and adopt strategies aimed at managing effectively their supplier portfolio.

In sum, the use of digital tools by customers is changing the way they “discover, evaluate, purchase, and use products and how they share, interact, and stay connected with brands” (Rogers, 2016). As a result, companies are pushed to adopt customer centric business model. The direction of companies towards services, together with the concept of solution, are leading to reconsider different aspects of the business towards a value-based solution perspective (Töytäri & Rajala, 2015).

Value-based solutions’ proposition requires a different business logic to be successful. The implementation of a solution requires the exchange of information and the evaluation of alternatives based on the created value. This leads to a joint commitment for value creation (Töytäri, 2018). In other words, buyers and sellers, in a perspective of value co-creation, implement products and services within the customer's business, adapting them to fulfill very specific needs for the solution of customer problems (Viio & Grönroos, 2014; Ulaga & Kohli, 2018). On this point, Töytäri (2018) explains schematically the differences between Product logic and Solution logic (Figure 3), clarifying that the transition from product logic to solution logic is not an easy task. Obstacles to change are identified by Töytäri, Keränen, & Rajala (2017) in the product-oriented sales culture, predominant management practices, IT systems implementation, and path dependence in organizational principles.

Key dimensions	Product logic	Solution logic
Exchange focus	Transaction	Relationship
Optimization focus	Exchange value (e.g. Capex)	Use value (e.g. Capex + Opex)
Exchange scope	Product	Solution
Temporal focus	Short-term	Long-term
Relationship logic	Independence for value capturing power	Partnership for joint value creation
Initiator	Buyer	Seller
Market phase	Commoditized	Innovation
Solution vision	Buyer’s	Jointly created
Value sharing reference	Supplier cost	Customer value

Figure 3 - Key differences between value capture and value creation-focused strategies

Source: Töytäri, 2018

Because of this transaction towards a serviticized, knowledge-driven economy, a new approach to value creation is emerging: value is no longer incorporated into the products or services exchanged between buyers and sellers, but it originates in relationships (Corsaro, 2018). In this way, as is shown in figure 4, the exchange value is transformed into value-in-use and supplier and customer share the responsibility of co-creating value-in-use through their joint resource integration (Eggert et al. 2018).

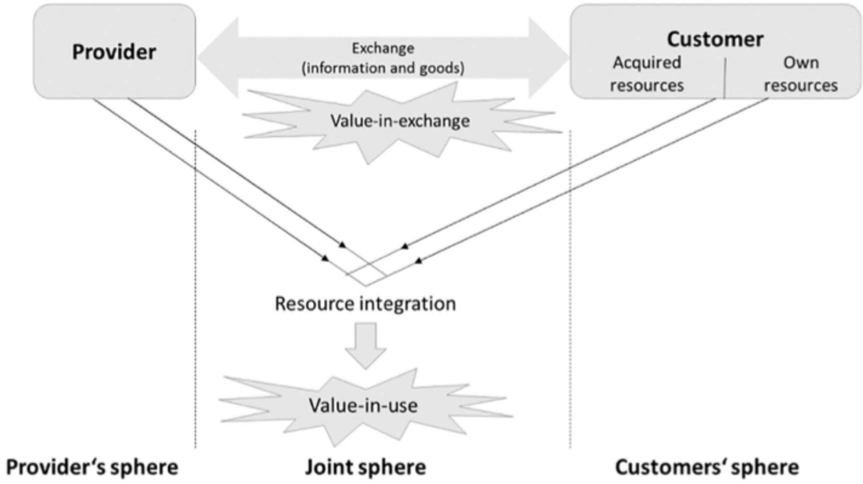

Figure 4 - The Resource Integration View of Marketing

Source: Eggert et al. 2018

On this point, Macdonald et al. (2016) point out that since the value proposition is jointly designed by the supplier and the customer, it depends "on the quality not only of the supplier's resources and processes but also of customer resources and processes as well as of the joint resource integration process […] and the value that arises is not predetermined and simply verified but is, rather, continually optimized by both parties".

The logical consequence of the above is that buyers are demanding more value, not only from products or services but also from the relationship, and they want to access qualified supplier capabilities in the best possible terms and conditions (Cuevas, 2018).

The second domain of digital transformation is competition. Competition and cooperation were generally seen as two opposite sides. Nowadays many companies have to consider asymmetric competitors, i.e. companies belonging to other industries but that offer competing value to customers. At the same time, companies may have an incentive to cooperate with their competitors, due to interdependent business models. According to Aagaard (2019) the result is a business ecosystem, that is characterized by high complexity, interdependence, cooperation, competition and coevolution. In particular, the relationship between two or more companies simultaneously involved in cooperative and competitive interactions is defined as coopetition (Nalebuff & Brandenburger, 1996 in Ritala, Golnam & Wegmann, 2014). This type of relationship could lead to a "cooperative advantage" and to a win-win situation, even if it pursues "two co-existing contradictory forces with conflicting goals" (Fang et al., 2011 in Chai et al., 2018). It is easy to imagine that when companies pursue cooperation and competition at the same time, tension arises. Firms need to work together to create value, but also to compete with each other to gain a greater share of the value. The key factor which determines the success

of coopetition is the companies' ability to manage this tension.
Ritala et al. (2014), investigate how the potential benefits of coopetition can be realized as part of an individual firm's business model and they show that such non-traditional strategies and business models can lead to a positive result for each actor involved. Other authors also state that the generic drivers of coopetition-based business models consist in increasing the size of the current markets, creating new markets, efficiency in resource utilization, and improving the firms' competitive position (Ritala et al., 2013). In order to fully understand the concept of a coopetition-based business model, it is useful to present one of the examples that best represents the concept: Amazon marketplace.
Amazon marketplace is the ecommerce platform offered by Amazon to third party sellers. For Italian third party sellers the cost is 39 euros per month and a commission on each transaction ranging from 7 to 45% (in the first case for computer products, in the last case for accessories for Amazon products). Sellers can use Amazon's logistics for delivery or they can ship the items themselves. With regard to collaboration, Amazon has provided independent sellers with tools that allowed them to transfer their catalogs of books to the Amazon pages in an immediate way. This gave sellers the opportunity to promote the sale of their books on the highly trafficked web pages that, up to that moment, had sold Amazon products only. Amazon, in addition, has provided a feature that gives buyers the possibility to see, for every product page, the complete list of prices of a single item charged also by other sellers. In this way Amazon collaborates with the bookstores and, at the same time, competes in a price competition to win the customer orders (Ritala et al., 2014). In sum, if a third party is able to offer better terms of purchase on an item, Amazon allows customers to get access to that offer. It is important to say that this decision was situated within the overall customer-oriented approach of Amazon.com. Amazon Marketplace was deemed a success, firstly in terms of lowering of operating expenses due to a lower need to store products. Secondly it was a success in terms of revenues, since the combination of commissions and subscriptions ensures Amazon a good money flow, regardless of whether customers buy from Amazon or not. This type of coopetition-based business model has been favorable also to small bookstores: Amazon Marketplace gave them the chance to present their offerings to a very huge number of potential customers.

The third domain of digital transformation is data. As widely said in the last paragraph, nowadays data constitutes a fundamental part of how every business operates, differentiates itself in the market, and creates new value. While traditionally data was collected through planned measurements, in the digital age a huge amount of data is generated from conversations, interactions and processes taking place inside or outside the company.

The fourth area of digital transformation is innovation, as digital technologies are reshaping the ways businesses innovate. Nowadays, unlike the past, technologies allow for a cheaper way to make tests and experimentation. This leads to a very different approach to innovation, based on constant learning through rapid and continuous experimentation and market feedback.
This approach comes from the Lean Startup Method and it proposes a continuous design-verification-modification process, with massive use of the web, aimed at adapting the product step by step to the needs of customers, keeping costs under control. According to Blank (2013), the ones that succeed go quickly "from failure to failure, all the while adapting, iterating on and improving their initial ideas as they continually learn from customers". The Lean Startup Method is widely used for innovating business model and it will discussed in the next chapter.
As manufacturing companies move toward digital servitization (as it will largely explain in next chapter), Sjödin et al. (2020) argues that "agile innovation processes inspired by the software industry may provide the necessary flexibility to succeed". The authors also explain that agile project management focuses on two principles: risk minimization by providing short iterations of defined deliverables and co-creative communication with partners in the development process (Sjödin, et al., 2020).

The final domain of digital transformation is the value delivered to customers.
Technological innovation of product and process opens the way to innovation of the functionalities and services offered to the customer, generating new relationships in the ecosystem (suppliers, partners, company, customers) and new service-oriented business models.
In a customer-centric perspective, this step relies on the introduction of smart services. It is possible to define the service as smart when it is fundamentally delivered in such a way as to anticipate the problems and needs of the customers, thanks to the use of ICT technologies that facilitate the acquisition and processing of contextual data (Rapaccini, 2015).
There are three elements through which a service can become smart: artificial intelligence at the base, connectivity and co-creation of value by the customer of the service.
The smart services are considered central in an optical of value-in-use since they allow to:
• reduce costs incurred by the customer and the supplier, thanks to the reduction of human intervention during the delivery process;
• increase market volumes as a result of greater accessibility to the service for customers;

• increase the degree of innovation, thanks to the modular architecture at the base of smart services, which facilitates the development of further services and solutions by emerging players in the ecosystem.

According to the work of Berman and Bell (2011), in the digital age, using information from data and analytics, organizations can redesign the customer value proposition on three levels: enhancing, extending or redefining the value of the customer experience.
In the first case, the value proposition made of traditional products or service can be extended with digital attributes and services. Extending the value proposition means finding new ways to cash in from these features. The aim is to add new revenue streams. In the case of a redefinition of the value of the customer experience, companies transform the entire customer value proposition, replacing physical with digital or building fully integrated digital/physical value and revenue (Berman & Bell, 2011).
According to the authors' path, like the redesigning of customer value proposition, also the reconfiguring of operating model can be seen as a three stages process.
Generally, companies first create the basic tools and capabilities to engage customers across multiple touchpoints. The second stage of operational transformation consists in exploiting information and relationships across channels, business units and supply chain partners. The third and last stage of operating transformation consists in optimizing all elements of the value chain around customer touch-points (Berman & Bell, 2011).
Given the two process just described, the aforementioned research shows that the strategic journey to digital transformation can be achieved through three paths.
As shown in Figure 5, the first path put firstly the focus on the creation and integration of digital operation and then, in order to achieve the full transformation, on the customer value proposition. The second path consists in the opposite route, starting from the enhancement of the customer value proposition. The third path combine two approaches, improving at the same time value proposition and operations capabilities.
This last path, nowadays, seems to be the most promising, allowing companies that are able to do that, to have a unique position to gain leadership in the industry.
Confirming the above, Bhattacharya et al. (2018) state, with a more global view, that "the new global era creates enormous opportunities for companies that develop the right value propositions and the organizations to deliver them".

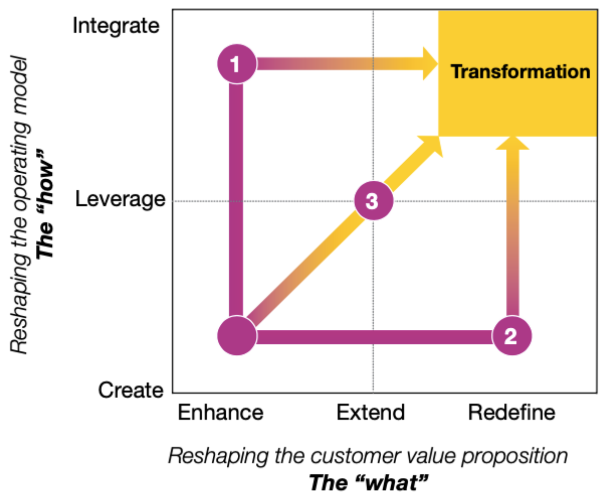

Figure 5 - Paths to digital transformation

Source: Berman & Bell, 2011

Berman & Bell (2011) also state that companies that want to perform an effective digital transformation path should focus on acquiring key competencies, such as the ability to build customer value as a foundational competency for industry, revenue and business models, drive customer centricity across every part of the organization and integrate all customer touch points through digital and physical channels; integrate information across internal and external sources and leverage the predictive power of advanced analytics; optimize all elements of the supply chain and give to workforce the right competencies aligned around the right business opportunities.

1.3 Manufacturers digitalization in the post Covid-19 next normal

During 2020 the world is witnessing a global pandemic that caused vast economic breakdown across the world, as customer demand and industry activity and confidence have collapsed. In March 2020, Member States of European Union introduced containment measures, with a significant impact on industrial production. The seasonally adjusted industrial production fell by 10.4% in the EU, compared with February 2020 (Eurostat, 2020). According to the Internal Labour Organization (2020), manufacturing is one of the most affected sectors in terms of the negative impact on economic output. In Italy the impact of Covid-19 on manufacturing was the drastic drop in production and orders, respectively -33.8% and -51.6% in May 2020 compared to May 2019.

All the world's leaders have wondered how to deal with such a calamity and how, once the immediate crisis is over and restrictions are gradually removed, companies can rebound and return to a "next normal" and build resilience for future disruptive crises (Rapaccini, et al., 2020). ASAP SMF in collaboration with Digital Transformation Lab (Adrodegari et al., 2020) develop a research which investigates the role of services in dealing with the Covid crisis in the period between mid-March and early April 2020. The survey involved 180 companies, of which 145 classified as "product-centric" (manufacturing or distribution companies and service companies on physical products operating mostly in the capital goods or durable goods sectors). From this research it emerges that while the challenges that Covid has posed to companies are primarily related to survival during the crisis and the restart of the economy, the perception of managers is that in the following phases other equally important challenges await companies, asking them to evolve towards a new future.

More in particular, the results that emerged in the time period analyzed (March-April 2020) show that the business of selling products/systems/plants had a much more negative scenario than selling of services. The 66% of companies expect a high or very high impact in terms of reduction of the "product" business, while this percentage drops to 49% for the services business associated with the products. These types of services consist, for example, in the sale of spare parts, reactive maintenance activities (request by the customer) or preventive/proactive maintenance activities (by default or on the basis of evidence related to the usage of the asset), customer training, consulting and optimization of the product's operation in users. If the investments in purchase of new goods will be slowed down, the decrease will happen in much smaller measure for the demand of these services. Furthermore, if the decline in the sale of new/produced plants will continue, the business of services to the product will tend to grow, due to the greater seniority of the installed equipment, which will require more maintenance. A possible explanation of these results is that the offer of services related to the product is less affected by economic cycles and it requires more intense and close interactions with customers, strengthening their loyalty, and it is an element of differentiation from the competition. Services also enable companies to gain a better understanding of their customers' operations, strategies and organization (Kowalkowski & Ulaga, 2017 in Rapaccini et al., 2020; Adrodegari et al., 2020). On this aspect another relevant result emerges from the survey. The most advanced services, i.e. those that create more value for the client, and that often require even less physical presence of the supplier, are those less impacted by the crisis. In the same way, alternative business models to pure sale are less impacted: leasing or renting, or more advanced revenue models such as "pay-x-use" or "pay-x-performance”.

Futhermore, increasing the rate of digitalization in service delivery and in the service portfolio seems to be for most companies a good solution to mitigate the crisis. Confirming this, the results show that about 57% of the respondents said that their innovation initiatives regarding the introduction of new service technologies and the development of new digital services will be highly accelerated by the pandemic.

Starting from the data collected in phase 1 (March-April 2020), the research of Adrodegari and other authors (2020) also proposes a four-phases reaction model that described Covid crisis according to different time periods and different actions of adaptation and evolution. This model was then reported in an international publication on Industrial Marketing Management journal (Rapaccini et al. 2020) and it is shown in figure 6.

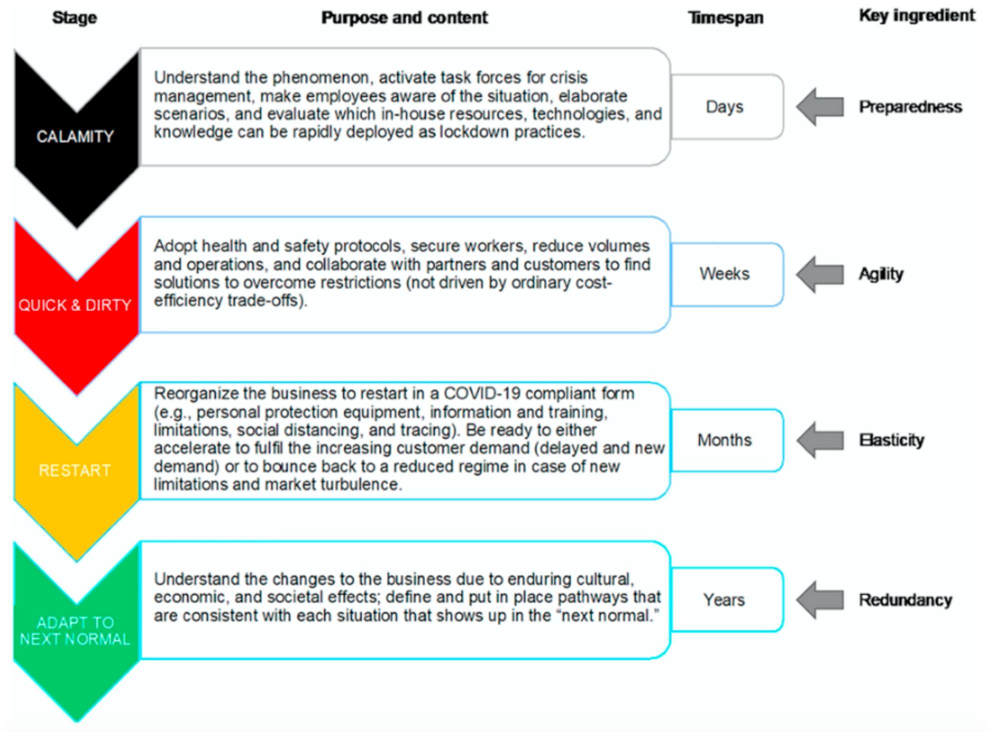

Figure 6 - A four-step COVID-19 crisis management model

Source: Rapaccini et al. 2020

In order to address the crisis and build resilience during the next normal, companies should intervene at every stage of the crisis management model. The key ingredients of resilience linked to every phase are Preparedness, Agility, Elasticity and Redundancy and they are described in the following table (Kowalkowski et al., 2020).

Preparedness	Reflect on the needs to rebuild the business, searching for new opportunities and enacting new ideas for development after the crisis.
Agility	Adapt or respond rapidly to a changing environment both in terms of volume and variety.
Elasticity	Increase the exchangeability and flexibility of relationships among people and things within the firm and the wider ecosystem.
Redundancy	Slacks of modular resources that can be rapidly activated to reconfigure the value network.

Table 1 - Key ingredients of resilience

Source: Kowalkowski et al., 2020

In summary, ASAP's research on Phase 1 (Adrodegari et al., 2020) suggests that, in order to remain competitive in the next normal, companies should focus more on business models based on advanced service and customer centricity, building resilience to crisis, investing in suitable human and digital resources .

In order to deepen and verify the developments discussed in the model, the Digital Transformation Lab of the University of Padua (Paiola, 2020) has developed an interview program for managers in top positions of industrial companies. In particular these interviews were submitted to the Top Management Team of 77 Italian manufacturing companies in the period from April 20 to June 4, 2020 (phase 2). This scenario, compared to that of the research previously mentioned (phase 1: late March - early April), presents greater understanding of the impacts of the crisis and a broader view of its consequences and possible reactive moves in the short and medium term. As concerns the service offering, the results show that the most widely offered services are the so-called Product Life-cycle Services, i.e. those product-oriented and easy-to-use services such as product warranty (85%), spare parts sales (82%), online documentation (80%), and product training activities (87%). More complex services related to process support are less common in the offerings: these are the so-called Process Support Services , such as consulting related to other companies' products (11%), assistance and support for both marketing processes (20%) and R&D processes (35%).

It seems evident the importance of modern value proposition elements that refer to remote condition monitoring and digital technological retrofitting of products, the use of e-commerce platforms in the relationship with the market and the implementation of maintenance services based on data analysis. Looking at the future, additional relevant data from the research relates that about 50% of companies intend to enhance the service component in the offering and 51% will increase the offering of full service product packages (full-service contracts or advanced maintenance contracts) in the future. Finally, 13 % will implement urgent changes in pricing and service revenue models within the year.

As regards the level of digitalization, and in particular the hardware-software equipment, almost all companies (92% and 97% respectively) usually use office automation tools (such as Ms Office, Suite Office 365) and platforms for remote meetings (such as Skype, MS Teams, Zoom); A big part of the companies (88% and 79% respectively) are used to adopt cloud solutions for sharing data and documents (e.g. Google Drive and Dropbox) and ERP systems.

Regarding the adoption of solutions for data analysis and Artificial Intelligence, the data show lower results (28%), while there are good results for the implementation of the Internet of

Things (53%). The use of e-commerce in BtoB is remarkable, since 26% of companies have a dedicated platform.
In view of the future, however, one of the most active areas of investment are solutions for data analysis and Artificial Intelligence, with 13% of companies planning to invest within the year, and 28% in the future; Moreover, 25% of companies intend to invest in CRM and 22% in MES factory 4.0 systems. Looking at CRM, EY Consulting (2020) state that, at a time when the physical visits are limited, CRM is becoming more and more central, not only as a back office and pipeline management tool, but also as a real interface with those customers that are no longer easily reachable from direct network or distributors/agents. In the future it will be necessary to work on communication aspects (content and form) in order to evolve the tool into a real marketing support even in the target and customer acquisition phase.
In general, the COVID-19 pandemic has forced B2B buyers and sellers to switch to digital in a massive way. Between July and August 2020, McKinsey carried out a study on a sample of over 3,000 professionals in the Business-to-Business (B2B) market titled "Italian B2B decision maker response to COVID-19 crisis". The interlocutors, to the question "How do you currently interact with sales representatives from your company suppliers during the following stages of interactions?" answered as represented in the left part of figure 7. When they were asked "How do you would prefer to interact with sales representatives from your company suppliers during the following stages of interactions?", they answered as shown in the right part of Figure 7.

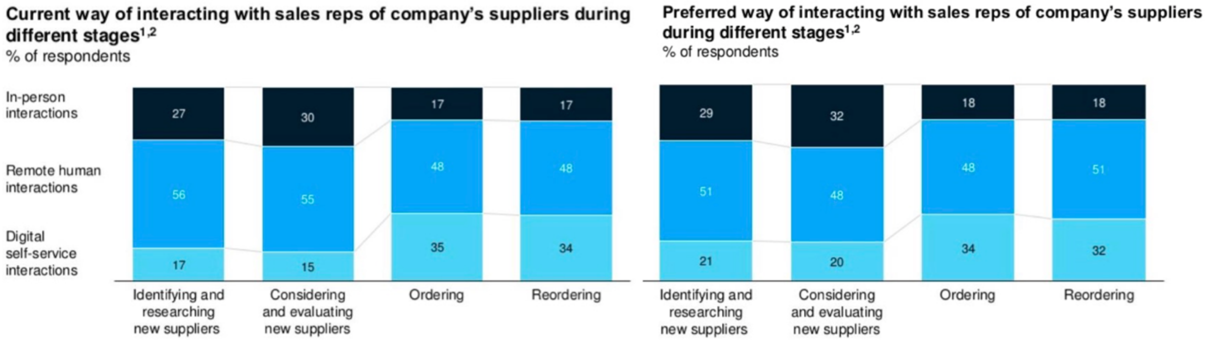

Figure 7 – McKinsey survey results

Source: McKinsey, 2020

From the figure it is possible to understand that many of the buyers and sellers claim to prefer remote human interaction and digital self-service interactions to traditional face-to-face interactions. This trend is steadily intensifying and continues even after the lockdown period. In fact, about 70% of respondents say that digital interactions have made it easier for buyers to obtain information, place orders and organize the service, with significant savings on travel expenses. In addition, the 74% of respondents stated that this new sales model is as effective as or more than the previous one. For this reason, during the pandemic, the majority of B2B companies have shifted their go-to-market model from traditional to digital, with heavy reliance on video and online chat (Figure 8).

On the other hand, the data shows that B2B buyers make purchases and reorders online even for large amounts. The 53% would spend more than $50,000 for a transaction made on a completely selfe-serve or remote interaction. According to respondents, these pandemic-induced patterns are likely to become permanent. Almost nine out of ten decision makers say that new sales and marketing practices will remain stable throughout 2021 and beyond.

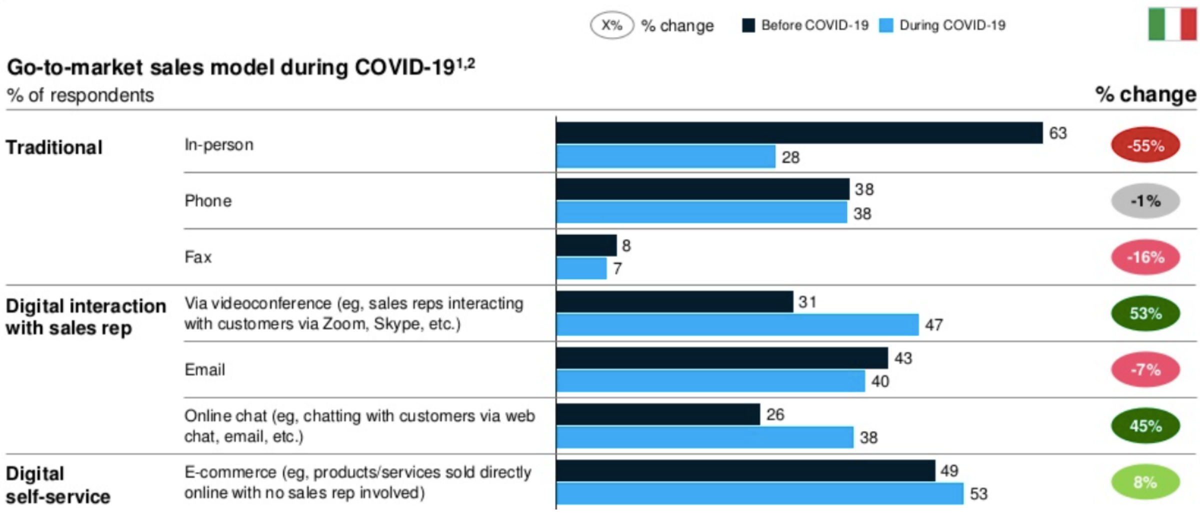

Figure 8 – McKinsey survey results

Source: McKinsey, 2020

Comparing the results obtained from the researches performed in phase 1 and phase 2, it emerges that the Covid crisis has acted and will act in the near future as an accelerator or activator of digitization and servitization projects. A Digital Servitization strategy, in fact, is realized in the adoption of new technologies to improve the delivery of current services and the development of new services: data-driven, remote, proactive and "increased" (Paiola, 2020).

The Covid crisis has helped companies to overcome the doubts and skepticism related to data sharing, providing an important opportunity for the growth of this type of proposals. In this regard, it is important to consider that about 20% of interviewed companies, already starting from phase 1, launched or accelerated projects related to Ticketing and Helpdesk or CRM systems.

Another area of acceleration highlighted by digitization projects concerns the remote control of products. The smart connected product enables monitoring, control, optimization and autonomy through enabling technologies such as IoT, Cloud and analytics.

The pressure on digitalization and the use of digital technologies for the delivery of products and services, due to their ability to grant agility, resilience, rapidity and effectiveness of response to customers' needs, are likely to redesign the business reality of the next-normal, in which effectiveness and value generated will be greater than today.
About that, Mckinsey (2020) and Paiola (2020) agree in stating that the “next normal” phase includes also a progressive migration of customers from traditional sales channels to online ones. McKinsey (2020), in fact, shows that B2B sales leaders have moved from being “forced” to adopt digital to face the early stages of COVID-19 to a growing conviction that digital is the way to go.
Technologies such as IoT, Cloud, AI and 3D Printing will play a crucial role also in improving the management of supply operations and in building the Digital Supply Network, made of greater interconnectivity between different players and improved collaboration, efficiency and responsiveness. Hence the need for companies to rethink their business model to adapt as soon as possible to this new context: defining their own digital strategy, guiding the company towards change, acquiring the necessary resources and skills and assessing operational and strategic risks.
Finally, research data show the importance of the role of the culture of change in shaping companies' responsiveness to the crisis. In this context, Covid-19 can push companies to renew not only their offerings (towards services) and technology, but also their corporate culture, requiring the active and comprehensive involvement of the entire top management team in shaping the new strategic directions of the company.
The communication in the Coronavirus era emphasizes an increasingly value-based approach by brands and companies (EY Consulting, 2020). This approach is going to impact the new normal, as consumers tend to choose brands that they feel close in terms of values and with which they have experienced a positive customer experience on the various touchpoints. If this trend in B2C is already easily identifiable, it should be applied in B2B.
B2B customer acts in a wider context, raising his or her expectations in terms of digitization, omni-channel and fluidity on the one hand and in sharing values on the other, even in selecting the business partners. The brand should therefore become central in B2B communication as well, as the main vehicle of transversal values: passion, quality, reliability, innovation.
In order to address the demand for omnicanality, the "new normal" will give a strong acceleration to the adoption of digital, making it necessary to rethink the customer journey in a "digital first" perspective. To achieve a successful result, it will not only be necessary to digitize processes and tools, but also to transform business and approach to sales force and customers.

2 Digitalization and business model innovation: toward advanced service-oriented business models for manufacturers

2.1 Business models and business model innovation: an introduction

As already said, the growing opportunities offered by digitalization put pressure on companies to systematically and quickly identify new business opportunities (Kiel et al., 2016) and require managers to reconsider and adapt existing business models (Linz et al., 2017) or even design completely new ones. According to Teece (2010), a business model "articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers". According to Osterwalder and Pigneur (2010), a business model "describes the rationale of how an organization creates, delivers, and captures value". The influence of digitalization on business model, including IoT technologies, Cloud platforms, Big Data and Data Analysis is fuzzy (Rachinger et al., 2019), since it poses significant challenges to its various interlinked elements (Amit & Zott, 2012). As such, many changes led by digitalization are disruptive (Matzler et al., 2016 in Rachinger et al., 2019) and they may also lead to the obsolescence of existing business models. This scenario drives to the need for Business Model Innovation (BMI). BMI is defined by Bouwman et al. (2017) as "a change in a company's business model that is new to the firm and results in observable changes in its practices towards customers and partners". Even if a detailed description of the structure of business models is beyond the aim of this work, a quick presentation of the business model canvas and its nine building blocks can be useful to understand how business models are created and modified today.

Alexander Osterwalder is the inventor of Business Model Canvas, a strategic business design tool which, using visual language, allows to visualize and assess a business idea or concept, helping to create and develop innovative, high value business models.

As shown in Figure 9, the canvas is composed of nine interconnected building blocks. In order to address the right elements of the model, the questions reported in every block can be helpful. The Customer Segments building block defines the groups of people or organizations that may be interested in the value proposition that can be declined differently precisely because of the customer segment to which it is addressed. Customer segments ultimately represent the target market. Examples of customer segments are mass market, niche market, segmented, diversified and multi-sided markets.

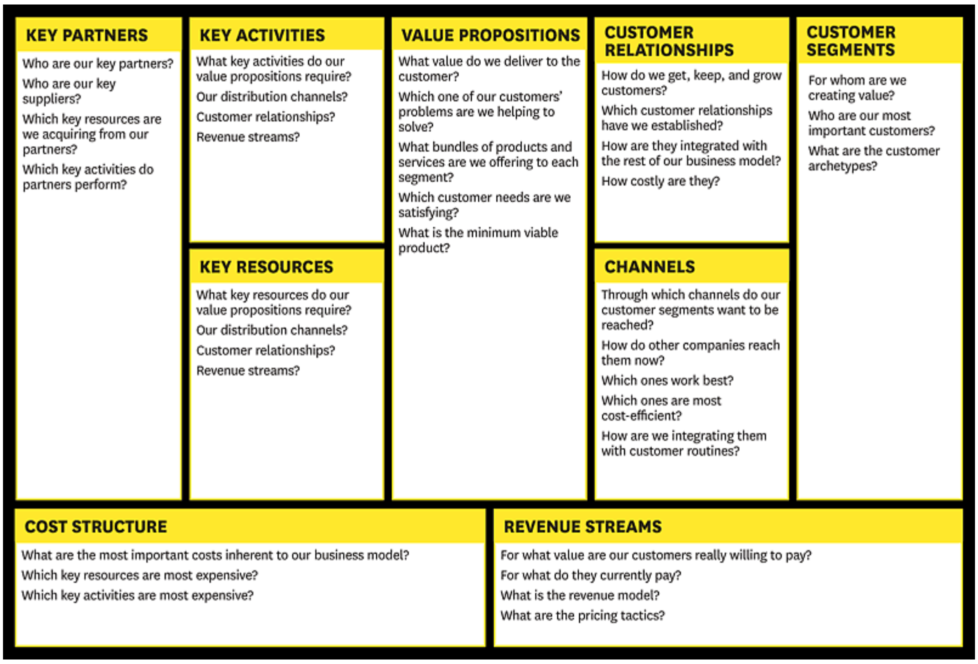

Figure 9 – The Business Model Canvas

Source: Blank, 2013

The Value Propositions building block is the central block of the business model canvas. It is about the 'value' that the company brings to the market, i.e. the advantages (compared to other similar proposals on the market) guaranteed to its customers. Starting from the product or service that the company provides, value have to be declined differently in relation to the customer segment. Value may be represented by price competitiveness, ease of use, exclusivity of an offer, ability to effectively solve a problem, novelty, ability to transfer intangible values, access to certain services and so on.

The Channels building block describes the combination of means by which the value proposition reaches the customer, in the communication, distribution and sales phases, considering every customer touch point that play an important role in the customer experience. In practice, the company leverages channels to inform potential buyers of the existence and value of its products, to make them accessible for purchase, and to ensure adequate after-sales support. Channels can be direct (i.e. company-owned) or indirect (i.e. official distributors and partner stores).

Customer Relationships building block defines the type of relationships a company establishes with its customers. This form of communication helps the company acquire new customers and retain existing ones, and is therefore an essential part of a business plan that works.

Questioning the interaction with the target audience helps clarify what kind of relationship is being built, support the customer experience and strengthen the company's image in the marketplace.

The Revenue Streams building block describes the revenues that the company earns from the sale of products or services to a specific customer segment. The variables involved are prices (fixed or dynamic) and payment methods, two fundamental aspects to make the business model sustainable. The revenue streams can be of a different nature and be generated from various sources: from the sale of physical products to user fees, from the sale of a license to brokerage commissions. At this stage, it is possible to identify the payment system preferred by clients, as well as the added value for which the target audience is willing to pay.

The Key Resources building block describes all the key resources a firm needs to make its business work: human resources (workforce), physical resources (outlets, plant, machinery), intellectual resources (software, user licenses, copyrights) and financial resources (loans, lines of credit, cash). The aim is to identify the resources that are most effective in creating a specific value proposition for a given customer segment.

The Key Activites building block includes all the activities required to create a value proposition. These are complemented by the most efficient processes for reaching the target, maintaining customer relationships and, of course, generating revenue. Key activities can be divided into three types: production, problem solving, maintenance or development.

The Key Partners building block includes the network of suppliers and partners with whom the company collaborates to create value for the customer. A company, in fact, is not a self-sufficient structure, but rather a system that acts within a wider context, supported by external actors. Forming strategic alliances responds to the company's need to reduce costs, mitigate competitive risks and acquire particular resources and activities. Osterwalder and Pigneur (2010) identifies four different types of partnership: strategic alliances between non competitors, coopetition (strategic partnerships between competitors), join ventures to develop new businesses, buyer-supplier relationships to assure reliable supplies.

The Costs Structure building block defines the fixed and variable costs that the firm incurs for key resources, activities and partners. For some types of business, containing expenses becomes a central issue, especially if the goals of the business plan include keeping prices competitive.

In analyzing the cost structure, there are both fixed costs (for example, rent and salaries) and variable costs, which depend on the volume of goods and services produced. In any case, the central objective is to ensure that revenue streams exceed expenses: only then can the business be said to be truly sustainable.

Business model canvas represents a dynamic system, by which there is interplay (cause and effect) between the nine blocks. If an element in one block is changed, this will affect another element of another block, and so on. As it will be deepened later, innovating business model means understanding and rethinking the company at a higher level, as if it could be possible to observe all the processes as a whole and their synergies, with a view from above.

Through the logic of visual thinking, the business model canvas creates a sort of universal language: this allows to share and simplify complex concepts that affect the operation of the company, making them understandable to all. This is actually an ideal tool to have a clear and schematic view of any business project.

Business model canvas and its broad view on the business could help companies to innovate their business models ”through customers' eyes” (Osterwalder & Pigneur, 2010), an approach that can result in the discovery of completely new opportunities. Discovering new opportunities related to value creation and distribution for customers, supplier and partners is at the root of Business Model Innovation (Gambardella & McGahan, 2010).

Companies whose goal is to generate new customer value propositions or transform their operating models need to develop new dynamic capabilities. This can allow companies to be flexible and to react to fast-changing customer needs.

Teece (2007) defines Dynamic capabilities as “the firm's ability to integrate, build, and reconfigure internal competences to deal with changes in the business environment”. The strength of a firm's dynamic capabilities is crucial to its ability to maintain longstanding profitability, including the ability to design and adjust business models (Teece, 2018). These dynamic capabilities can be disaggregated into the capacity to sense opportunities and threats, to seize opportunities, and to maintain competitiveness through enhancing, combining, protecting, and reconfiguring the business enterprise’s intangible and tangible assets (Teece, 2007). In other words, in order to be aligned with customer needs, companies must be able to constantly sense and seize opportunities and to periodically transform aspects of the organization (Teece, 2018).

Considering that a business model “describes an architecture for how a firm creates and delivers value to customers and the mechanisms employed to capture a share of that value” (Teece, 2018), it is possible to say that business strategy delineate how, where and for what purpose and goal a business model will be used (Štefan & Branislav, 2016). In other words, strategy refers to the contingent plan with regard to the business model to be used (Casadesus-Masanell & Ricart, 2010). Agarwal and Helfat (2009) state that dynamic capabilities represent the mediator between strategy and business models, ensuring the strategic renewal of organizations.

In other words, Teece (2018) argues that dynamic capabilities and strategy combine to establish a sustainable business model that drives organizational transformation (figure 10). As a consequence, Teece (2007) states that management's ability to evolve and improve business models is a critical micro-foundation of dynamic capabilities.
In sum, the strength of digital technologies (social, mobile, analytical and cloud) comes from how companies integrate them to transform their business and the way they work (Kane et al., 2015). Finally, what sets digital leaders apart from others is a clear digital strategy coupled with a culture and leadership that can drive the transformation.

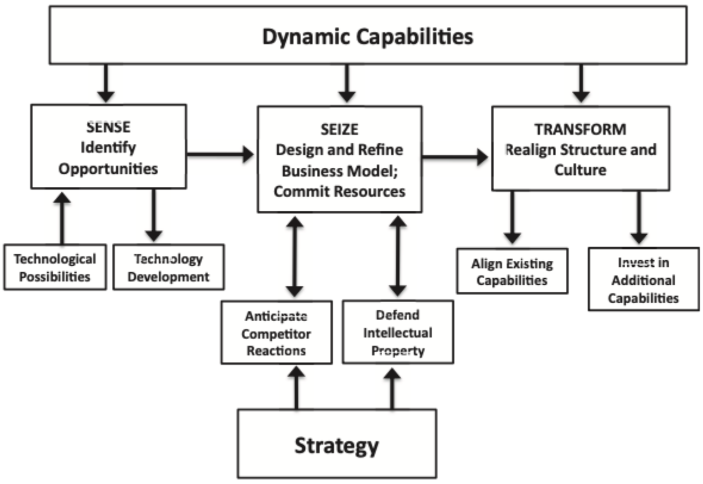

Figure 10 - Dynamic capabilities, business models, and strategy
Source: Teece, 2018

Looking at business model innovation from a more pragmatic perspective, Lindgardt & Ayers (2014) defines it as the art of improving competitive advantage and value creation by making simultaneous, mutually supportive changes to both an organization's value proposition to its customers and its underlying operating model. The same authors identify four different approaches to business model innovation that can help executives to make effective choices in designing the innovation path (Figure 11).
The first approach identified is the "re-inventor" approach. It is typically used in light of an important industry challenge, such as commoditization or new regulations, where a business model is slowly deteriorating and growth prospects are doubtful. In this situation, the company should reimagine its customer value proposition and realign its operations to profitably deliver a superior offering. In this scenario, the company should reimagine its customer value proposition and realign its operations in order to deliver a superior offering.

The adapter approach is deployed in the case in which the current core business, even if reinvented, is unlikely to overcome fundamental disruption. Adapters explore related businesses or markets, in some cases stepping outside their core business entirely.
The "maverick" approach implements business model innovation to extend to a potentially more profitable core business. Mavericks use their core advantage to disrupt their industry and establish new standards. This requires the ability to constantly evolve the competitive advantage of the business. The adventurer's approach aggressively expands a company's vision by exploring new or adjacent territories.

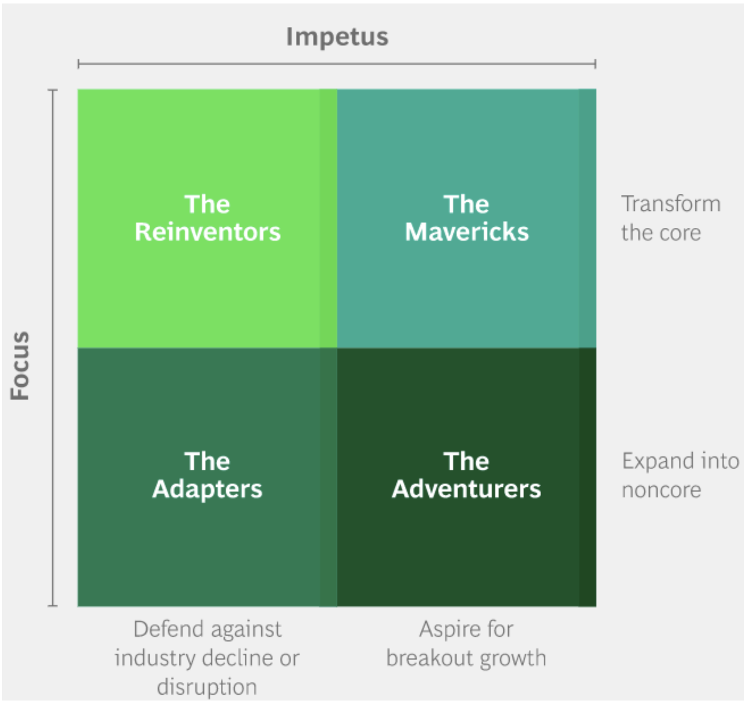

Figure 11 – Four approaches to BMI

Source: Lindgardt & Ayers, 2014

2.2 Manufacturing servitization: from product- to process-oriented business models

As already said, the Internet of Things, along with the other key technologies of the fourth industrial revolution, offers a variety of benefits for firms able to integrate them in business models. IoT, in fact, allows companies to acquire a huge amount of information that may help them to modify their value proposition through innovative product and service offerings (Suppatvech et al., 2019).
This task of IoT goes hand in hand with the concepts of servitization and product-service systems (PSS). Servitization is defined by Baines et al. (2009) as "the innovation of an

organization's capabilities and processes to better create mutual value through a shift from selling product to selling PSS". PSS (Product-Service System) is defined by Baines et al. (2007) as "an integrated combination of products and services that deliver value in use". It is also defined by Mont (2002) as "a system of products, services, supporting networks and infrastructures that are designed to be competitive, satisfy customer needs and have a lower environmental impact than traditional business models".

Thus, according to Kindström (2010), servitization encompasses the development of new offerings where products are no longer at the core of the company's value proposition, or even of its business model. Traditionally, manufacturing companies considered physical goods as the main part of total value proposition, while services were considered only as complements to the products. Thereafter, customers in both consumer and business markets have changed their expectations and needs, shifting from simply buying products to "adopting sophisticated solutions that solve contextual problems and create value-in-use" (Gebauer, Paiola, Saccani & Rapaccini, 2020). The concept of solutions can be defined as "innovative combinations of products and services leading to high-value unified responses to customers' needs" (Sawhney, 2006 in Paiola, Saccani, Perona & Gebauer, 2013). From the above it is clear that customer centricity is a key feature of servitization strategies (Baines et al., 2009). In addition, servitization, usually powered by IoT, strengthens and improves the quality of relationships between manufacturers and customers (Grandinetti et al., 2020).

Switching from products to solutions in a successful way is not an easy process. Companies need to develop capabilities to design, commercialize and deliver services (service capabilities) and to include these services into customized solutions (integration capabilities). Companies must then develop the skills to understand customer needs from a global perspective. Solution providers should, in other words, be located in proximity of the customer to understand which combination of products and services is best tailored to their needs. (Paiola, Saccani, Perona & Gebauer, 2013).

In the evolution of servitization, providing services has become a main differentiating factor of a conscious and explicit strategy, with the consequence that the boundaries between products and services are not precisely defined (Baines et al., 2009).

According to Tukker (2004), a PSS business model enables companies to create new sources of added value and competitiveness, since it meets customers' needs with an integrated and customized approach, allowing them to focus on their core business. In advance, A PSS business model can build strong relationships with customers, increasing customer loyalty, and it allows companies to innovate faster, as they are able to follow their customers' needs better.

Gaiardelli et al. (2014), in their work “A classification model for product-service offerings”, present a Product-Service (PS) offering classification model, using three major dimensions: PS offering orientation, PS offering focus and nature of interaction between customer and PS provider (Figure 12).
The PS offerings focus dimension derives from Mathieu’s work (2001), which identifies two forms of PS offerings that are differentiated in product support services and customer process support services. The former usually involve standardized solutions and a low-intensity relationship between the parties. Customer process support services refer to highly tailored

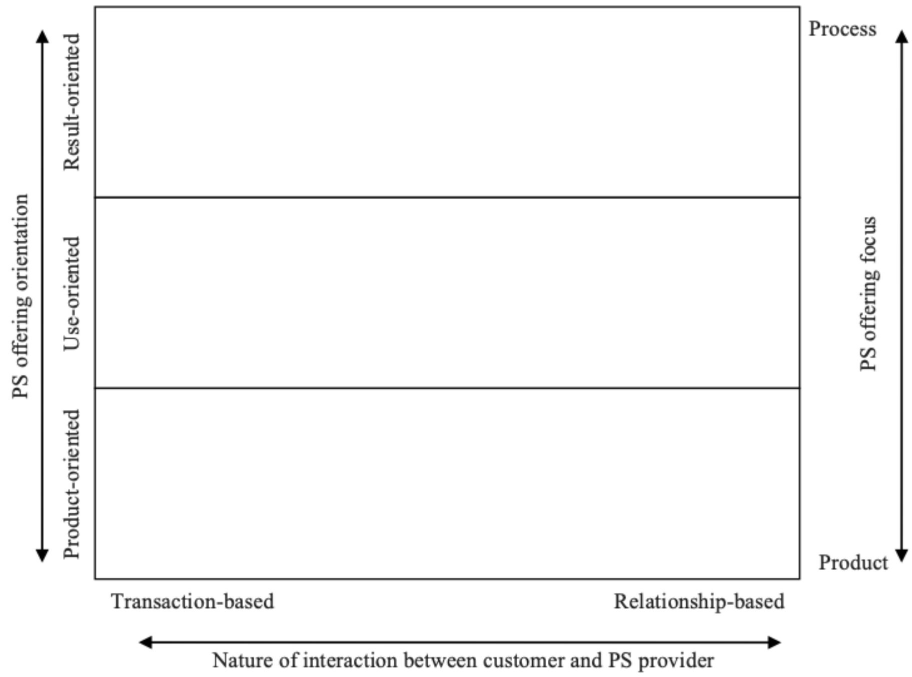

Figure 12 - The PS offering classification model: general scheme
Source Gaiardelli et al., 2014

solutions that require significant involvement and commitment from both the parties.
The second dimension is the orientation of the PS offer and refers to the classification proposed by Tukker (2004), who categorized the PSS in three types: product-oriented, use-oriented and result-oriented.

• Product-Oriented PSS

In this first category the core value of business remains the sale of the product. Thus, the product’s ownership is transferred to a customer and some extra services are added to the offering. These services may include services that are closely related to the product and could help the customer to manage the product during its useful lifetime (Gaiardelli et al., 2014).
For instance, if the customers need any kind of assistance, with IoT-based PSS the support team can operate from a remote location to modify the parameters directly in the machine, using the

internet connection. For the provider, supporting customers in this way is a valuable advantage in terms of costs and speed (Zancul et al., 2016).
More in detail, looking at the nature of interaction between customer and PS provider, product-related services are divided in:

- Transactional services provided for specific needs of customers, for which they pay once they are performed: shipping, installation, returns, repairs, spare parts and consumables.
- Extended warranties and preventive maintenance services, for which customers pay a one-time fee that covers a fixed period of time.
- Condition-based maintenance, based on foreboding technology: these types of service require a closer relationship with the service provider, since data need to be obtained and monitored.

Similarly, consulting, training, and advisory services can also be classified based on the nature of the interaction between the client and the provider (Figure 13). Providing documentation, for instance, is a purely transaction-based service while help desk, hot line and training activities require a closer relationship between the parties (Gaiardelli et al., 2014).

• Use-Oriented PSS
As far as use-oriented services are concerned, products still play a central role, but the sale alone is not the ultimate goal: in fact, ownership of the product remains with the PS provider, who makes it available in several forms to users, for example through leasing renting, sharing and pooling. In other words, providers of this PSS type enable the use of the product by customers by applying their service (Weking et al., 2018). Looking at use-oriented services, Tukker (2004) state that the PSS provider is frequently responsible for maintenance, repair and control. As will be detailed in the next paragraph, the IoT device allow companies to monitor its assets conditions and to provide a better support service, correcting or preventing any technical problem.
In this type of service offering, product leasing, renting, and pooling are usually included.
With leasing, the lessee pays a recurring fee for unlimited and exclusive access to the product. Through a renting service, the customer has exclusive access to the product for a limited period of time while in sharing solutions, the product is used by different customers sequentially. Finally, with a pooling solution, simultaneous use of a product occurs by different customers. All of these PS propositions can be offered using several different type of contracts, ranging from short-term and long-term ones (Figure 13). For short-term deals, the interaction is

generally transaction-based, while in long-term contracts a more stable relationship exists (Gaiardelli et al., 2014).

• Result-oriented PSS

In the last category, result-oriented services, the customer and the provider agree on a result, but not on pre-determined means or products to obtain it. It is not a matter of selling a product, but of offering a service to solve a problem. Providers are responsible for an entire customer problem and they are integrated into the customer's organization (Weking et al., 2018). This type of PSS represents the completion of the transition from product logic to solution logic, conceived by Töytäri (2018) and reported in paragraph 1.2. According to Reim et al. (2015), in fact, in contrast to use-oriented, this category of PSS focuses on providing a solution. According to Tukker (2004) this type of PSS may occur in three different varieties: activity management/outsourcing, pay per service unit and functional result. In the first case, a portion of a company's operation is outsourced to a third party, but the decision on how to perform and control this activity remains with the client. In the second case, the customer does not pay for the product itself, but for the output provided by the good in relation to the level of use. In the functional result case, the supplier agrees with the client to deliver a result. This category, unlike activity management and outsourcing, entails a functional outcome in abstract terms. The supplier is completely free to decide how to deliver the result and is concurrently the product owner, the user and the process decision maker. Given their nature, these PS offerings are based on relationship-based interactions (Figure 13). The provider is empowered to decide how to deliver the outcome, simultaneously being the product owner, the user and the process decision maker.

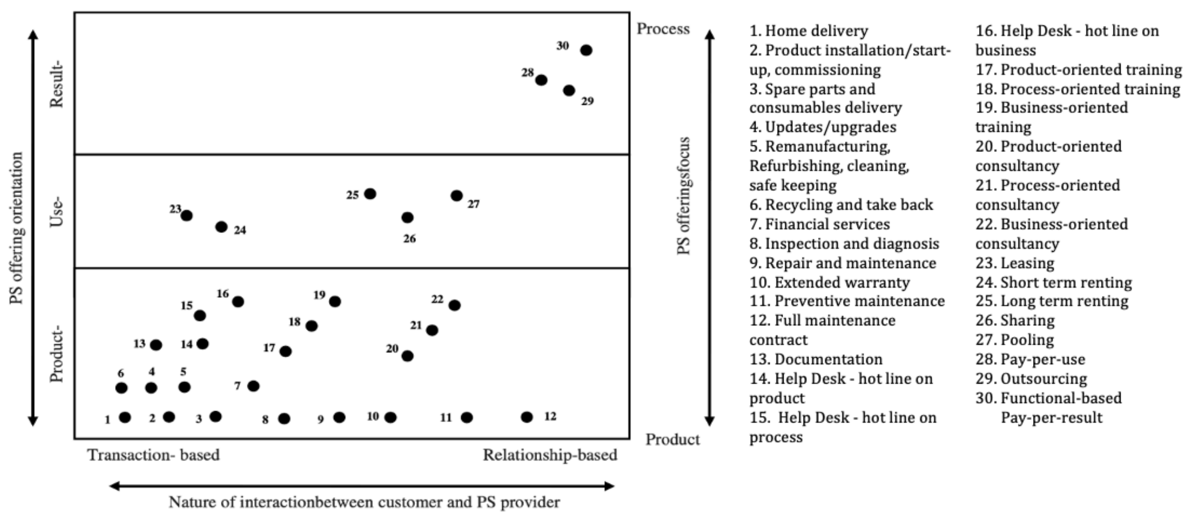

Figure 13 - PS classification model

Source: Gaiardelli et al., 2014

Strictly related to the aforementioned classification, Weking et al. (2018) show how Product-, Use- and Result-oriented PSS result in three Business Model Patterns (BMP) in practice: Product-oriented manufacturing, Use-oriented enabling and Result-oriented service offering (Figure 14).

The first BMP is based on the product-oriented PSS type and it is defined as "a traditional BM focused on delivering goods with respect to their development, production, integration and sales" (Weking et al., 2018). According to the authors this PSS BMP includes two sub-types. The first one focuses on cost-effective manufacturing of parts and components based on high volume and high quality, and then selling them to companies that integrate these components into products/solutions.
The second type focuses on assembling and integrating parts and components into complex systems. The level of complexity of the system determines the degree of collaboration needed between them and their customers. This type of assemblers have more visibility towards the end customers than components producers and they could provide service as part of the pre-sales-phase to understand the customer's needs. In general, in this PSS BMP the collaboration between manufacturers and their customer takes place until the point of sales, remaining on a goods dominant logic.

	Product-oriented manufacturing	Use-oriented enabling	Result-oriented service offering
Value proposition	High-quality, cost-effective components and integrated and functional products	Custom products and expert knowhow as a service to operate and maintain products	Customer results as a service, products as substitutable tools
Revenue model	Sell a functional good	Sell product-service hybrid	Sell result
Customer base	Industrial firms, price-sensitive, globally sourcing	Industrial firms, highly complex and individual needs	Industrial firms, requirement of maximum cost transparency or with volatile demand
Customer interaction	Until point of sales	Until point of sales, during operation and for maintenance	Throughout customer lifecycle
Transfer of product ownership	Yes	Yes	No
Degree of product standardization	High	Low	High

Figure 14 - PSS business model patterns

Source: Weking et al., 2018

Use-oriented enabling, based on the PSS BM type use-oriented, is a BMP in which providers become an essential part of the supply chain, even if the product is still completely under the customer's control. Products are offered with enablers (e.g. IoT solutions for connectivity) and integrated interfaces. In this way the supplier is able to monitor their usage and the need for maintenance, enabling also remote control and lifecycle-oriented support service. Unlike product-oriented PSSs, the service component is central in this BMP. While in product-oriented PSSs services only provide additional value, in this PSS BMP good and service logic are integrated.

Result-oriented service offerings deliver results as a service by embedding products and services as a hybrid service (Aurich et al., 2006 in Weking et al., 2018), helping companies to create results as part of the customers' supply chain. With this BMP, the transition from a transactional view of the customer to a relational one is complete (Paiola & Gebauer, 2020). In this BMP a close contact with the end customers is observed, since supplier guides them throughout their valuable production, granting the result of their operations.

2.3 Data, digitalization and advanced business models: digital servitization in manufacturing

As already said in the last chapter, Servitization and Digitalization are the most impacting phenomena on B2B manufacturing strategies (Frank, Mendes, Ayala, & Ghezzi, 2019). The transition from the sale of products to the sale of integrated products and services (Product-Service System) is perceived as an important strategy of differentiation, allowing companies to capture additional value and leading them to reach competitive advantages, especially in markets that are moving towards commodization (Hunke & Engel, 2018). According to Baines et al. (2007), the above is based on the assumption that offering integrated product-service packages will help companies bypass price-based competition and establish strong relationships with customers that secure market share and create new and sustainable revenue streams.

Weking et al. (2018) state that the shift from a product offering to a service offering creates new opportunities including improving the position in the value chain, innovation potential and customer value.

The implementation of advanced information and communication technologies (ICT) contributed to the enhancement of digital PSS, leading to the concept of Digital Servitization (Zambetti et al., 2020). Kohtamäki et al. (2019) define digital servitization as "the transition toward smart product-service-software systems that enable value creation and capture through monitoring, control, optimization, and autonomous function".

In other words, some of the founding pillars of Industry 4.0, such as IoT (Internet of Things), Cloud platforms, Big Data and Data Analysis are offering manufacturing companies the opportunity to rethink their strategies towards a service business orientation (Paiola & Gebauer, 2020). In this regard, Gebauer et al. (2020) state that business digitalization “is not associated primarily with the adoption of some specific technology, but is essentially built on their combination, in order to enable new ways of value creation in both consumer and industrial markets”.

The Internet of Things (IoT), and in particular the Internet of Industrial Things (IIoT), plays a primary role in helping manufacturers maximize the value of their machines. As already mentioned, the key idea behind the IoT concept is to transform common objects into connected devices able to detect the surrounding environment, transmit and process the acquired data, and thus provide feedback to the environment. In recent years, the deployment of IoT devices around the world is advancing rapidly. Statista (Statista Research Department, 2018) forecasts that the number of IoT connected devices will be 38.6 billions in 2025 and 50 billions in 2030. As a subset of the Internet of Things, the Industrial Internet of Things (IIoT) encompasses the areas of machine-to-machine (M2M) communication technologies. The IIoT allows a better knowledge of the production process, thus enabling an efficient and sustainable production (Sisinni et al., 2018) and an extension of product portfolios with tailored services in analytics and remote/predictive maintenance (Boehmer et al., 2019).

In other words, distinguishing Internet of Things intended as general concept and the Industrial Internet of Things, in the first case the “things" are intelligent and interconnected devices that improve human awareness of the surrounding environment and allow to save time and money. The Industrial IoT, on the other hand, is responsible for connecting all industrial assets with information systems and business processes (Sisinni et al., 2018).

Since these IoT features enable physical products to become data generation platforms that lead to invaluable analytics, big data and data analytics can be seen as key drivers for advanced IoT applications. In this regard, Zancul et al. (2016) state that “service offering can be extended if the company is able to monitor and to gather data from its product during the client usage lifecycle phase”.

As a consequence, the ability to access and collect a large amount of data constitutes a powerful strategic asset that companies jealously preserve to differentiate themselves from competitors (Paiola & Gebauer, 2020). The main reason is that these types of data enable companies to analyze real time information on how installed products are being used by customers, for more effective forecasting and strategic planning. In advance, it optimizes industrial operations, giving companies the opportunity to monitor and automatize products’ functions, remotely and globally (Paiola & Gebauer, 2020; Suppatvech et al., 2019).

In sum, the aforementioned technologies may impact the way companies provide services, both at the product and customer level. This impact may affect the current companies' business model in different ways.

If, for instance, IoT is used to make basic installed products more efficient, as in the case of product-oriented PSS (see 2.2), digital technologies pose little threat to manufacturers' business-as-usual (Paiola & Gebauer, 2020). In other cases, when process- and solution-oriented PSS are involved, the impact of digital technologies on the business model is more substantial, often leading to a redefinition of all the building blocks that compose it. Therefore, acknowledging the distinction made by Berman (2012) that was reported in the first chapter (see figure 2 in 1.3), Paiola and Geubauer (2020) postulate that the effects of IoT technologies on firms' business models can be placed on a growing complexity scale. It starts from BM enhancements, intended as ordinary modifications that companies typically implement to their strategies to preserve their competitive advantage, such as adding properties and services to traditional products in order to differentiate them from those of competitors; BM extensions deal with product or process developments that enable companies to increase cost efficiency and market share, such as adding new revenue streams by expanding traditional offering through the use of digitally delivered services, content or information; finally, BM redefinitions drive a radical reshaping of the value propositions and business model elements, modifying every BM building block (see Figure 9). According to Suppatvech et al. (2019) servitized value propositions enabled by data analysis are the cornerstone of business models redefinition.

Suppatvech et al. (2019), state that IoT-enabled servitized business models can be classified into four archetypes, according to their main value propositions:

• The add-on business model

It refers to a business model that, through the use of the Internet of Things, activate additional functionalities or add customized services to the utility of existing products or services. Looking at the PSS categorization presented in the last paragraph, this Business model refers to product-oriented PSS in which the provider offers services that are bundled together with a physical product to support its function (Tukker, 2004). Suppatvech et al. (2019) work suggest that through the adoption of IoT, companies are enabled to offer four types of services tied into the core physical asset and service: innovative digital services, facilitate service delivery, leverage customer data, and on-demand delivery.

In the first case, sensor-based digital services are linked to traditional products with the aim to offer new value propositions for customers.

In the case of facilitate service delivery business model, technologies are used to make the

delivery of existing product and services easier and to increase efficiency and/or reduce the complexity of the service provided.
In the leverage customer data business model, information obtained from customers' product usage is leveraged by the product or service provider to offer personalized services to customers.
Finally in the case of the on-demand business model, the aforementioned personalized services is available if and when required by customers.
In sum, add-on business models are adopted by the providers who offer digital services with the aim to providing additional utility to those of existing physical goods or services.

• The sharing business model
In this model the customers pay for the use or the access to a product for a limited period of time, which allows several users to continue using the product when it is available.
From the supplier's point of view, this business model optimizes the utilize of the goods, but the supplier is responsible for providing customers with a sufficient number of products. A widespread example is given by car sharing, that allow customers to drive vehicles without having to return it to the supplier after each use. From the provider's side, this require the adoption of technologies for booking, payments and tracking.
This type of business model corresponds to a type of use-oriented PSS according to Tukker's (2004) classification.

• The usage-based business model
This model allows customers to pay for the actual usage of a product or service, rather than bearing the costs of ownership. Providers, who are committed to providing the expected utility in use, can adopt two types of business models which can be applied in the context of both B2B and B2C: pay-per-use and subscription.
In the first case the customer is only charged for the actual usage or consumption of the product or service. The amount of product/service usage is measured by IoT technologies. This allows companies to create a consolidated and continuous relationship with the customer, since it does not end at the time of sale. In addition, customers are willing to pay a higher price by virtue of the flexibility granted to them.
In subscription business model the customer, through the payment of a fee, has unlimited access to the product or service until the time span of the subscription ends.
Nowadays the "freemium" model is also very popular. The dynamic on which this business model is based is to provide a product/service with basic features for free. The aim is to push

users to test it and then to pass, at a later time, to a superior model with additional functions or features. In practice, the company engages customers by offering a basic version of the product for free and when advanced features are required, the customers can pay for the "premium version". An example are the services offered by LinkedIn, Spotify, Dropbox, Skype. Looking at Tukker's (2004) classification, this business model is related to a result-oriented PSS.

• The solution-oriented business model

This business model provide integrated solutions to customers' needs thanks to IoT. From a B2B perspective this means providing support for customers' core operations, increasing efficiency and business capabilities. According to the authors there are two types of solution-oriented business models: availability business model and optimization/consulting business model. In the first case, suppliers guarantee customers the continuous and constant use of products that provide a certain utility, without interruptions. IoT technologies give providers the option to access real-time information about the actual state of product, allowing them to offer maintenance in a more effective and faster way.
In optimisation/consulting business models, thanks to IoT, suppliers provide solutions and advices to the customer's business operations, in addition to ensuring the availability of products. Looking at Tukker's (2004) classification, this business model is related to a result-oriented PSS.
For each of these IoT-enabled servitized business models archetypes, Suppatvech et al. (2019), identify the roles of IoT in enabling servitized business models, the benefits and the inhibiting factors. A complete view of the findings is shown in figure 15.
From the scheme it is possible to see that each of the IoT-enabled servitized business models archetypes is aligned with specific PSS. Add-on business models provide product-oriented PSS, while Sharing Business models are associated with use-oriented PSS. Solution-oriented Business Model and Usage-based Business models are associated with Result-oriented PSS.

Paiola and Gebauer (2020), in their research, analyze data from 25 manufacturing companies based in the north of Italy with the aim of obtaining detailed information on the type of IoT technologies used by the companies, the current and potential use of these technologies (with particular attention to services) and the consequent changes in the BM. The main findings show that at the time of interviews 6 firms out of 25 were using IoT technologies to move from product-oriented to end-user's process-oriented services. In particular, two of the interviewed companies were involved in applying complex digital servitization strategies that include performance-based contracts with key customers with remote equipment management.

In other cases, the use of IoT to deliver advanced services is obstructed by a series of structural, organizational or environmental factors, including unpreparedness for digital servitization and resistance to new technologies on the part of customers; disinterest in digital servitization on the part of channels, which are often too complex and/or powerful to bypass; cultural unpreparedness of the companies' sales force in selling advanced services and digital solutions.

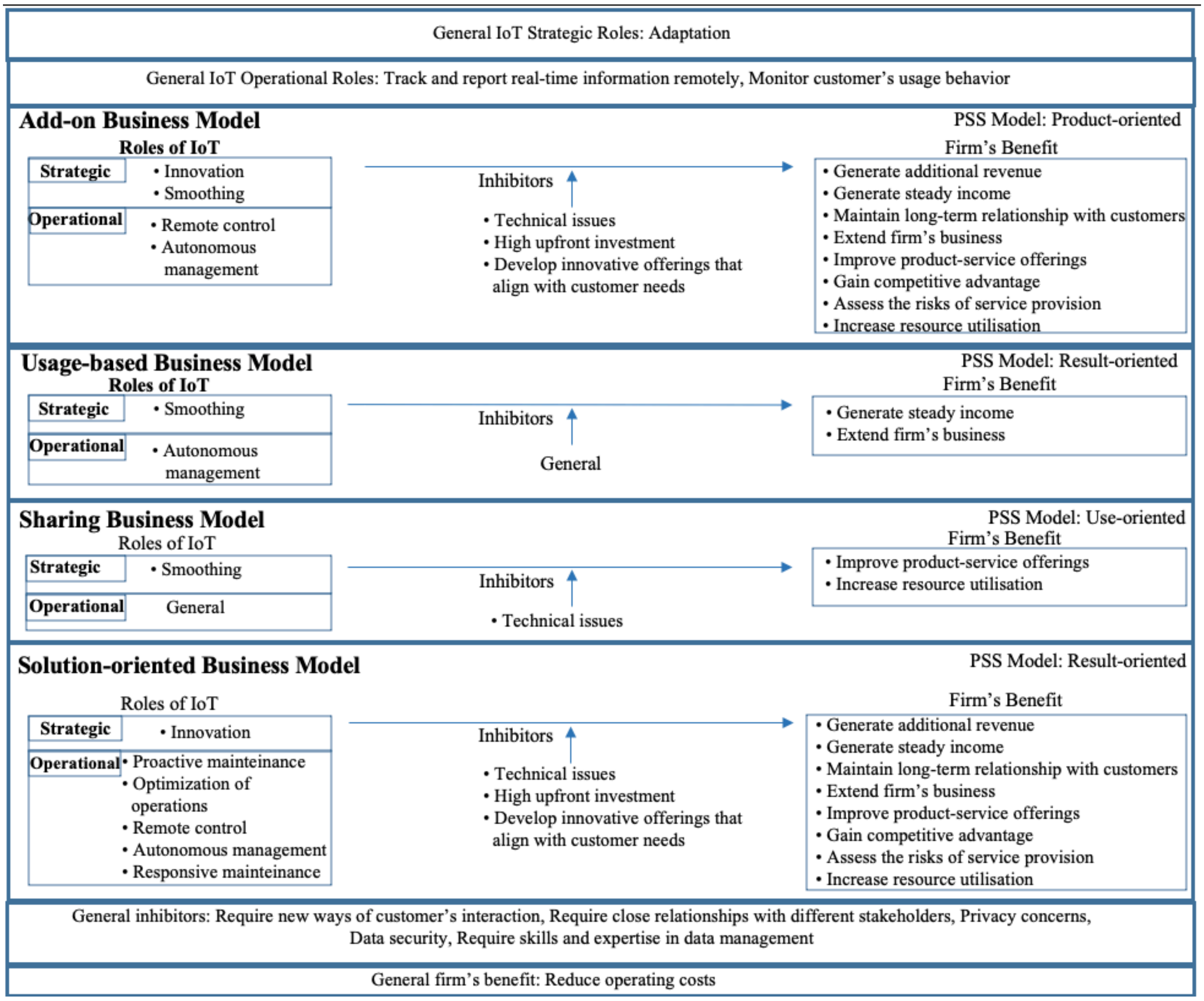

Figure 15 - IoT-Enabled Servitized Business Model Archetypes

Sources: Personal elaboration of Suppatvech, et al. 2019.

In summary, solution-oriented business models are considered by literature (Hypko, Tilebein, & Gleich, 2010; Visnjic, Jovanovic, Neely, & Engwall, 2017 in Paiola & Gebauer, 2020) the most advanced form of servitization. As already said, the move to outcome services requires a business models redefinitions, leading firms to face several challenges in terms of value creation, value delivery and value capture. As far as technology is concerned, the main difference between process-oriented and result-oriented business models is in data analysis, a critical capability that enables companies to exploit the full potential of the installed product usage insights. In advance, companies that can leverage IoT technologies on their own are rare, requiring an ecosystem of vendors, complements and stakeholders that requires additional new skills (Kohtamäki et al., 2019). This topic, due to its relevance, will be widely discussed in the next chapter.

3 Digitalization and ecosystems positioning strategies for B2B manufacturing companies

In today's competitive market environment, creating superior customer value is critical to a company's success, especially in markets that are moving toward commoditization. To accomplish this task, as already mentioned, buyers and sellers jointly implement products and services within the customer's business, moving from a product-logic to solution-logic, in a perspective of value co-creation. This change in the logic of value is aligned with the change in the logic of business models. Business models are no more fixed, static and closed frameworks but rather open and dynamic structures, where the creation and capture of value has also become a collaborative effort within the ecosystem.

The first part of the chapter investigates the impact of digitalization on the ecosystem and on the strategies of its actors. The second part of the chapter explores how the power of actors is reflected in strategic behaviors and how B2B manufacturing companies can improve their competitive position within their networks by focusing on digital servitization.

3.1 Supply chain and ecosystems role in digitalization: an introduction

The increasing level of connectivity, sophisticated data gathering and analytics capabilities empowered by the Internet of Things (IoT) have driven a shift toward an information-based economy. Industry 4.0 and digitization are often perceived only as technology concepts aimed at increasing efficiency and reducing costs. Many companies still underestimate the enormous market impact of innovative business models and their integration into superior digital ecosystems.

According to Iivari et al. (2015) big part of conceptualizations of the business model does not consider the interconnected nature of businesses evolving in the same innovation ecosystem.

For many years, companies used supply-oriented business models, designing their products or services for maximum profit and trying to respond with them to customer demand. Such an ecosystem is now showing all its limitations, because it relies heavily on the company's resources and makes it difficult to innovate and expand a product or service with new features. In this regard, Vinit Parida, Professor of Entrepreneurship and Innovation at Luleå University of Technology, in a speech during the 2019 Asap Service Management Forum (Bellini, 2019) argues that “to achieve a more competitive and more socially, economically and environmentally sustainable industry, digitalization is certainly a key enabler, but it is not enough. The missing piece is the business model. It is necessary to experiment new business models to achieve this benefit. We must also be careful not to focus only on change at the level of the individual society, but any change that is based on digital must be managed from an ecosystem perspective. All this perhaps makes "things" more complex, but amplifies the possibilities of identifying new forms of competitiveness and opening up new markets".

Digital ecosystems are profoundly transforming the traditional model. Instead of using a linear path between supplier and customer as happened in the past, companies can use new technology platforms and value-added online services to create more business opportunities. The digital ecosystem also generates value for the entire supply chain, providing companies with more ways to improve their service propositions. Finally, it allows for indirect customer interaction at many different points in their daily lives. In this context, changes to one firm's business model configuration may affect the business models of other firms at the ecosystem level. Consequently, business models should be open, dynamic, and ecosystem-based. Business model also must take into account the needs of today's environment, making business model reinvention an ongoing and inclusive process (Derfus et al. 2008 in Krčo et al., 2019).

IoT, through its natural propensity to create digital business ecosystems, has the potential to completely transform the business landscape, leading to a scenario in which "everyone is a partner and a competitor at the same time, companies exist through co-dependency, every organization offers software solutions based on an open-source technology approach" (Krčo et al., 2019). With IoT, in conjunction with physical objects, data is a source of value and connectivity enables smarter supply chains, manufacturing processes, and even end-to-end ecosystems to be built (Sniderman et al., 2016).

Digital ecosystems can be thought of as networks on which different technologies rest. At the highest level they are composed of companies, people, data, processes and things that are connected by the shared use of digital platforms in order to foster collaboration and deliver useful outcomes for all parties involved. The idea is to create a collection of flexible services that can move and adapt quickly to the ever-changing needs of a business.

The new ecosystems are enabled by the intertwining of different technologies, from cloud computing to social, IoT and mobile platforms, and of what allows the flexible use of resources, the creation of specialized and collaborative interaction channels, the access to the most diverse application and service platforms.

Confirming this, Krčo et al. (2019) state that, since delivering and sustaining IoT solutions is complex and requires expertise across multiple technical domains, for a successful delivery of IoT solutions it is critical the existence of an ecosystem of diversified partners that bring in a complementary set of skills, services, and geographic coverage.

Adner (2017) define the ecosystem as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize". The same author conceptualizes ecosystem in two ways: ecosystem-as-affiliation and ecosystem-as-structure.
In the first case, the ecosystem is seen as a community of affiliated players defined by their networks and membership platforms, while, in the second case, the ecosystem is considered as a configuration of activities delineated by a value proposition. Ecosystem-as-affiliation puts emphasis on the disruption of conventional industry boundaries, increasing interdependence, and on the prospect of symbiotic interactions in productive ecosystems.
However, in this view, according to the author, it is difficult to distinguish its characteristics from those of other interdependence-oriented systems approaches (e.g. networks). Also, because of its inclination to look at clusters, this view of the ecosystem tends to focus on community governance, with a restricted view of the specific features of value creation.
In studying interdependent value creation, a complementary approach identified by the Adner is the ecosystem-as-a-structure approach. Starting with a value proposition, this approach looks to identify the group of actors that are needed for the proposition to be realized.
Analyzing the components of the previously presented definition, the author outlines more specifically the fundamental characteristics of the ecosystem-as-structure.
First, focusing on alignment, the mutual agreement on positions and activity flows among ecosystem members become fundamental. Such alignment, which is different from the concept of participation, leads the different actors to be satisfied with their positions, contributing to the success of the ecosystem. Digitalization can make a contribution by aligning ecosystem actors and leading to better coordination and collaboration, fostering new service opportunities (Skylar et al., 2019).
An ecosystem, moreover, is inherently multilateral. This means that it is not enough to have a multiplicity of partners, but a set of relationships that cannot be broken down into a sum of bilateral interactions is also required. The actors participating the system, in fact, should have the creation of common value as their general objective. The defining attribute of partners is that they are actors on whose participation the value proposition depends. The previously presented definition, in summary, sees the value proposition and the structure of alignment as the foundation of an ecosystem.

Starting from the already mentioned definition of ecosystem, Adner (2017) also defines ecosystem strategy as "the way in which a focal firm approaches the alignment of partners and secures its role in a competitive ecosystem".

The author states that while the ecosystem is made up of multiple companies, each company defines its own ecosystem strategy, which includes a view of ecosystem’s structure, roles, and risks. In this context, partner alignment depends on the firm's success in moving its partners into positions and roles according to its strategy. According to the author's approach, to achieve this, companies should, first, recognize gaps and, second, create conditions to fill those gaps.

These gaps can emerge from different circumstances. They can arise in the case of co-innovation risks, namely when partners are challenged to develop the skills to undertake the new activities. Gaps can then also arise from the challenge of partner expectations regarding structure and roles. Structural expectations concern what positions are in place, who delivers to whom, who addresses the end customer, and who assumes an upstream role. Role expectations concern the roles of leader or follower: which players will assume leadership responsibility of systems alignment, and which one will accept a non-leadership role.

The willingness to fill the role of leader or follower is contingent on the aspiration of the focal company and the agreement of the actors on whom the value proposition depends. An ecosystem leader is the firm that establishes its vision of structure and roles, setting the rules of governance. An ecosystem follower is a firm that accepts these terms and relinquishes the leadership role.

As a result, ecosystem strategy focuses on the competitiveness of ecosystems and their components. More specifically, competition operates at two different levels: within the ecosystem, with respect to securing activities, positions, and roles, and between ecosystems, with respect to collective advantages in creating and capturing value over rival ecosystems.

From this situation, a tension can arise. Actors in the ecosystem could find themselves in conflict between choosing to increase the overall ecosystem's value creation (e.g. by enhancing partners’ competitiveness) or maintain a leadership position in the face of competitive partners whose contribution is increasingly important, and who may desire to change roles or revenue capture (Adner, 2017). If the focus of traditional strategy is the pursuit of competitive advantage, the focus of ecosystem strategy is the pursuit of alignment. Traditional strategy’s components such as the value, uniqueness, and inimitability of resources have its equivalent in multilateral partnerships, and the sustainability of competitive advantage must be maintained both by nurturing relationships and by keeping rivals at bay.

In this regard, Iansiti & Levien (2004) acknowledged four overall types of ecosystem strategies that depend on the turbulence of innovation and the complexity of the companies’ relationships: dominator, keystone, niche and commodity firm (Figure 16).

The keystone acts as the hub of the ecosystem and improves the stability of the ecosystem by providing the necessary tools for the sustainability of the ecosystem even under a high turbulence and innovation level (Paulus-Rohmer et al., 2016).
Niches reflect the big picture of an ecosystem and represent the substance of what the ecosystem does. Niche actors grow in relation to the keystone organization and profit from their closeness to it. Each niche actor develops unique products or services that meet a particular need (Iansiti & Levien, 2004). From a strategic perspective, the niche player seeks to specialize and differentiate itself from other niche companies in the ecosystem (Paulus-Rohmer et al., 2016).
The physical dominator occupies a large portion of the value generated by the ecosystem, but because shared value creation is lacking, it results in a lower level of innovation. Finally, commodity reflects firms that compete only through price and volume.

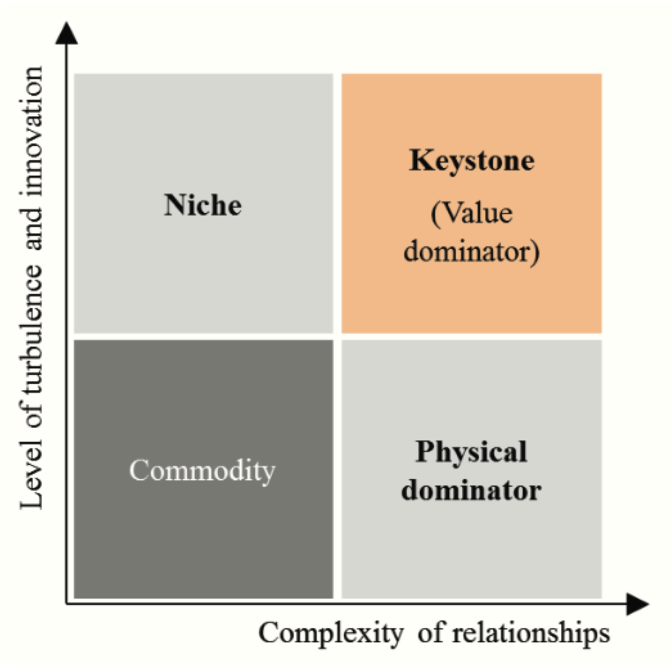

Figure 16 - Types of ecosystem strategies

Source: Paulus-Rohmer et al., 2016

Keystone strategies are of particular importance in business sectors with frequent or considerable external disruptions, since they support the diversity that preserve the overall structure, productivity, and diversity of the system. As a consequence, while single members of the ecosystem may change, the overall system, together with its keystones, persists. In advance, keystones also enhance the potential for ecosystem' s survival by encouraging change. An example of this is the case of the IBM-Microsoft-Intel ecosystem with respect to Apple. For several years, Apple acted as a dominator, refusing to allow its operating system to be licensed, and producing a highly integrated product (hardware, software platform, and many applications) thus also performing the functions of many other potential "species". But Apple failed in the face of Microsoft, IBM, and Intel, who operated with an effective keystone strategy. Examples of companies adopting niche strategies may be NVIDIA and Broadcomm in the chip industry, or Siebel Systems and AutoCad in the Software Applications industry (Iansiti & Levien, 2004).

According to Paulus-Rohmer et al. (2016), in addition to the strategic position in an ecosystem, it is also important to consider the direct connection between different businesses at the network level. The position between upstream and downstream businesses plays an important role in determining competitive advantage.
More in particular, Adner & Kapoor (2010) propose a framework that "exploits the relative location of activities within the ecosystem to distinguish among the different roles played by various actors in the firm's environment" (Figure 17).

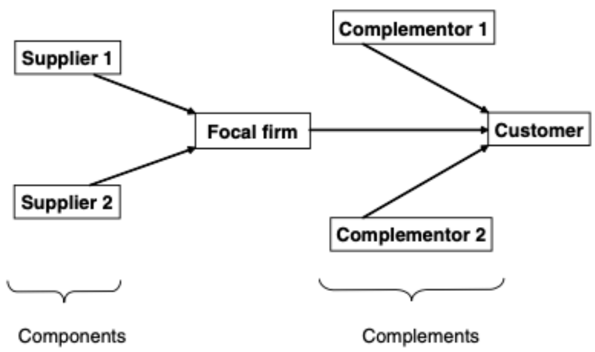

Figure 17 - Generic framework of an ecosystem
Source: Adner & Kapoor (2010)

The upstream activities, related to the firms that supply components to the focal firm, help to increase the focal firm's competitive advantage. On the other hand, downstream activities consist of supplying complements by the focal firm.
This pattern can also be viewed from the perspective of ecosystem strategies. Suppliers and complementors are the niche players, while key players seek to bring complements together to create value for the customer. In contrast, the strategy of a physical dominator would seek to vertically integrate complement providers to avoid the competitive environment that can create disadvantages.
Other authors (Zahra & Nambisan, 2011) identify three ecosystem roles: "feeder", "breeder", and "niche". These roles emphasize that actors' attitudes tend more toward ecosystem coevolution than toward their own strategic positioning (Valkokari et a., 2017).

Thus, such roles delineate the different types of value-creating and value-capturing opportunities that can occur within an ecosystem (Figure 18).

Breeders engage in the original research that triggers new technological paradigms or disrupts the knowledge foundation of an industry or niches therein. They manage to do this by discovering and combining new technologies and knowledge within an industry or by bringing innovations from other industries and combining them with existing ones in an industry. Both of these activities encourage the creation of new industry niches and new markets to exploit for growth. Since they are R&D driven, their marketing capability is limited. Generally, there can be two broad possibilities for breeders to appropriate value. If the nature of a discovery is likely to transform the industry, then incumbents can acquire the breeder. Otherwise, if the discovery is likely to change the offering within an existing ecosystem, breeders can acquire the necessary resources by partnering with other new companies and then proceed to conceive and develop new products (Zahra & Nambisan, 2011).

	New Venture Types		
	Breeder	Feeder	Niche Leader
Primary function	Create radically new ideas/knowledge that transform or create ecosystems	Discover & innovate within existing ecosystem knowledge base	Innovate and dominate a well-defined market niche in existing ecosystem
Core characteristics	Thinking, "Intelligent" organizations that lack applied imagination	Application-oriented, disciplined organizations with limited or no commercialization skills	Niche-focused (market, technology, & geography) organizations with well-developed knowledge about the market
Technological capabilities	Deep science-based expertise; relatively well developed R&D skills (although more of 'R' than 'D')	Application oriented expertise; considerable knowledge conversion capabilities	Extensive and highly specialized expertise in a narrowly defined area
Marketing capabilities	Very limited	Limited to identifying and/or evaluating market potential of new technology/knowledge in existing ecosystem	Highly niche-centric (i.e. close ties to customers and other key stakeholders in the niche market area)
Relational capabilities	Very limited; some ties with ecosystem leader	Well developed; extensive ties with ecosystem leader and members of the ecosystem	Relatively well-developed but limited to those members who are part of or adjacent to its particular niche area
Role in theInnovation Ecosystem	Explore, expand frontiers of knowledge underlying an ecosystem	Transform invention to innovation within ecosystem boundaries	Enhance the reach and range of innovation platform
Unique skills that allow them to play That role	R&D	Social Capital, combined with applied R&D	Technical competence, strong market orientation

Figure 18 - Types of ventures in innovation ecosystem

Source: Zahra & Nambisan, 2011

Feeders are skilled at converting innovations developed by breeders into more concrete innovations with a clear market orientation. In other words, feeders' activities in the ecosystem tend to leverage links in the value network in terms of commercialization of innovative ideas within the ecosystem.

Feeders connect breeders with the different ecosystem actors, including the leader company. These connections allow them to define the different applications of innovative ideas, finding new market niches that they can inhabit. These market gaps can emerge from the evolution of feeders or niche actors, and also from the introduction of new business models that transform inter-firm relationships within an ecosystem (Zahra & Nambisan, 2011).

Niche players are defined by Zahra & Nambisan (2011) as "specialized companies that develop one or more parts of the core technology or products/services that complement the platform, or implement one or more innovation processes in the ecosystem".

Niche players create value in the ecosystem by applying their specialized expertise in form of products/services or in form of innovation processes. The success of niche players is based on gaining a deep understanding of the wider goals of the ecosystem. Activities of niche players usually include experimentation, R&D, and product development.

Overall, three features define niche players: profound expertise in a well-defined area connected with one or more existing ecosystems; deep market knowledge and marketing expertise that allow them to position their offerings relative to the target market of an ecosystem; and the absence of independent marketing capability and thus dependence on the commercialization platform provided by the ecosystem leader.

Most of the mentioned roles and their related strategies can be connected to the network position of the company. Keystone and feeder, as well as breeders, serve as hubs while niche companies are typically in the position of spokes (Valkokari et al., 2017). A hub often acts as an ecosystem orchestrator, while spokes behave as complementary actors that deliver the services, technology solutions, and other assets deployed in various contexts. The position and role of the actor in the network thus depend on the strategies and actions of other actors and are thus constantly evolving. In other words, the ecosystem is continuously co-evolving and a niche actor might become the keystone of a new emerging ecosystem (Valkokari et al., 2017).

3.2 B2B value proposition and value distribution: power and positioning strategies in the ecosystem for B2B manufacturers

As already said, companies "should work together with companies in its supply chain in a closer and more coordinated fashion to achieve efficiency gains and, potentially, a sustainable competitive advantage" (Cox et al., 2001) but, at the same time, it should seek to maximize its individual power to capture greater value for itself (Peppard & Rylander, 2006 in Vendrell-Herrero et al., 2017). According to Porter (see Vendrell-Herrero et al., 2017), the interlocking systems of interdependent activities that constitute a product's supply chain establish the power structures. In advance, the resolution of the trade-offs created within these interlocking systems provides a strong driver of competitive advantage. The theme of organizational power within the supply chain is extensively treated by Cox (1999, 2007). Cox (1999) defines power as an unbalanced relationship in which supply chain upstream or downstream parties have the ability to capture most of the value created within the trade. The basic premise of Cox's works is that the power of one company over another is determined by the extent to which one company depends on the other for specific resources. It is also claimed that the level of that dependence is determined by the relative utility and relative scarcity of the resources brought by each party, where the utility of a resource relates to its commercial and operational importance to the enterprise and the scarcity of a resource deals with the degree to which an equivalent resource can be found elsewhere (Cox et al., 2001).

According to Kähkönen et al. (2015), resource dependence theory (RDT) is a central topic in studying supplier relationships and in explaining the concept of power and dependence. According to RDT, in order to acquire resources, organizations need to interact with those who possess or control such resources. The survival of the organization depends on its ability to ensure the continuity of the resources it needs.

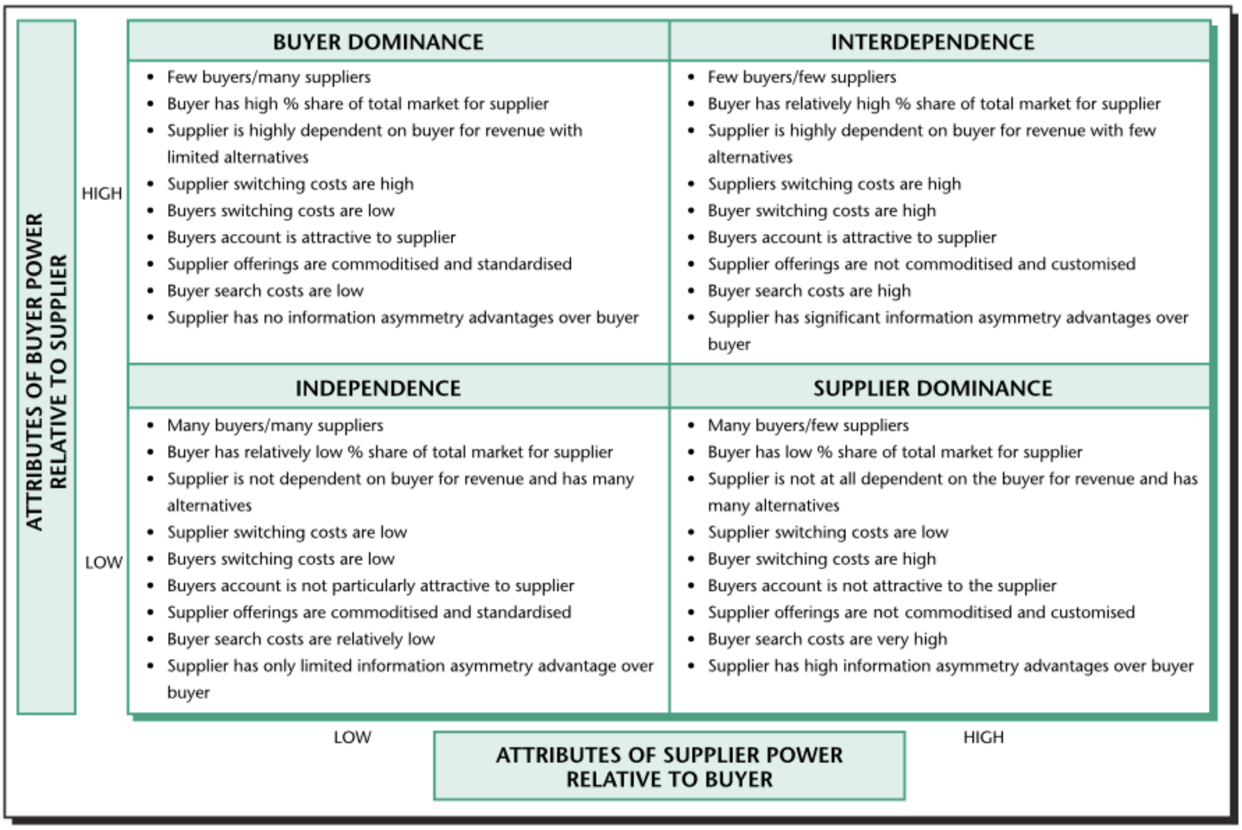

Figure 19 - The exchange power matrix

Source: Cox, 2001

In the context of a buyer-supplier exchange relationships, it is assumed that the key resources a buyer brings are its expenditures, which can be assessed in terms of volume, regularity and predictability, and its reputation in the marketplace (Cox et al., 2001). By contrast, the core resources a supplier brings to an exchange relationship are in the form of its product/service offerings and in the knowledge and organizational processes that underlie those

products/services (Cox et al., 2001). A buyer can be located in the buyer dominance box (Figure 19) if two conditions are met. The first condition is that the buyer offers the supplier resources (expense and reputation) that are relatively scarce and that the supplier considers relatively important. The second condition is that the supplier's resources (product/service, knowledge, and processes) are relatively common and are relatively unimportant to the buyer (Cox et al., 2001). If the opposite is true in terms of usefulness and scarcity of resources, then the supplier has power over the buyer (supplier dominance box). If the buyer is in the buyer's dominance box, he/she has supplier-related attributes of power that allow him/her to leverage the supplier's performance in terms of quality and/or cost improvement, and to make sure that the supplier receives only normal profits (Cox, 2001).
Looking at the interdependence box, both the buyer and the supplier own resources that require the two actors to work cooperatively, as neither actor can force the other to do something they do not wish to do. In other words, buyer and supplier are in an interdependent scenario if each actor offers a high perceived importance and distinctiveness of the resources (Figure 19). In this situation, the supplier can achieve above normal returns, but he/she must also transfer some value to the buyer in the form of less than ideal returns and some degree of innovation (Cox, 2007). Finally, in the independence box, neither the buyer nor the supplier has relatively important and unique resources to offer to the other party. This final scenario represents the classic market ideal, with many easily interchangeable buyers and suppliers (Cox et al., 2001). Of course, the ideal scenario for buyers is to force all of their suppliers into the buyer's dominance box. It is not always possible to achieve this desired goal. If this could be easily achieved, few providers would have the ability to operate within the interdependence or supplier dominance box. This ideal scenario for buyer is not always possible in the real world because of the countervailing power resources owned by the supplier (Cox, 2007).

Golgeci et al. (2018), in their work, consider the effects of power-based behaviors on relational outcomes. Companies' behaviors toward their business partners depend on the direction, extent, and approach on which power is exercised. Behavioral choices and strategies of firms are influenced by mutual capabilities and mutual perceptions of power symmetry/asymmetry and dependence in relationships. In this regard the authors, in accordance with the previous analyzed literature (e.g. Cox, 2001) believes that dependence and interdependence play an important role in determining how power-based behaviors are chosen by supply chain partners. Scheer et al. (2015) define dependence as “the need to maintain a relationship with another party in order to achieve one’s goals”. Golgeci et al. (2018) state that partner dependence positions are key factors to consider in supply chains, influencing choices of power-based behaviors and responses to those behaviors. For power-based behaviors to be important in analyzing the supply chain, relationships must go beyond the concept of market and "arm-length" transactions. At that point, relative power/dependency influences dominance, egalitarianism, and submissive tendencies between parties.

• Dominance behavior

Dominance behavior refers to actions initiated with the intention of forcing a partner to act in the firm's best interests in a unilateral manner. This behavior is adopted when a supply chain member expects its partner to comply. Even if such behavior can be driven by strategic positioning and socio-political reasons, a firm power position impacts the decision to exercise dominance. Firms may have various power advantages that empower them to use behaviors to establish influence over a partner. For example, when there is an imbalance in dependence between supply chain members, the more dominant firm may be inclined to act more assertively, being confident that its partner will meet expectations. In addition, the dominant firm may not care about the effects of its own behavior on the dependent partner's perception of their relationship (Golgeci et al., 2018).

• Egalitarian behavior

Egalitarian behavior is typically characterized by a higher degree of fairness, reciprocity and compromise between the parties and the bilateral relationship management. Such behavior refers to actions by supply chain members who believe that their partner has the same value and social status. Otherwise, although one or both firms may possess the resources to use dominant forms of power, their choice is to behave as equals. Symmetrical dependence (interdependence in "The exchange power matrix of Cox", 2006) deters partners from attempting to assume a dominant role over the other and it promotes mutual accommodation to achieve reciprocal desirable outcomes, encouraging cohesion, and synergy between parties as key innovation attributes. While relationships based on egalitarian behavior are not always without conflict, companies that adopt egalitarian behavior can leverage conflict as an input to value creation. In short, no matter their position of dependency, partners can often improve relationship satisfaction by engaging in egalitarian behaviors.

• Submissive behavior

Submissive behaviors are based on actions that are flexible, accommodating, and compliant with the requirements set forth by a supply chain partner. In order to achieve harmony between the parties such behavior places the compliant partner primarily in the position of a submissive partner, using forced and yielding behaviors. This can happen when a firm perceives it to be more dependent and/or lacking in counterpower, and, as a result, it is more likely to opt for submissive behavior in response to a partner's requests.

Forsström (2005) state that there are three different perspectives from which to analyze value creation in a supplier-buyer relationship: the monetary value of an offering, the value of a relationship and also the value created in a relationship. In advance, Smals and Smits (see Kähkönen et al. 2015) make a distinction between direct and indirect value. The former refers to the total amount of orders and profitability generated within the relationship. Indirect value, instead, reflects the benefits gained outside the current relationship. An example could be a situation in which a supplier helps a buyer to become more innovative. In this view, for buyers, suppliers can play a significant role as value co-creators. Moreover, Kähkönen et al (2015) show that the value co-creation with suppliers lead to an improvement of the buyer customization and service capability, thus leading to a mutual dependence that has a positive effect on value creation.
The following table incorporates the analyzed concepts.

	Ownership of valuable/unique resources (power)	Companies' behavior		Degree of cooperation
		Buyer	Supplier	
Buyer dominance	Buyer	Dominance	Submissive	Low
Interdependence	Shared	Egalitarian	Egalitarian	High
Independence	None of them	-	-	Low
Supplier dominance	Supplier	Submissive	Dominance	Low

Table 2 - Buyer-supplier dependency and behavior
Source: personal elaboration

Overall, according to Kähkönen et al. (2015), three supplier relationship management activities are highly connected to value creation practices and they also enhance the buyer dependence on the supplier: Early supplier involvement characterized by long-term commitment and the aim of integrating suppliers' capabilities in to the firm's product development; inter-firm learning characterized by joint planning, knowledge sharing and collaborative learning; supplier orientation characterized by goal sharing, constant development and search for new areas of collaboration (Kähkönen et al., 2015).

• Early supplier involvement

Early supplier involvement is seen by Dobler and Burt (see Kähkönen et al. 2015) as a way to integrate suppliers' capabilities into the purchasing firm's supply chain system and operations, thus engaging preferred suppliers since the early stages of product design and development, with a long-term perspective. Tipically, supply chain (especially those oriented to innovation) performances are positively impacted by supplier development activities, such as knowledge exchange and combination of precious and resources.

• Inter-firm learning
The establishment of mutual goals and strategic objectives by the parties is a critical factor in both early supplier involvement and inter-firm learning. The organization of learning processes requires not only collaboration between firms, but also effective practices to manage knowledge generation and dissemination. The authors also believe that information control and information exchange can have an influence on power dependency between buyer and seller.

• The supplier orientation of a buyer
Reciprocal goals, strategic planning, ongoing development, and finding new areas of collaboration, which are important drivers of value creation, are also key factors in supplier orientation. However, elements of supplier orientation have also been found to influence dependency relationships.

Previously reviewed literature (Cox, 1999; Cox, 2007) confirms that in a buyer-seller relationship, holding unique resources considered valuable to the other party is of paramount importance in order to achieve an interdependent position with the other party and to avoid a situation where one party is dominated by the other party. Unique resources can occur in different forms such as intellectual patents, organizational culture, tacit knowledge, flexibility, etc.
Going back to the concept of digital servitization, from the Kohtamäki et al. (2019) work it is possible to realize that some studies have extended the power approach to servitization, but no one has actually focused on the interaction between digitization, ecosystem architecture, and positioning.
On this point, Rabetino and Kohtamäki's (2018) observe that "manufacturers need some bargaining power to sell integrated solutions and enable data acquisition, analytics, and implementation". Vendrell-Herrero et al., 2017 state that digital servitization may offer opportunities for downstream companies to improve their position in the supply chain. As already said, digital technologies enables upstream companies to make the transition from

capturing value through the traditional product-oriented business models to creating more value from service offerings (Holmström & Partanen, 2014 in Vendrell-Herrero et al., 2017). In addition, while the process of creating and capturing value has often been separate before, today's smart and connected products lead companies to new and different strategic choices related not only to how value is created and captured, but also related to how the amount of data is managed, how relationships with traditional business partners such as channels are redefined, and what role companies should play in supply chain (Porter & Heppelman, 2015).

For product-oriented companies that add digital services to their offerings, it is critically important to know how to leverage their unique resources to "rebalance their power position relative to downstream companies" (Vendrell-Herrero et al., 2017). The authors also state that the application of such unique resources offers opportunities for upstream companies to remodel the competitive scenario, since it enhances their bargaining power. Ulaga & Reinhart (2011) investigated what resources can be considered unique and valuable in manufacturing firms. The first resource identified is the installed base of products, which allows manufacturing companies to offer maintenance and repair services, thus having access to product usage and customer process data. Therefore, as already said, IoT technologies are the means to transform the company's installed base (IB) into a stream of product usage and process information, which is considered to be of high value (Paiola & Genauer, 2020). In this regard, Porter & Heppelman (2014) state that "through capturing historical product-usage data, buyers' costs of switching to a new supplier increase. In addition, smart, connected products allow firms to reduce their dependency on distribution or service partners, or even disintermediate them, thereby capturing more profit. All of this serves to mitigate or reduce buyers' bargaining power".

Another distinctive resource identified by Ulaga & Reinhart (2011) is related to research and development (R&D) and production. Unique goods-oriented resources (process standardization, quality control, capacity management, and rapid prototyping) can be leveraged by manufacturing firms for the deployment of offerings that have an unique value for the buyer, thus improving their power position in the supply chain.

A third distinctive resource identified by Ulaga & Reinhart (2011) is related to field service organization. Most manufacturing companies have investments in field organizations to deliver and install assets and provide maintenance for their installed base. After-sales services are often a high-margin activity that represents a significant part of manufacturers' profits. If manufacturing companies are able to leverage these distinctive resources, they can enhance their value creation, value delivery, value proposition and value capture components of their business model.

The aforementioned research made by Paiola & Gebauer (2020) on 25 Italian B2B manufacturing companies reiterates the importance of the installed base as a valuable resource. Nine of the interviewed companies decide to offer their customers a "retrofitting kit" that permits the connection of traditional products already sold and thus the ability for the company to gather big data.

Focusing on value creation, intended as the position and role in the value system, and value delivery, intended as the sales model, channels and customer relations (Osterwalder & Pigneur, 2010 in Paiola & Gebauer, 2020), the research results show that manufacturing companies directly linked with end customers are in a strong position to leverage their installed base. Due to the fact that they are in a direct relationship with their customers, they don't have to be worried about conflicts with distribution channels, and they don't have to improve their positioning strategy in the value system. For companies that do not have direct access to the end user, the scenario can be very different, especially if there are obstacles to bypass channels. In other words, if the supply chain is composed by powerful actors, a "downstream move" aimed to access end-user firms' data can be very challenging and risky. A downstream move can take the form of the disintermediation of the downstream channels via IoT technologies or control of the distributor (Paiola & Gebauer, 2020). In the first case, the internet can be helpful for companies to reduce buyer power or disintermediate distribution and service partners, leading to a digital disintermediation. For these firms, the success of the move heavily depends on the attributes of the downstream actors in the supply chain. The move may be successful if, for example, the downstream actors lack the skills to perceive changes in the environment and the resources to exploit them, or if they lack the power to react. In other cases, downstream actors may not see a threat in the move because the disintermediation strategy implemented by the upstream firm may be related to a small part of their offering, or a new value proposition that addresses a niche market. In the second case, a firm may try to take control of the distributor, bypassing channels' actors. Due the riskiness of this strategy (the retailer could decide to preclude the manufacturer from a large portion of its customers with a counteroffensive strategy), only two companies in the entire sample pursued this route.

4 MeteRSit case

4.1 Case introduction

The case that will be presented in the following paragraphs concerns an Italian manufacturing company operating in the B2B market, in which I had the opportunity to do an internship. In particular, I had the opportunity to work as a digital transformation intern within the digital transformation function. This company, which will be fully described later, has recently decided to change its mission, with the aim of moving from a product-centric to a customer-centric perspective.
The objective of my internship was to investigate how digitization has impacted on the business model of the company analyzed and to propose possible future scenarios from the perspective of services.

4.2 Sit Group and MeteRSit: a description of the company

4.2.1 Sit Group

SIT S.p.A., headquartered in Padua, is a leading company that operates with two divisions. The Heating Division is active in the design, production and marketing of components and systems for the control, regulation and safety of appliances for domestic gas heating and catering plants. SIT also operates in the Smart Gas Metering sector (with its subsidiary MeteRSit), producing new generation meters that can be managed remotely with real-time reading and communication of consumption data.
SIT is now one of the world's leading players in its sector and is facing a path of transformation from a mechanical firm to a company capable of increasingly integrating this component with electronics, ready to face and win the challenges of Industry 4.0 on global markets. The company has such a strong presence in people's daily lives that it is estimated that around one in two households worldwide that have a gas heating appliance has a SIT component in their home. The Company is headed by the Chairman Federico de' Stefani, son of one of the founders, who holds 72% of the shares. SIT is listed on the Italian Stock Exchange.
Founded in 1953 by Pierluigi and Giancarlo de' Stefani, with the name SIT La Precisa, from the '60s to the '90s the company has experienced a significant development on the reference markets, including international ones, culminating in 1997 with the opening of the Shanghai branch. Since the end of the '90s acquisitions have been made in Holland and Italy and

investments in production capacity in Italy, Holland, Romania, China and Messico. In 2009 the subsidiary MeteRSit was established (initially in the form of a JV), one of the pillars of the company's development. In 2019, the Group employees 2246 people, 153 of which in the Smart Metering Division.

The Group is composed of 6 production companies located in Italy, Mexico, Holland, Romania and China. This geographical dislocation corresponds to a "local" approach to the multinational dimension of the company through the establishment of continental platforms to serve the reference markets. SIT has important shares in the markets in which it operates. The wide commercial network, the cutting-edge technology, the constant push for innovation (also in partnership with major customers), the important investments in R&D and the commitment of its people have allowed SIT to reach this position.

Figure 20 - SIT's Global Presence

Source: Sit Media Information, 2019

In the Heating sector, which represents about 73,8% of revenues in 2019, SIT products are present in many types of gas applications such as heating and hot water boilers (the most important component), gas stoves and fireplaces, domestic hot water applications and professional kitchens.

SIT includes among its customers important national and international operators, such as in the Heating sector Ariston, Baxi, Bosch, De Longhi, Electrolux, Vaillant and in the Smart Gas Metering sector Italgas and 2I Rete Gas.

During 2019 SIT decided to express more clearly and explicitly its determination to pursue and maintain a constant balance between economic objectives, respect for the environment and attention to the social dimension, redefining in this perspective, its Mission, Vision and Values.
Mission:
"Our commitment is to create smart solutions for climate control and consumption measurement for a more sustainable world".
Vision:
"To be recognized as the leading sustainable partner for energy and climate control solutions (and to enjoy the journey!)".
Values:

• Customer orientation
• Sustainability
• Lead by example
• Technology
• Lean
• Passion

SIT is focusing on the technological development of its products in the belief that innovation can be the driving force for the company's future growth. The company is looking in particular at the development of increasingly integrated electronic and mechanical solutions, able to communicate with the external environment through Internet of Things (IoT) technologies. In the area of electronic products, the development of new products continues to improve SIT's presence in the sector, in particular through co-design projects in the field of remote control, control panels with color touch screen technology, integration of home automation devices.
SIT is also working to grow the intelligence of the meter, which will not only measure consumption but will communicate with the and will therefore become an integral part of home automation.
SIT's economic and financial performance in recent years has demonstrated the company's ability to generate significant and stable earnings.
SIT's consolidated revenues in the period 2013-2018 recorded a compound annual growth rate (CAGR) of 7.9%, reaching €352.2 million in fiscal year 2019.
Both businesses contributed to achieve these remarkable results.
The Heating Division reached revenues of €260 million in 2019 and the Smart Gas Metering Division (revenues of 88.6 million euros in 2019) showed a growth of 23.1% compared to 2018, allowing it to confirm its strong competitive positioning on the Italian market.

4.2.2 The Metering division: MeteRSit

MeteRSit, established in 2009, is a SIT Group company that designs, manufactures and markets smart gas meters with innovative measurement technologies and communication functions.
The Smart Gas Meters are the new smart meters that communicate data in real time, able to accurately measure consumption and be managed remotely. In this area the particular measurement technology developed by MeteRSit (defined thermo-mass) allows a greater precision of measurement and a considerable reduction of the physical dimensions of the meter itself.
The opportunity to develop this business has been given by the replacement of old gas meters with new generation meters according to new European directives (EC Directive 2009/73).
MeteRSit holds in Italy a market share of more than 30% and it is now engaged in the implementation of new communication protocols in order to make these products suitable for international markets both within and outside Europe.
The Smart Meters business represents, for the Group, an important growth driver considering that, in the period 2013-2018, there has been an extraordinary progression in the sales with a compound annual growth rate of 70.5%.
MeteRSit is independent from SIT for sales, after sales marketing and R&D functions.
Staff functions such as Human Resources, Digital Transformation, Governance and Legal and Finance are common to both divisions.
In 2020 SIT acquires 100% of Janz-Contagem e Gestão de Fluídos S.A., a Portuguese company specialized in the production of residential water meters. The acquisition is strategic for SIT because it allows to further strengthen the smart metering division of the Group, applying to the water sector the gas meter know-how. With the acquisition of Janz, SIT expands its product portfolio to water meters, a market that, as it will be shown later, is expected to grow significantly in the coming years.
In particular, the segment of "smart" meters will grow due to the huge investments planned by Utilities to reduce losses in the water distribution network. Janz's product portfolio will be further developed by benefiting from MeteRSit's metering and consumption data communication technologies. Federico de' Stefani, Chairman and CEO of SIT S.p.A said that *"The expertise and know-how we have developed with gas meters, particularly with regard to the communication of meters with smart grids, will be the basis of the synergies we will create with Janz, to accelerate the growth path in the smart water meters segment. The goal is to establish an international player in smart meters, gas and water, representing excellence in measurement and communication technologies to support the networks of utilities. A center of*

technological excellence made by SIT dedicated to the development and worldwide distribution of smart meters, with certified expertise and advanced processes for the measurement of energy elements to protect natural resources".

The case study of the company is focused on the Smart Metering division: MeteRSit, which operates in a market with high growth potential. As today, MeteRSit has the following business model (Figure 21).

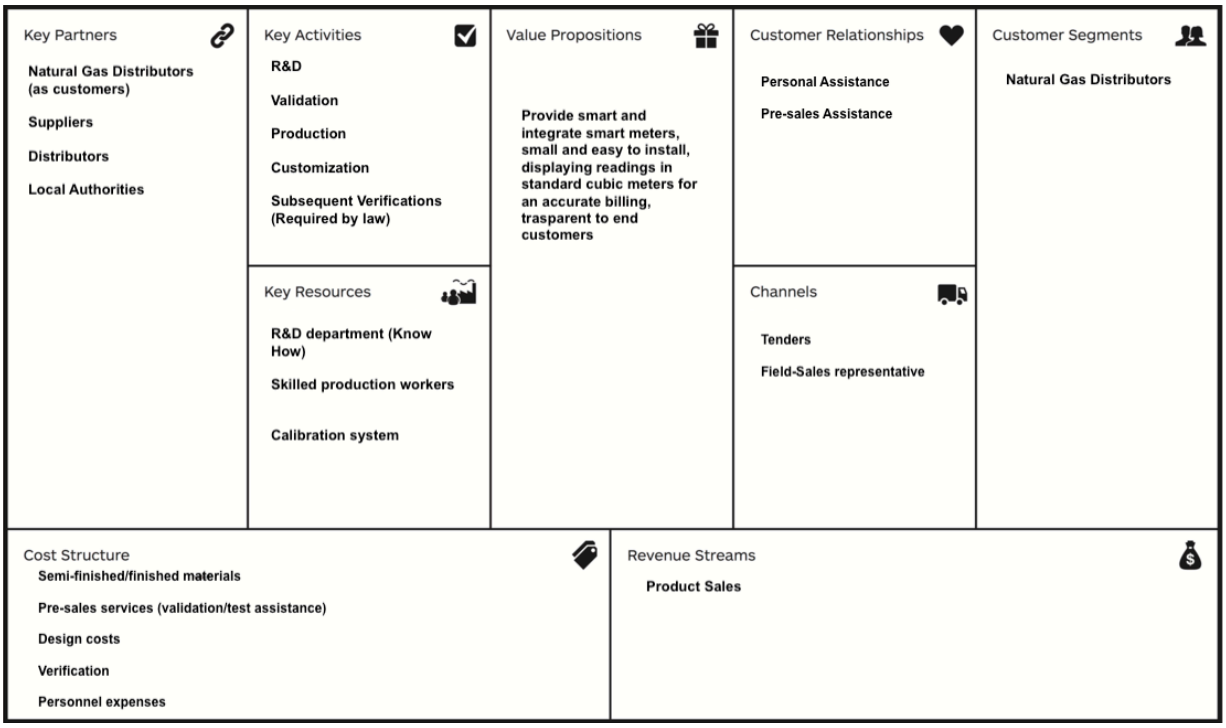

Figure 21 - MeteRSit Business Model

Source: Personal elaboration

4.3 Digital transformation in SIT

4.3.1 Case methodology

During my internship I had the opportunity to have an ongoing interaction with the digital transformation manager, to interview crucial managers of the organization and to take part in a meeting (Table 3).

Date	Name	Position	Duration
27/11/20	Diego Minerva	Key Account Manager	00:43:52
09/12/20	Luigi Bernardo	Key Account Manager	00:43:33
17/12/20	Giovanni D'Alberton	Product Marketing Manager and Project Manager	00:56:40

Date	Meeting Name	Duration
10/12/20	Digital Transformation - What's going on and what's next	01:40:51

Table 3 - Interviews and meeting list

Source: Personal elaboration

From these interviews important data were collected, which were then inductively analyzed. Interviews were registered, transcribed, categorized and coded. More in particular the coding scheme presented in Voss et al. (2002), Corley & Gioia (2004) and Gioia et al. (2013) was adopted.

As shown in Appendix 1, this methodology consists of a first open coding, aimed at identifying initial concepts in the data and grouping individual observations, sentences into categories (Corley & Gioia, 2004), called first-order categories. Then, through axial coding, relationships between first-order categories were searched, in order to link them in a reasonable way (second-order themes). Finally, through selective coding, core categories were selected (aggregate dimensions) and related to other themes.

4.3.2 Digital transformation function

In order to make possible the beginning of a journey from a traditional mechanical company to a digitized one, SIT established a Digital Transformation function as of April 2019. The function, being in a staff position, reports directly to the CEO, it is independent and responsible for defining and coordinating the digital transformation process. SIT's Digital Transformation Manager, who heads the function, said that "the mission of SIT's Digital Transformation function is based on three pillars: process innovation, technology and people. All that matters is that it is a journey that is done all together and that engages and grows confidence in people and in the use of technology. No digital project can stand up without one of these three pillars. SIT has always proven to be a major technology player and therefore a path of digitalization of both internal and external processes (such as thinking about businesses that are based on data and digital solutions for the customer) is something that cannot be missed."

The Digital Transformation function started its work by gathering the needs within the organization and, with the help of a consulting firm, mapping the people within the organization, dividing them into Ambassadors, Supporters, Followers.

Ambassadors are those people who have skills and mindset that allow them to be leaders of the change, involving the company structure in the path towards the Digital Transformation. As far as Supporters are concerned, the level of skill and mindset allows them to actively support the Digital Transformation process both on initiatives related to their own area of expertise and on cross-cutting projects. Finally, followers are people with a limited level of skill and mindset who need to be involved both in terms of skills and awareness of Digital Transformation issues.

The ambassadors were then given a training course called "Train the Trainer", which was designed to build, train and strengthen the communication skills needed by those who have to teach others, enabling them to be as clear and efficient as possible in conveying information. Digital ambassadors will then be expected to provide training to close collaborators.

In addition to this, another training course was also delivered to 300 Italian employees on Office 365, which proved to be very useful in dealing with smart working at a time when staff was forced to work from home due to the Covid 19 pandemic.

In this regard, the Digital Transformation Manager said that "staff training, both specific to precise projects and more general at the mindset level will have to be constant throughout the time frame of the function". The interviewed manager mentioned the time horizon because "the Digital Transformation function is destined to dissolve, which means that at the end of this initial digital transformation process the company will have acquired a digital culture that will enable it to work independently. Digitization will have to become an asset of the company and no longer be relegated to a specific function."

More specifically, the objectives of the function are presented in figure 22.

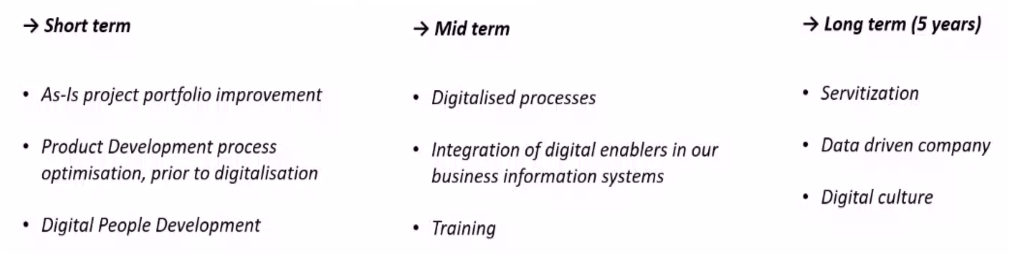

Figure 22 - Digital Transformation objectives

Source: Digital transformation manager presentation

The way in which the Digital Transformation function operates is related to agility, originating from the Lean Startup concept. The Lean Startup method favors experimentation over planning, customer feedback over intuition, and iterative design over traditional "big design up front" development.

A hybrid organizational model has been chosen for the Digital Transformation function (Figure 23). The central unit is currently very small (2 people) and the digital sub-units are within the various functions. In other words, the model includes a central Digital Team with Digital specialists embedded in the various functional areas and cross-functional teams. In this model, the relationship between the central team and the integrated digital specialists is essential. In the future SIT digital transformation will arrive at a decentralized model, in which there will no longer be a coordinating unit but each function will be responsible for its own digitization with its own strengths and, at that point, SIT can be considered permeated.

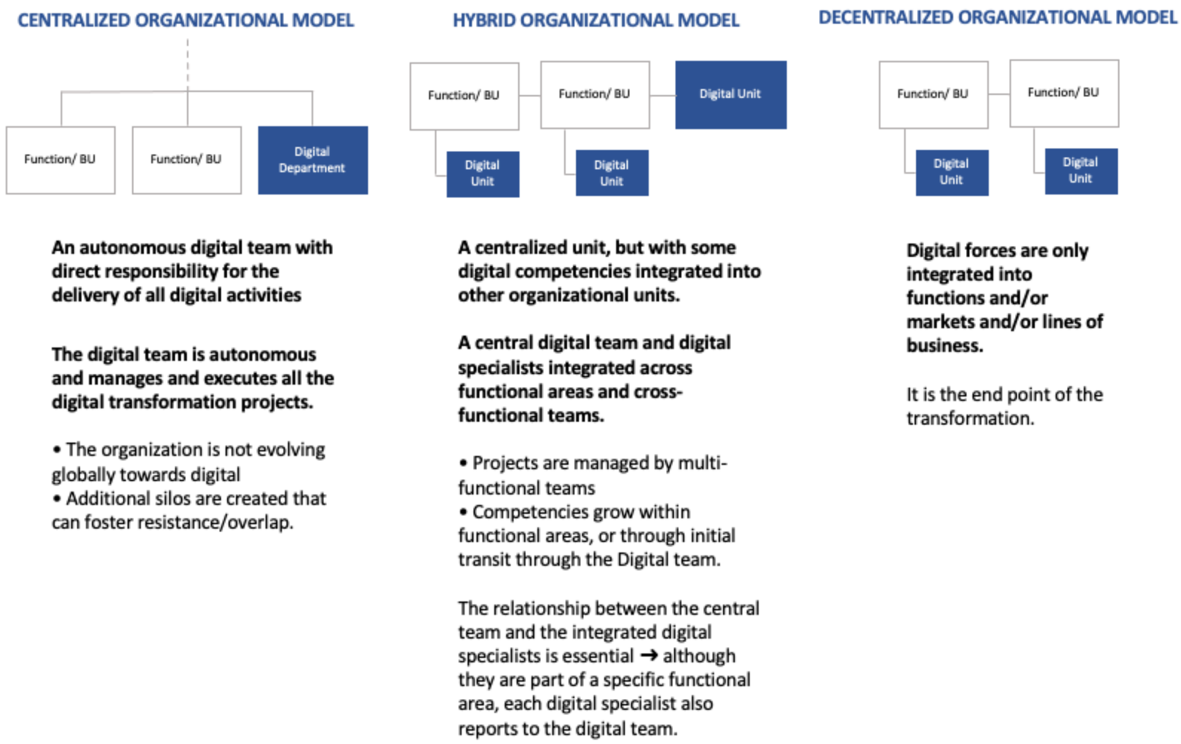

Figure 23 - Digital Transformation organizative model

Source: Personal elaboration of SIT presentation

With the aim of achieving the proposed objectives, the digital transformation function initially implemented specific projects for the digitalization of processes. As explained below, some of them are common to both divisions while others were initially designed for the heating division and will later be expanded to the metering division (Table 4).

Digital Transformation Project	**Heating Division**	**Metering Division**
Visual Management System	Implemented	Not Implemented
Industrial Internet of Things	Implemented	Implemented
Customer Relationship Management System	Implemented	Implementation in short term
Remote Assistance through Augmented Reality	Implemented	Implementation in short term

Table 4 - Digital Servitization Projects

Source: Personal elaboration

4.3.3 Function Projects: Visual Management System and IIoT

With regard to the function's projects, in the product development area a great deal of work has been done to redefine procedures, both for the Metering and Heating functions.

The objective is to involve all functions, not just R&D, in the development plan.

At first, a visual management project has been carried out for both heating and metering.

A visual management system makes important information visible to operators at the times and places where they need to see it. The visual management system also allows the full visibility of the progress of the activities in real time, highlights the possible criticalities that are generated and allows an immediate corrective action. Through the visual management it is possible, moreover, to make visible in a clear way the information of the results and objectives to be obtained, during the execution of the activities. This "mind map" makes it possible to organize all the questions, reflections and suggestions regarding a certain topic into a visual organization chart. Initially, by 2020, the plan was to start using paper-based scoreboards to get familiar with the system and then eventually move to digital. However, the Covid crisis has prompted SIT to move directly to digital. This system is being used effectively by various teams in the heating sector (Marketing, R&D, Quality).

Another project that has been started is the implementation of an IIoT system in the production site of Rovigo. In the plant there has been a change from a manual entry of production data to a completely digital and real time data management. SIT succeeded in making smart all the production lines, allowing an optimal data transmission and management.

4.3.4 Function Projects: CRM

A further initiative on which SIT's digital transformation function has recently focused is the CRM system: a technological platform that allows SIT to put the customer at the center and to listen to the customer's needs, with the possibility of following the changes in purchasing behavior.

The CRM system is implemented in SIT in a context of efficiency and optimization of processes that includes support for teamwork, efficiency of customers management (contacts, opportunities, performance, history, offer, ...), improvement of information exchange between functions for better integration and operational efficiency and measurement.

In particular, a recent press release from the company states that "*in combination with a major reorganization of our Sales and Marketing process, we started from the need to provide colleagues with a "digital enabler" that would allow us to listen even more the customers through a deeper knowledge of their needs and constant communication with them. At the same time, the new CRM allows us an efficient workflow, digitizing sales processes to meet new customer needs and, at the same time, improving the go-to-market through decisions based on real and current data. When fully operational, Salesforce CRM will help us to spend less time on low-value activities, make our sales processes more efficient by reading constantly updated data, manage our know-how by making it available to colleagues and the company, and further improve customer relations through greater connectivity between sales, marketing and R&D departments*" (SIT Spa, 2020).

At the moment, CRM is adopted by the entire Sales team of the Group's Heating division and by the end of the year SIT's Strategic Marketing will also be able to exploit the platform's potential. For 2021 it is planned to expand the CRM system to the Smart Metering division. In addition, an integration of CRM with SAP and BI is planned for 2021.

Once fully operational, the CRM system will allow SIT to:

- Spend less time on low-value activities
- Sell more effectively, focusing effort also based on constantly updated data
- Save time in managing information flows
- Improve customer relationships by having all relevant information at your fingertips
- Facilitate collaboration between sales, marketing, R&D, etc.
- Create business knowledge by collecting information and building a business history

4.3.5 Function Projects: Remote Assistance through AR

An additional digitalization project is linked to the possibility of providing the assistance service through augmented reality glasses. In this case, the pilot project was born within the quality and after sales area of the Heating division. The need was to have a pair of glasses that could focus on very small details, allowing a remote technician to manage support operations.

The extension of this project to the Metering division was one of the subjects of my internship at SIT.

Based on interviews with MeteRSit's Key Account Managers (see table 3), it has emerged that, after having established itself in the Italian market, MeteRSit is looking to expand the business abroad. As it will be explained in the next paragraph, some European countries, including UK, are considered attractive markets since authorities are developing smart gas meters roll-out projects. One of the Key Account Managers (see table 3) states that "*one of MeteRSit's strengths has always been to be there for customers, with field interventions in the validation and testing phases of the product. This has allowed Italian customers to become aware of MeteRSit's meter technology and has allowed the company to gain an important market share. We have tried to adopt the same approach also with foreign customers, through transfers of technicians. Today MeteRSit does not have a strong market abroad, we are working in order to develop it. To do this it is necessary to provide assistance to customers in the validation and testing of products. To date, mainly due to the Covid crisis, MeteRSit is not able to be present for foreign customers in the same way as Italian customers. Even if there was no prohibition to move beyond local borders, the trips to support foreign customers would still be very expensive in terms of time and costs. Hence the need to have a more effective and less expensive approach to assistance*."

Listening to these needs, the Digital Transformation team decided to extend the project of remote assistance through augmented reality to the Metering division, investing in a platform capable of connecting anyone who needed assistance with the team of experts at MeteRSit headquarter.

The platform, identified among the various offers, allows, through the use of augmented reality glasses but also smartphones or tablets, to solve problems in real time and visually communicate detailed and complex instructions, using contextual drawings and arrows. Technicians can share their real-time view with experts at MeteRSit headquarters to get specific information, reducing travel time and costs.

The idea of the digital transformation team is to provide augmented reality glasses to commercial partners located in foreign territories to allow them to connect to the headquarters and solve any validation and testing problems (pre-sales phase) of customers. To understand the importance of this project is useful to know that smart meters are sold through public tenders and a sale usually includes a large number of meters. For this reason it is important that during product validation and testing (pre-sale phase) MeteRSit staff has a tool to show to the customer the advanced features of the MeteRSit smart meters.

On the other hand, the platform also allows to connect via smartphone with reduced but still effective functionalities, allowing to take advantage of a remote support service even without having augmented reality glasses. This makes the technology more accessible, not being dependent on any specific hardware.

The application of this platform in MeteRSit would result in significant cost savings, since the costs related to travels made to provide assistance to customers are very significant.

What has been said about Digital Transformation in SIT reiterates and confirms what was said in paragraph 2.1, namely that the strength of digital technologies comes from how companies integrate them to transform their business and the way they work (Kane et al., 2015). Finally, what sets digital leaders apart from others is a clear digital strategy coupled with a culture and leadership that can drive the transformation.

4.4 MeteRSit: Gas Smart Meter Market and competitive analysis

4.4.1 Smart metering sector

MeteRSit is in the business of smart and integrated gas meters, newly conceived meters capable of acquiring data continuously and sending it in near real time to cloud platforms. Smart Metering is generally defined as the application field of the Internet of Things focused on connected meters (called smart meters), for the measurement of water, gas, electricity and heat consumption and on their correct billing and remote management (Salvadori, 2019). MeteRSit's believe is that "these products can improve the way in which gas is measured, sold and used, enabling a more transparent relationship with the end customer and his awareness of energy consumption"[1].

The advantages of smart gas metering systems are numerous (Bianchini et al., 2018):

- The calculation of daily gas balance able to identify the national energy commercial balance;
- The reduction of operative costs for readings and contract management operations (e.g. change of supplier, deactivation, etc.) due to the remote reading;
- The possibility to identify abnormal consumptions or device malfunctions;
- The possibility to introduce a ranking to classify Operators as a function of distribution efficiency;
- The possibility to promote concurrence between Natural Gas operators for the possibility of obtaining a "spot" reading (outside the reading cycle) during the change of supplier
- The definition of bills on effective and not on estimated consumptions, thus eliminating disputes and refund procedures.
- The possibility for the end users to identify their actual consumption and so to be aware of energy efficiency and rational use of resources.

Such an advanced measurement infrastructure (AMI) is different from automatic meter reading (AMR) because it allows two-way communication between the meter and the gas distributor. More in particular, Le et al. (2016) define Advanced Metering Infrastructure (AMI) as "the system that collects and analyzes data from smart meters using two-way communications, and giving intelligent management of various power-related applications and services based on that data. The AMI includes smart meters, e.g., electric, gas, and heat meters, at customer premises, access points, communication backbone network between customer and service providers, and data management systems to measure, collect, manage, and analyze the data for further processing." As a consequence, the entire Internet of Things industry is in full development and regulation is a major driver of growth. European regulations force the progressive replacement of traditional meters with new generation solutions and this obligation can be translated into concrete advantages for both utilities and consumers. Regulatory obligations mainly involve the gas and electricity Smart Metering sectors, which is why they are the main segment of the IoT market.

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[1] MeteRSit Web Site (https://www.metersit.com/it/)

4.4.2 Smart Metering in Europe

Interviewing MeteRSit's Key Account Manager, what emerged is that as far as Europe is concerned, while for electric meters there is a mandated call for replacement of traditional meters with smart meters, as far as gas meters are concerned there is a recommendation to start developing smart meters. In other words, according to the Directive 2006/32/CE, while the electric meter must be smart in Europe, the gas meter needs to be smart only if economically justified by a cost-benefit analysis. In case of positive results, the Directive has indicated a penetration of the 80% up to the 2020 and each member state has to organize its own roll-out project. Hence, there is a different situation in each European country regarding smart metering. Consequently, for MeteRSit, each country/market has its own peculiarities, and should be approached differently from others. For this reason, the various analyses have to be carried out taking into account that each country/market has its own characteristics and conditions.
Italy was one of the first European countries to move towards smart gas metering. In fact, to improve the efficiency and the safety of natural gas distribution, the roll-out of new gas smart meters have been started as required by the Italian national Authority in the 2008 (AEEGSI, 2008). As already said, MeteRSit was born in 2009, and it was able to meet the demand for smart meters for the Italian market. To date, as provided by European directive, the replacement of smart Meters in Italy is almost complete and MeteRSit is approaching foreign markets, where the state of replacement is at the initial stages.

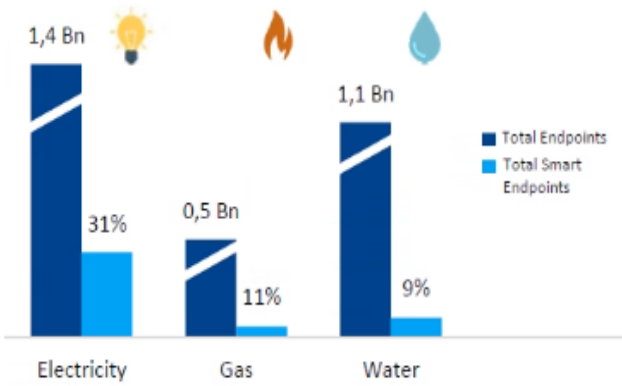

Figure 24 - Smart penetration in Gas Metering

Source: SIT presentation

In Europe, the most promising markets for smart gas metering in the short-term are the United Kingdom and the Netherlands. In the United Kingdom, for instance, the Government started the promotion of smart meters in 2009 to reach the 100% since 2020. However, despite the objective, the decision is left to the end users, which has to require the installation of a smart device: the principal British Gas distributor assures that only the half has asked the installation even if it has offered it to 8.4 millions of clients. In the Netherlands the rollout phase has started in the 2012 with the objective of the 90% (7 millions of smart meters) by the 2020 (Bianchini et al., 2018). With a more global view, figure 24 shows the global market size and the "smart penetration" of electric, gas and water meters. As shown in the figure, gas and water metering markets exhibit the lowest smart penetration rate (11% and 9% respectively), therefore, these markets are expected to present a sound growth trend in the next years, as shown in figure 25 and in figure 26.

Global market for smart gas meters is predicted to growth from 0,9B$ in 2018 to 1,2B$ in 2023. The main opportunities are in replacement (e.g. Italy) and new installation (e.g. UK and Germany). According to forecasts, the UK market deployment wave will peak to compensate the Italian market decline from 2020 onwards. The Indian opportunity in pre-paid and walk by smart meters (19% CAGR 20-23), the market entry opportunities in China (22% CAGR 20-23), South Korea (141%) and Turkey (507%) should lead the sector's growth. From figure 25 it is possible to see that EMEA (Europe, the Middle East and Africa) represents an important market for smart gas metering.

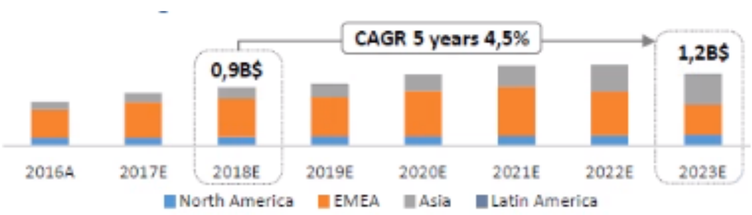

Figure 25 - Smart Gas Metering Market Data

Source: SIT presentation

Since, as mentioned above, SIT Group has recently acquired Janz, a water meter manufacturer, it is interesting to analyze also the smart water metering market. Unlike smart gas metering, for smart water meters, North America represents the largest market, while EMEA holds a small percentage. Overall, 174 millions new installation of water meters (of which 64 millions smart) are expected in 2024. By the end of 2025, one third of installed base would be smart.

The Smart Water Metering 10,3% growth rate up to 2024 (figure 26) could be driven by aging infrastructure and increasing water consumption and governments and utilities initiatives to reduce non revenue water, accurate meter reading and development of smart city infrastructure.

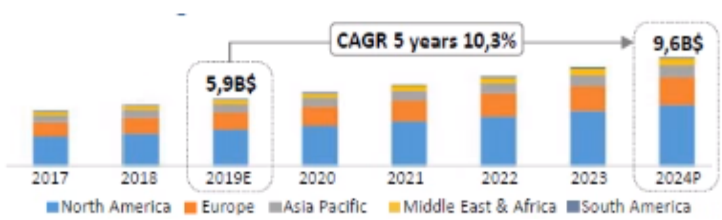

Figure 26 - Smart Water Metering Market Data

Source: SIT presentation

Maintaining a global perspective, a recent research conducted by Frost & Sullivan (Crandall, 2018) on the smart gas metering market provides three predictions. The first prediction argues that the Government's mandates will persist as the primary driver for smart meter deployment. Secondly, according to Frost & Sullivan, in the smart gas meter market technological innovation is limited. As a consequence, smart meters are speedily becoming a commodity. Chinese meter manufacturers are starting to aggressively target the international market, putting pressure on premium manufacturers. As third prediction, the research state that the "metering as a service" market and the offering of solutions for energy management are expected to grow, as meter producers are looking for ways of "leveraging their expertise and attracting investment from utilities that lack the financial resources to implement a CAPEX-led rollout" (basically providing meters as a service instead of selling them as a capital equipment asset).

4.4.3 The new market trend of Infrastructure-as-a-Service

The study performed by Northeast Group (2018) confirms the already mentioned predictions and describes a more advanced model with a global perspective. The study argues that managed services has recently been growing in popularity. The model presented consists in the outsourcing of physical and operational aspects of a smart metering system to third parties (Figure 27). At the simplest level, managed services can be delivered as Software-as-a-Service (SaaS), where software solutions that support the advanced metering infrastructure (AMI) are hosted in the cloud by the provider and used on a subscription basis.

In more extensive service contracts, the provider could also have operational responsibility for the AMI system, leading to Smart Metering-as-a-Service (SMaaS).

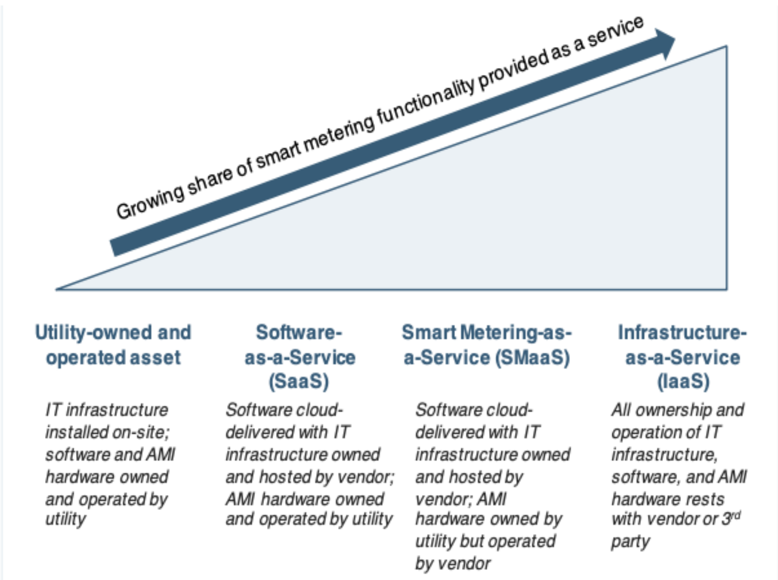

Figure 27 - Various model of managed services

Source: Northeast Group, 2018

At the extreme of the scale there are full managed services, often called Infrastructure-as-a-Service (IaaS). This type of service consists of the delivery of full AMI as a service, including the leasing of physical infrastructure that remains the property of the provider. The research conducted by Northeast Group (2018) states that managed services give insight into where the industry is moving, how utilities that have yet to implement smart meters can do so, and how those that have completed deployment can extract more value from their investments. In order to deepen each type of managed services, figure 28 shows all the types of services that each value proposition includes.

To date, only a small proportion of smart meters are operating under such service contracts, but this amount is predicted to increase over the next decade. The benefits are manifold for both providers and utilities. Entrusting meter data collection and meter data management to a reputable third-party provider usually assures greater security than can be achieved by the utility alone. In advance, implementation time can be halved when the IT infrastructure is cloud-hosted, while internal employees do not need to be trained to operate the complex new systems. Most importantly, service-based offerings convert costs from an initial capital investment to recurring operating expenses, thereby mitigating the huge upfront costs of smart metering systems (Northeast Group, 2018).

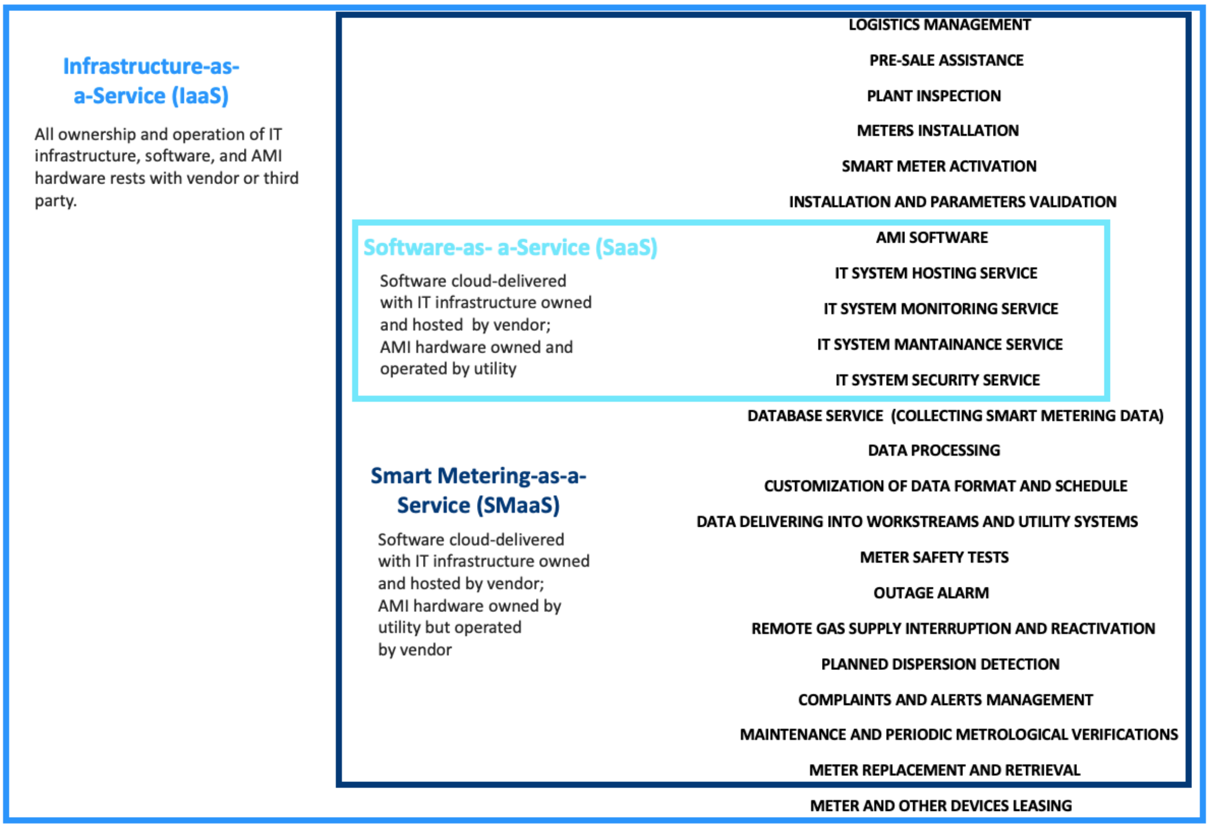

Figure 28 - Iaas, SMaas, Saas

Source: Personal elaboration

This helps small utilities that are not able to make large initial investments. With respect to service providers, the service model provides longer term relationships and recurring revenue. However, as discussed below, there are barriers to the deployment of managed services, chief among them the regulatory framework in many markets and the power of some supply chain players.

4.4.4 Supply chain components activities and positioning analysis

The two main markets in which MeteRSit operates are Italy and the United Kingdom. In analysing the factors affecting the company's ability to implement digital servitization strategies, these two main markets were chosen as they were considered more significant for the purposes of the research.

In Italy, smart meters are sold to the gas distributor through public tenders. The distributor installs meters (independently or through a third party), takes the reading and sends necessary data for billing to gas suppliers, which send bills to the end customer. The gas distributors buy the Smart Meters from the producers and they have the property of the meter and also of the data that the meter communicate. These data are usually jealously guards as a strategic asset. Gas suppliers acquire data and uses insights coming from data to define its industrial strategies. From what has been said, it can be understood that the gas distributor in Italy is in a dominant position in the supply chain (Figure 29).

Metersit, in addition to the product, provides a product warranty, committing to replace malfunctioning meters, but without having to provide any replacement or delivery service.

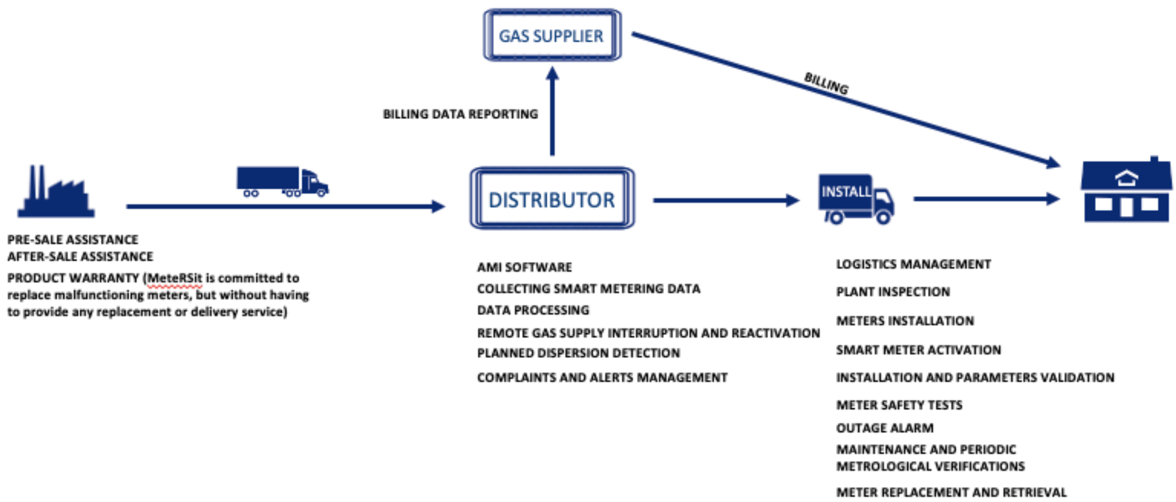

Figure 29 - Italian Gas Metering supply chain

Source: Personal elaboration

Also in the UK, sales are made through public tenders, but, as MeteRSit's Key Account Manager pointed out, meters are not sold directly to the gas distributor but to Meter Asset Providers. The latter will then offer the meters to the distributors as a Service. Then, the energy provider has the meter installed by an installation company (this also happens in Italy), then in the UK, unlike Italy, the readings are taken by a reading company (which is unique for the whole of England) which then transmits the data to the energy provider who makes the bills. Again, the data is jealously kept by an actor in the supply chain.

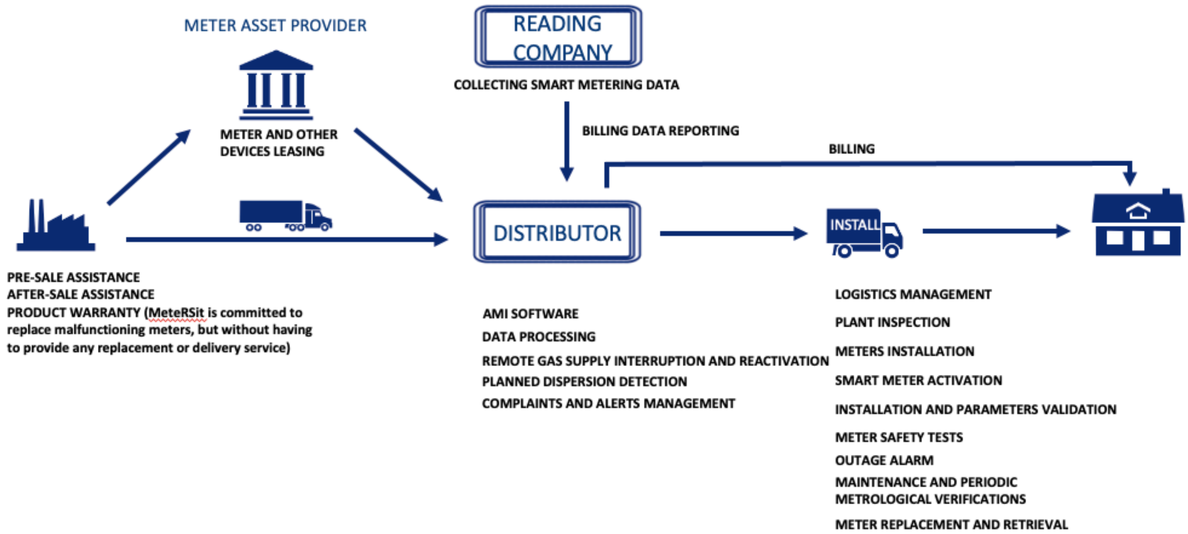

Figure 30 - UK Gas Metering supply chain

Source: Personal elaboration

With regard to the role of national authority in the market, what emerged from the various interviews is that the authority determines the necessary requirements of the product and the necessity of services for the end-user and it has an important role also in establishing future developments of gas smart meters implementation. More specifically, the Product Marketing Manager and Project Manager of MeteRSit (see table 3) state that “any additional product variant or additional service aimed at the end consumer must be mandated by the authority. If, for example, additional sensors to increase the safety of the indoor system became a mandatory requirement for the energy authority, then this requirement would become mandatory on all meters that are installed and then all new meters would have to be equipped (by law) with these specific features”. On this point, the Italian authority has recently issued its own guidelines, asking distribution companies to be courageous in developing activities linked to innovation, the circular economy and safety. In other words, some gas distribution companies are experimenting with new solutions, taking a proactive approach towards the authority. The distributors, without any obligation on the part of the authority, can be promoters of certain projects that they consider useful for the purpose of enhancing the end customer's value. If in some time the experiments that distributors are doing today prove to be very useful, then the authority will add new requirements for future gas meter generation.

As far as UK market is concerned, the UK authority that launched the program to replace traditional meters with smart meters (for electricity and gas) has mandated that at each replacement, it is necessary to install a smart electricity meter, a smart gas meter, a communication hub that collects all the data and, connected to this hub, an In Home display. The communication hub sends both data to the distributor for billing and to the end user to update him in real time on consumption. Since this service is not charged to the end consumer, the distributor would have no economic interest in providing an InHome Display unless it was imposed by the authority.From what has been said, it is possible to understand how important the role of the authority is in defining the product and service offering for end consumers.

4.4.5 MeteRSit competitive environment

As already said, Servitization is one of the projects of the digital transformation path of Sit. In figure 31 it is possible to see the Servitization path that SIT's managers have in mind and the position in which the metering division is today. MeteRSit's devices are smart devices and they are able to communicate data but, to date, MeteRSit does not provide any service related to the data. Indeed, they only provides spare parts supply service. For this reason it is possible to position the company between the two lowest steps of the pyramid. The fact that the expected growth for data analytics and services is greater than 10% hints at how much servitization is taking hold in this industry as well. As already said, utilities' power positioning and the regulatory framework hinder the ability to offer additional services bundled to the product.

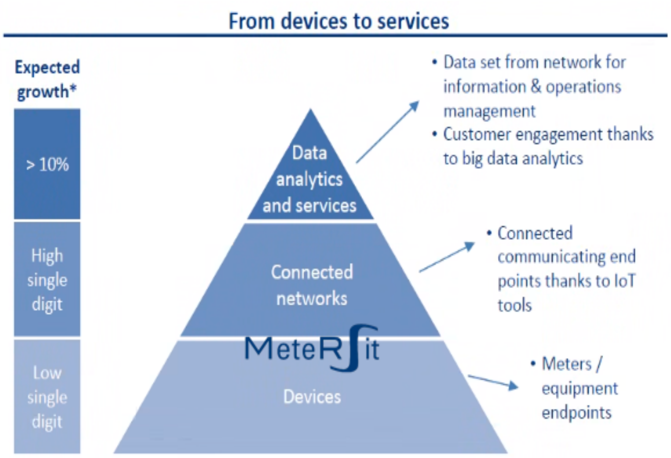

Figure 31 - Sit position in servitization path
Source: SIT presentation

To better define the competitive positioning of MeteRSit, a Porter's five force analysis and a SWOT analysis may be helpful. According to Porter (2008) the nature and the degree of competition in an industry is based on five forces: the rivalry among existing competitors, the threat of new entrants, the bargaining power of customers, the bargaining of the suppliers, the threat of substitute products or services.
Existing competitors are generally larger than MeteRSit and have been in the market for much longer. Many of them also focus not only on gas meters but also on electricity and water meters. Since services provided to end-consumer are more common in electricity, some of the competitors have developed a service-based corporate culture. The threat of new entrants, as anticipated, is considerable as Chinese manufacturers are entering the international market with very competitive prices. The bargaining power of the suppliers is not that high, since none of them provide MeteRSit with a unique resource. What is high is the bargaining power of buyers (gas distributors). As already said, smart gas meters are sold through public tenders, so even if the size of each customer order is very high, also buyer's ability to substitute is high and switching costs are very low. Moreover, by purchasing the device, the distributor also becomes the owner of the data transmitted by the device. These data are jealously guarded by gas distributors as strategic asset. With regard to the threat of substitute products or services, according to market research conducted by Forst & Sullivan, one of the future trends for the global gas smart metering market is the spread of smart metering-as-a-service. In other words, the supply of gas metering devices could no longer be done through sales but through the payment of an annual fee for the use of the products. More generally, the trend consists in a shift in the manufacturers' offerings towards a complete solution that includes all the activities necessary to manage the advanced metering infrastructure. This service-based offering would give utilities an advantage by converting costs from an initial capital investment to a recurring operating expense (From CAPEX to OPEX). This benefits utilities that cannot make such a large initial investment. These utilities, usually smaller in size, do not have the benefit of economies of scale. In essence, they borrow economies of scale from suppliers.
The figure 32 contains the SWOT analysis, a technique for assessing strengths, weaknesses, opportunities and threats of MeteRSit business.

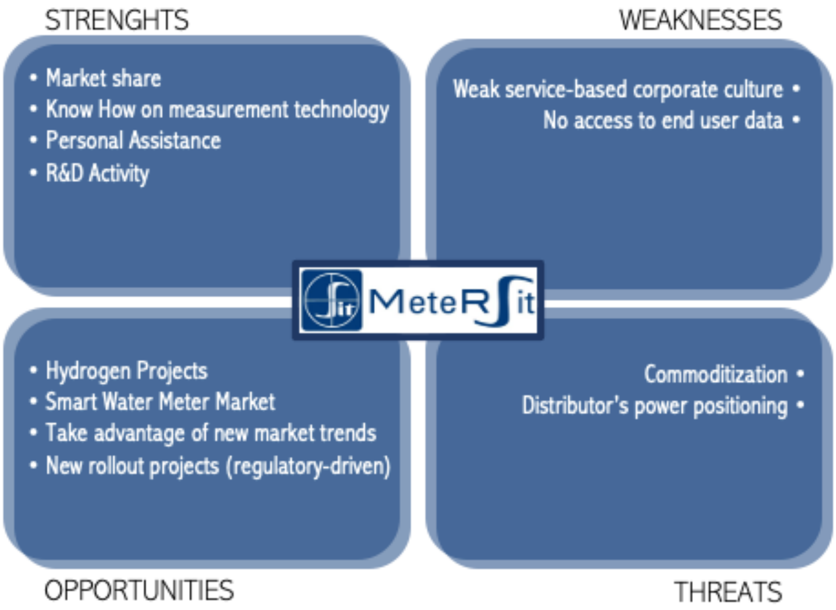

Figure 32 - MeteRSit SWOT Analysis
Source: Personal elaboration

4.5 Business Model Innovation: scenarios and proposals

Once the market environment in which MeteRSit currently operates has been presented, the objective of my internship was to identify possible future scenarios for MeteRSit's business.
Quickly summarizing the market context, what emerged from the interviews is that even though there is the prospect of spreading smart metering as a service, the main markets in which today MeteRSit operates demonstrate inertia in taking this path. The main obstacles were identified in the limits imposed by the authority and in the positioning of the distributor, who is not willing to entrust third parties with the gathering and management of gas consumption data. In such an uncertain market context, where the distributors has a huge bargaining power, three possible future scenarios have been identified.

4.5.1 Scenario 1: Turnkey Solution

The first scenario is called "turnkey solution" and it foresees to pursue the path of Infrastracuture-as-a service and therefore to offer a solution that includes the supply of devices, installation, maintenance, data collection, processing and communication (See figure 28).
According to Gaiardelli et al. (2014) classification, this type of solution is a result-oriented PSS (See 2.2). The customer and the provider, in fact, agree on a result, but not on pre-determined means or products to obtain it. It is not more a matter of selling a product, but of offering a service to solve a problem. In this case the problem is to have an accurate billing. As conceived by Töytäri (2018) and reported in paragraph 1.2, this type of PSS represents the complete transition from product logic to solution logic.

The foundational premise of this scenario is that the distributor decides to outsource many of the activities it performs today, including gathering and analyzing gas consumption data. This type of value offering could lead to an increase in customer loyalty, diversification of revenue sources, access to data and constant and real-time monitoring of the device operating status. This would result in several changes within the business model.

At first value proposition changes, since it is not more about providing smart and integrate smart meters but providing a complete solution for a given result. This radical reshaping of the value propositions leads to a business model redefinition (Paiola & Gebauer, 2020), in which almost all building blocks are affected. Since new key activities are concerned (installation, data gathering, data management), MeteRSit would need new key partners in order to get key resources needed (installation network, data management software). This obviously greatly impacts the cost structure, adding cost items related to the new components.

In this case, revenue streams are also affected, as it would no longer be revenue from the sale of products, but it would consist of a recurring fee (i.e., annual) related to the use of the product and all related services required. Looking at figure 13 (see 2.2), it refers to pay-per-result. A solution-focused value proposition includes a close, long-term relationship with customers.

Looking at classification of ecosystem strategies made by Iansiti & Levien (2004), in this scenario MeteRsit would implement a keystone strategy, acting as the hub of the ecosystem and improving the stability and sustainability of the ecosystem. Other players, however, would also like to implement the same ecosystem strategy and, in such a scenario MeteRSit would find itself competing with large market players that, over the years, have already developed a background in services. These competitors are already proposing infrastructure-as-a-service solutions, although, as mentioned, this model is not yet widespread in the markets where MeteRSit operates.

To sum up, even if this scenario is based on a trend identified by an important market research and important players have communicated their intention to move in this direction, to date the markets affected by MeteRSit show inertia, due to the decisions of the authority and to the fact that distributors tend to withhold data for their industrial strategies.

In addition, to date, this does not seem to be the best route for MeteRsit since a weak service culture could be a problem in competing with those who have developed a background in services.

4.5.2 Scenario 2: Product-focused Business Model

The second scenario is called "Product-focused Business Model" and it is based in a context of transformation of large players towards Infrastructure-as-a-service. MeteRSit would assume a

leading position within the supply chain focused on the production of devices. In other words, MeteRSit would specialize in producing meters and supply them to the big players who, in turn, would offer them as a service. In this case the value proposition would not undergo a drastic change, as well as the business model. Customers' segments building block would undergo a change in that the customers would no longer be the utilities but the large players who, in scenario 1, were identified as competitors.
Looking at classification of ecosystem strategies made by Iansiti & Levien (2004), in this scenario MeteRsit would implement a commodity strategy, competing on volumes and prices. Such a strategy would allow to exploit the know-how related to the product and it would include production organization logics that would allow MeteRSit to be competitive on meter prices. In this case, in fact, competitors could be identified in Asian producers who manage to have very low production costs and to be very competitive on the price of products with essential technical features. In this situation, obtaining a good margin can be difficult and, if large production volumes can't be achieved, customers could have an high bargaining power.

4.5.3 Scenario 3: Co-creating value with the distributor

The third scenario is called "Co-creating value with the distributor" and differs from the other two scenarios in that it takes place in a context of uncertainty where market inertia is taken into account. In other words, in this scenario it is considered the possibility that the market transformation towards infrastructure-as-a-service will not happen, due to the limitations identified above. Given the inertia of the market, this scenario is based on a strategy that can be implemented in the short term, and that does not depend on the transformation of the components of the supply chain or on changes dictated by the authority.
In this context, this third strategy involves enhancing MeteRSit's business by offering a knowledge-based service component, exploiting its distinctive resources. With the goal of moving from a situation of buyer dependence to interdependence (see Figure 19 in 3.2), MeteRSit should exploit its distinctive components. As already said, buyer and supplier are in an interdependent scenario if each actor offers a high perceived importance and distinctiveness of the resources.
Given that from the various interviews it emerged that research and development is a strategic asset for MeteRSit, it could be exploited and offered as a service to arrive at a logic of value co-creation. Other types of services could be added to the offering, based on what have emerged as MeteRSit's distinctive resources, such as assistance and verification activities.
As already said, gas distribution companies are increasingly taking a proactive approach towards the authority, being promoters of certain projects that they consider useful for the

purpose of enhancing the end customer's value and they are also conducting a lot of experiments regarding renewable gas. In doing so, MeteRSit could offer them a service component based on know-how related to measurement technology and based on MeteRSit's research and development department. In other words, through its distinctive assets, MeteRSit can co-create value with the customer in a use-oriented enabling PSS BMP perspective (see figure 14 in 2.2). It could be considered as a use-oriented PSS in the sense that a service is offered to customers in order to improve its activity and its operations (in this case related to specific innovation projects). Looking at classification of ecosystem strategies made by Iansiti & Levien (2004), in this scenario MeteRsit would implement a niche strategy. As stated by Zahra & Nambisan (2011), in fact, niche players create value in the ecosystem by applying their specialized expertise in form of products/services or in form of innovation processes. According to Paulus-Rohmer et al. (2016), in advance, niche actors grow in relation to the keystone organization and profit from their closeness to it. Each niche actor develops unique products or services that meet a particular need (Iansiti & Levien, 2004).

This type of scenario could lead to the creation of indirect value for buyer, that Smals and Smits (see Kähkönen et al. 2015) define as the benefits gained outside the current relationship (see 3.2). This is in fact a case where a supplier helps a buyer to become more innovative. As already said, in this view, for buyers, suppliers can play a significant role as value co-creators. In advance, this scenario is strictly related to Kähkönen et al. (2015) supplier relationship management activities, which are highly connected to value creation practices and they also enhance the buyer dependence on the supplier: early supplier involvement characterized by long-term commitment and the aim of integrating suppliers' capabilities into the firm's product development; inter-firm learning characterized by joint planning, knowledge sharing and collaborative learning; supplier orientation characterized by goal sharing, constant development and search for new areas of collaboration (Kähkönen et al., 2015). Looking more generally at the ecosystem, such a scenario reflects the idea of ecosystem-as-structure identified by Adner (2017) and defined as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize".

This leads to a change in the relationship with the customer, moving MeteRSit from a position of buyer dependence to a position of interdependence (See figure 19 in 3.2). As a consequence, customer relationships building block would change. The value co-creation approach, in fact, could be reached through a push or pull approach. In other words, MeteRSit could manage the co-creation relationship with customers in two ways, waiting to receive specific requests (pull) or proposing collaborations on innovation projects (push). The second option requires dedicating some specific resources to the development of these activities, affecting key activities and cost structure building blocks.

Looking at the competitive side of this scenario, what has emerged is that some of the competitors have already undertaken this path (guided by a pull perspective). This is the case of the collaboration between Pietro Fiorentini (MeteRSit's main competitor) and the Hera group. From this collaboration it was born a device that cares about the safety of the user, it has the ability to intercept leaks, even the smallest ones, as well as the effects of a violent earthquake that can generate outbreaks and fires and inhibits the flow and directly notifies the remote control center as well as the end user so that the environment can be secured proactively.

Several opportunities for co-creation at the international level are provided by the growing willingness to replace natural gas with hydrogen. MeteRSit, in fact, started a collaboration with a UK customer, in which distinctive resources are combined in order to create an innovative product capable of measuring the percentages of hydrogen in natural gas.

If the number of such value co-creation processes could be increased, the benefits to MeteRSit would be significant. First, MeteRSit would gain bargaining power towards the distributor and change the relationship with them. The relationship would become long-term oriented and would no longer be based on the simple supply of a product, but on a value proposition that includes a bundle of products and services. To increase these opportunities, MeteRSit would need resources dedicated to this goal so that it could develop these opportunities on a push basis. This would certainly have an impact on the company's business model, which, however, would not be disrupted, but it would only be affected by an enhancement, intended as ordinary modifications that companies typically implement to their strategies to preserve their competitive advantage.

Conclusion

The aim of this research is to assess the impact of ecosystem players' positioning strategies on the ability of a manufacturing company to move towards a digital servitization path. In order to face this research aim, an in-depth analysis of an Italian B2B manufacturing company highlights that the positioning strategy of other players in the ecosystem greatly influences its ability to leverage digital technologies to deliver services. In fact, the company has to tackle the power positioning of some ecosystem players that, limiting its ability to implement digital servitization strategies, threaten its attractiveness in an everchanging market. What emerged from the business case is that, in order to improve its positioning and role in such context, the company should add service components based on distinctive resources to its value proposition.

Before detailing the possibilities available to the company in order to enhance its role in the market, some of the main themes covered along this thesis will be recalled, starting from the impact of Industry 4.0 on the manufacturing sector.

The founding technologies of industry 4.0 have reshaped the way manufacturing firms compete and provide value to their customers. Manufacturing companies are encouraged to innovate their Business Models to remain competitive in a market environment that is constantly evolving, because of the actual digital transformation.

Since B2B customers are changing the way they discover, evaluate, purchase, and use products, companies are pushed to adopt customer centric Business Models, moving from a product-logic to a solution-logic. The analysed company is trying to follow this direction: after changing its vision, the company is planning customer-centred business model innovations.

From the analysis of the literature it emerged that innovative combinations of products and services (called Product-Service System) are implemented within the customer's business, adapting them to fulfill very specific needs for the solution of customers' problems and, thus, allowing customers to focus on their core business. More in details, different types of Product-Service System have been classified according to their offering orientation and the nature of interaction between customer and Product-Service provider: product-oriented, use-oriented and result-oriented.

A first evidence is that product-oriented PSSs usually employ standardized solutions and a low-intensity relationship between the parties involved. On the other hand, use-oriented PSS, supporting customer actions, refer to highly customized solutions that require significant involvement and commitment from both customers and suppliers. In result-oriented PSS, providers are responsible for an entire customer problem. In this last case, the transition from a product logic to a solution logic is complete, projecting the relationship between the parties in a long-term perspective. This approach leads to a new conception of value creation in which the exchange value is transformed into value-in-use and supplier and customer share the responsibility of co-creating value-in-use through their joint resource integration. The aforementioned transition is perceived as an important strategy of differentiation, allowing companies to capture additional value and leading them to reach competitive advantages, especially in markets that are moving towards commodization.

In performing this transformational path, it is likely that leveraging on manufacturing companies' internal resources is not sufficient, requiring an ecosystem of vendors, complements and stakeholders that claims for additional new skills. As a consequence, Business Models are no more fixed, static and closed frameworks but rather open and dynamic structures, where the creation and capture of value has also become a collaborative effort within the ecosystem. Digitalization can make a contribution by aligning ecosystem actors and leading to better coordination and collaboration, fostering new service opportunities.

Analyzing the concept of ecosystem, what emerges is that, within it, there is not only coordination and collaboration, but companies are simultaneously involved in cooperative and competitive interactions. It fact, it was found that traditional strategy's components, such as the value, uniqueness, and inimitability of resources, have its equivalent in multilateral partnerships and the sustainability of competitive advantage must be maintained both by nurturing relationships and by keeping rivals at bay. The main conclusion is that uniqueness of certain resources and the willingness to strategically withhold them from some players in the ecosystem can limit the ability of manufacturing companies to pursue digital servitization strategies and more generally undermine their competitive position in a changing marketplace.

To support this assumption , the case of MeteRSit, the Metering Division of the Sit Group, is analysed in detail.

From the interviews, it emerged that the Sit Group attributes great importance to Digital Transformation and recognizes its role in contributing to the strategic success of the entire company. In fact, the firm is implementing several projects for the digitalization of internal and external processes, through an autonomous and dedicated function. This function identified numerous objectives to be achieved in the next future, first among them the servitization project to be implemented within 5 years.

From the analysis of the reference market, it was revealed that the market is at risk of a turn towards commoditization while some important players are ready to move their offering towards a complete solution (Smart Metering-as-a-Service). As a matter of fact, however, the market is showing inertia to change and it is difficult to predict if the move towards the Smart Metering-as-a-Service will happen. This uncertainty was considered in the analysis.

The analysis and coding of the collected data, as shown in Appendix 1, lead to the conclusion that the factors impacting MeteRSit's ability to undertake a servitization strategy are technology, regulatory framework and positioning strategy. Consequently, this confirms that technology is an enabling factor for servitization path, as highlighted from the literature review. On the contrary, the power positioning of some players, together with the regulatory framework, represent an obstacle. More in particular, it emerges that the distributor (MeteRSit's customer) is able to gain and retain a very valuable strategic resource (gas consumption data) and this, as demonstrated by the literature review, allows it to have a position of power over MeteRSit, limiting its attractiveness in the market.

This conclusion paves the way for a further analysis, aimed at investigating how to transform this situation of buyer dependence into a situation of interdependence between buyer and supplier.

Thus, from these results, three possible future scenarios for MeteRSit are hypothesized.

The first two scenarios assume that the market will follow the Smart Metering-as-a-Service trend, while the third scenario assumes that market inertia towards change will persist.

The first scenario, based on a results-oriented PSS, leads to a Business Model redefinition, in which almost all building blocks are affected. In this way, the company would implement a keystone strategy, acting as the hub of the ecosystem and improving the stability and sustainability of the ecosystem.

In the second scenario (Product-focused Business Model), MeteRSit would specialize in producing meters and supply them to the big players who, in turn, would offer them as a service. In this case, the value proposition would not change drastically, nor would the Business Model, and MeteRSit would implement a commodity strategy, competing only on volume and price.

The third scenario (Co-creation value with customer) consists in enhancing MeteRSit's business by offering knowledge-based service components. These service components are based on distinctive resources that are valuable for the customer, identified in the measurement technology, in the research and development department and personal assistance capability. These service components are aimed at assisting the customer in specific innovation projects, giving it access to MeteRSit's technological know-how. In other words, a process of value co-creation in innovative projects is implemented, in which MeteRSit offers its distinctive

resources and capabilities as a service. In this way, the analyzed company, in line with its vision, would be able to shift the focus from a product logic to a solution logic.
The technology dimension is present in this scenario both as a means and as an object of innovation. In other words, the co-creation of value mainly concerns product changes on the technological level, which drives customers to rely on those who have the know-how on measurement technology. Technology, at the same time, also takes over as a mean of customer management. Through technology, in fact, MeteRSit will be able to offer remote assistance to be present for customers in the co-creation phases.
Looking at classification of ecosystem strategies presented in paragraph 3.1, in this scenario MeteRsit would implement a niche strategy, creating value in the ecosystem by applying its specialized expertise in form of service.
The third scenario implies the start of a path towards servitization that does not involve a drastic change in the Business Model (as instead happens in the first scenario) and does not bind MeteRSit's business to price battles (as instead happens in the second scenario). For this reason, it is possible to conclude that, at the moment, the third scenario is the most suitable for the analyzed company.
Since, as stated by the literature, the power of one company over another is determined by the extent to which one company depends on the other for specific resources, applying this strategy MeteRSit would be able to improve its power positioning, moving from a situation of buyer dependence to one of interdependence. In addition, the customer relationship would be projected into the long term, allowing MeteRSit to enhance its competitive position and diversify the sources of revenues.

References

Aagaard, A. (2019). *Digital Business Models Driving Transformation and Innovation*. Palgrave Macmillan

Adner, R. (2017). *Ecosystem as Structure: An Actionable Construct for Strategy*. Journal of Management. Vol. 43, No. 1, pp. 39–58.

Adner, R., & Kapoor, R. (2010).*Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations.* Strategy Management Journal. Vol. 31, No. 3, pp. 306-333.

Adrodegari, F., Paiola, M., Rapaccini, M., & Saccani, N. (2020). *Reagire a covid-19, l'importanza dei servizi.* ASAP Service Management Forum.

AEEGSI. (2008). Direttiva 155/08/ARG/gas. Roma.

Agarwal, R., & Helfat, C.E. (2009). *Strategic renewal of organizations*. Organization Science. Vol. 20, No. 2., pp. 281-293.

Amit, R., & Zott, C. (2012). *Creating value through business model innovation*. MIT Sloan Management Review. Vol. 53, No. 3., pp. 41-49.

Arindam, B., Nikolaus, L., Martin, R., & Rajah, A. (2018). *The New Globalization. Building the New Global Enterprise*. BCG.

Atzori, L., Iera, A., & Morabito, G. (2010). *The internet of things: A survey*. Computer Networks. Vol. 53, pp. 2787–2805.

Baines, T., Lightfoot, H., Benedettini, O., & Kay, J. M. (2009). *The servitization of manufacturing: a review of literature and reflection on future challenges*. Journal of Manufacturing Technology Management. Vol. 20, No. 5, pp. 547-567.

Baines, T., Lightfoot, H., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J., Angus, J., Basti, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., & Wilson, H. (2007). *State-of-the-art in product-service systems*. Proceedings of the Institution of Mechanical Engineers. Journal of Engineering Manufacture. Vol. 221, No. 10, pp. 1543-1552.

Baines, T., Ziaee Bigdeli, A., Bustinza, O.F., Shi, V.G., Baldwin, J., & Ridgway, K. (2017). *Servitization: revisiting the state-of-the-art and research priorities*. International Journal of Operations & Production Management, Vol. 37, No. 2, pp. 256-278.

Berman, S.J. (2012). *Digital transformation: opportunities to create new business models*. Strategy & Leadership. Vol. 40, No. 2, pp. 16-24.

Berman, S.J., & Bell, R. (2011). *Digital transformation: creating new business models where digital meets physical*. Executive report. IBM Global Business Service. New York.

Bhardwaj, S., Jain, L., & Jain, S. (2010). *Cloud computing: A study of infrastructure as a service (IAAS)*. International Journal of engineering and information Technology. Vol. 2, pp. 60-63.

Bhattacharya, A., Lang, N., Reeves, M., & Augustinraj, R. (2018). *Building the New Global Enterprise. The New Globalization.* BCG.

Bianchini, A., Saccani, C., Guzzini, A. & Pellegrini, M. (2018). *Gas smart metering in Italy: state of the art and analysis of potentials and technical issues*.

Blank, S. (2013). *Why the lean start-up changes everything*. Harvard Business Review. Vol. 91, No. 5, pp. 63-72.

Boehmer, J. H., Shukla, M., Kapletia, D., & Tiwari, M. K. (2020). *The impact of the Internet of Things (IoT) on servitization: an exploration of changing supply relationships.* Production Planning & Control. Vol. 31, No. 2-3, pp. 203-219.

Bouwman, H., de Reuver, M., & Shahrokh, N. (2017). *The impact of digitalization on business models: how IT artefacts, social media, and big data force firms to innovate their business model*. 14th International Telecommunications Society (ITS) Asia-Pacific Regional Conference. Kyoto.

Cardoso, J., Voigt, K., & Winkler, M. (2008). *Service Engineering for the Internet of Services*. Enterprise Information Systems. Vol. 19, pp. 15-27.

Casadesus-Masanell, R., & Ricart, J. E. (2010). *From strategy to business models and onto tactics.* Long Range Planning. Vol. 43, No. 2–3, pp. 195-215.

Chai, L., Li, J., Clauß, T., & Tangpong, C. (2018). *Drivers of Coopetition: Interdependence, Opportunism and Technology Uncertainty.* 49th Annual Meeting of the Decision Sciences Institute. Chicago.

Chen, H., Chiang, R., & Storey, V. (2012). *Business Intelligence and Analytics: From Big Data to Big Impact.* MIS Quarterly. Vol. 36, No. 4, pp. 1165-1188.

Corley, K., & Gioia, D. (2004). *Identity Ambiguity and Change in the Wake of a Corporate Spin-Off.* Administrative Science Quarterly. Vol. 49, pp. 173-208.

Cox, A. (1999). *Power, value and supply chain management*. Supply Chain Management. Vol. 4, pp. 167- 175.

Cox, A. (2001). *Understanding Buyer and Supplier Power: A Framework for Procurement and Supply Competence*. Journal of Supply Chain Management. Vol. 37, pp. 8-15.

Cox, A. (2007). *Transactions, Power and Contested Exchange: Towards a Theory of Exchange in Business Relationships.* International Journal of Procurement Management. Vol. 1, pp. 38-59.

Cox, A., Sanderson, J., & Watson, G. (2001). *Power regimes: A new perspective on managing in supply chains and network*s. Proceedings of the 10th International Annual IPSERA Conference.

Corsaro, D. (2018). *Gestire la sales transformation: Tra human e digital*. FrancoAngeli.

Costa, C., Mendes, C., & Osaki, R. (2018). *Application of Big Data and the Internet of Things in Industry 4.0.* Vol. 3, No. 11, pp. 20-24.

Cuevas, J. M. (2018). *The transformation of professional selling: Implications for leading the modern sales organization.* Industrial Marketing Management. Vol. 69, pp. 198-208.

De Mauro, A., Greco, M., & Grimaldi, M. (2016). *A formal definition of Big Data based on its essential features.* Library Review. Vol. 65, No. 3, pp. 122-135.

Deloitte. (2018). *Italia 4.0: siamo pronti? Il percepito degli executive in merito agli impatti economici, tecnologici e sociali delle nuove tecnologie.* White paper.

Eggert, A., Ulaga, W., Frow, P., & Payne, A. (2018). *Conceptualizing and communicating value in business markets: From value in exchange to value in use.* Industrial Marketing Management. Vol. 69, pp. 80-90.

European Parliament. (2015). *Industry 4.0. Digitalisation for productivity and growth*.

Eurostat. (2020). *March 2020 compared with February 2020, Industrial production down by 11.3% in euro area*.

Evans, D. (2011). *The Internet of Things. How the Next Evolution of the Internet Is Changing Everything.* Cisco IBSG.

EY Consulting. (2020). *Come reinventare la vendita? Le sfide del covid-19 per client & market management nel B2B*.

Falkenreck, C., & Wagner, R. (2017). *The internet of things. Chance and challenge in industrial business relationships*. Industrial Marketing Management. Vol. 66, pp. 181-195.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). *Embracing digital technology: a new strategic imperative*. MIT Sloan Management.

Fleisch, E., Weinberger, M., & Wortmann, F. (2014). *Business Models and the Internet of Things.* White Paper. Universität St. Gallen, Bosch Internet of Things & Services Lab. pp. 1–19

Forsström, B. (2005). *Value co-creation in industrial buyer – seller partnerships – creating and exploiting interdependencies: an empirical case study*. Doctoral Dissertation, Åbo Akademi University Press, Åbo.

Frank A. G., Mendes G. H. S., Ayala N. F., & Ghezzi A. (2019). *Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective.* Technological Forecasting & Social Change. Elsevier. Vol. 141, pp. 341-351.

Gaiardelli P., Resta, B., Martinez, V., Pinto, R., & Albores P. (2014). *A classification model for product-service offerings*. Journal of Cleaner Production. Vol. 66, pp. 507-519.

Gambardella, A., & McGahan, A. M. (2010). *Business-model innovation: General purpose technologies and their implications for industry structure.* Long Range Planning. Vol. 43, No. 2-3, pp. 262-271.

Gebauer, H., Paiola, M., Saccani, N., & Rapaccini, M. (2020). *Digital servitization: Crossing the perspectives of digitization and servitization.* Industrial Marketing Management.

Gilchrist, A. (2016). *Industry 4.0: The Industrial Internet of Things*. Apress. New York.

Gölgeci, I., Murphy, W. H., & Johnston, D. A. (2018). *Power-based behaviors in supply chains and their effects on relational satisfaction: A fresh perspective and directions for research.* European Management Journal. Vol. 36, No. 2, pp. 278-287.

Grandinetti, R., Ciasullo, M., Paiola, M., & Schiavone, F. (2020). *Fourth industrial revolution, digital servitization and relationship quality in Italian B2B manufacturing firms. An exploratory study.* The TQM Journal. Vol. 32, No. 4, pp. 647-671.

Hermann, M., Pentek, T., & Otto, B. (2015). *Design Principles for Industrie 4.0 Scenarios: A Literature Review.* 49th Hawaii International Conference on System Sciences (HICSS). Pp. 3928-3937.

Hunke F., & Engel C. (2018). *Utilizing Data and Analytics to Advance Service.* In: Satzger G., Patrício L., Zaki M., Kühl N., Hottum P. (eds) Exploring Service Science. IESS 2018. Lecture Notes in Business Information Processing. Springer. Vol 331.

Iansiti, M. & Levien, R. (2004). *Strategy as ecology*. Harvard Business Review. Vol. 82, No. 3, pp. 68-78.

Iivari, M., Ahokangas, P., Marjaana, K., Tihinen, M., & Valtanen, K. (2015). *Toward an ecosystemic business model in the context of industrial internet*. The Journal of Business Models. Vol. 4, pp. 42-59.

International Labour Organization. (2020). *ILO Monitor: COVID-19 and the world of work.* Updated estimates and analysis. Second edition.

Kagermann, H. (2014). *Chancen von Industrie 4.0 nutzen.* In: Bauernhansl T., ten Hompel M., Vogel-Heuser B. (eds) Industrie 4.0 in Produktion, Automatisierung und Logistik. Springer Vieweg, Wiesbaden.

Kagermann, H., Wahlster, W., & Helbig, J. (2013). *Securing the Future of German Manufacturing Industry: Recommendations for Implementing the Strategic Initiative INDUSTRIE 4.0*. Final Report of the Industrie 4.0 Working Group. Berlin.

Kähkönen, A.K., Lintukangas, K. & Hallikas, J. (2015*). Buyer's dependence in value creating supplier relationships*. Supply Chain Management. Vol 20, pp. 151-162.

Kane, G.C., Palmer, D., Philips, A.N., Kiron, D., & Buckley, N. (2015). *Strategy, Not Technology, Drives Digital Transformation*. MIT Sloan Management Review.

Khan, A., & Turowski, K. (2016). *A Perspective on Industry 4.0: From Challenges to Opportunities in Production Systems.* In Proceedings of the International Conference on Internet of Things and Big Data. Vol. 1, pp. 441-448.

Kiel, D., Arnold, C., Collisi, M., & Voigt, K.-I. (2016). *The Impact of the Industrial Internet of Things on Established Business Models.* In Proceedings of the International Association for Management of Technology (IAMOT) Conference. Orlando, FL, US.

Kindström, D. (2010*). Towards a service-based business model. Key aspects for future competitive advantage*. European Management Journal. Vol. 28, N. 6, pp. 479-490.

Kindström, D., & Kowalkowski, C. (2014). *Service innovation in product-centric firms: A multidimensional business model perspective.* Journal of Business & Industrial Marketing. Vol. 29, No. 2, pp. 96-111.

Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). *Digital servitization business models in ecosystems: A theory of the firm*. Journal of Business Research. Vol. 104, pp. 380-392.

Krčo, S.,van Kranenburg, R., Lončar, M., Ziouvelou, X. & McGroarty, F. (2019). *Digitization of Value Chains and Ecosystems* in Aagaard, A. (2019). *Digital Business Models: Driving Transformation and Innovation*. Palgrave MacMillan.

Kryvinska, N., Kaczor, S., Strauss, C., & Greguš, M. (2014). *Servitization Strategies and Product-Service-Systems*. Vol.1, pp. 254-260.

Krotov, V. (2017). *The Internet of Things and new business opportunities*. Business Horizons. Vol. 60, No. 6.

Lampropoulos, G., Siakas, K., & Anastasiadis, T. (2019). *Internet of Things in the Context of Industry 4.0: An Overview.* International Journal of Entrepreneurial Knowledge. Vol. 7, No. 1.

Le, T. N., Chin, W., Truong, D. K., & Nguyen, T. H. (2016). *Advanced Metering Infrastructure Based on Smart Meters in Smart Grid, Smart Metering Technology and Services*. Inspirations for Energy Utilities. IntechOpen.

Lindgardt, Z., & Ayers, M. (2014). *Driving Growth with Business Model Innovation.* Boston Consulting Group.

Linz, C., Müller-Stewens, G., & Zimmermann, A. (2017). *Radical Business Model Transformation: Gaining the Competitive Edge in a Disruptive World*. Kogan Page. London.

Liu, Y., & Xu, X. (2016). *Industry 4.0 and Cloud Manufacturing: A Comparative Analysis*. Journal of Manufacturing Science and Engineering. Vol. 139, No. 3.

Lycett, M. (2013). *"Datafication": making sense of (big) data in a complex world*. European Journal of Information Systems. Vol. 22, pp. 381–386.

Macdonald, E. K., Kleinaltenkamp, M., & Wilson, H. N. (2016). *How Business Customers Judge Solutions: Solution Quality and Value-in-Use*. Journal of Marketing. Vol. 80, No. 3, pp. 96–120.

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., & Byers, A. (2011). *Big Data: The Next Frontier for Innovation, Comptetition, and Productivity.* McKinsey Global Institute.

Mathieu, V. (2001). *Service strategies within the manufacturing sector: benefits, costs and partnership.* International Journal of Service Industry Management. Vol.12, No. 5, pp. 451-475.

McAfee, A. & Brynjolfsson, E. (2012). *Big Data: the management revolution*. Harvard Business Review.

McKinsey & Company. (2020). *Italian B2B decision maker response to COVID-19 crisis.*

McKinsey & Company. (2015). *Industry 4.0: How to navigate digitization of the manufacturing sector.*

McKinsey & Company. (2019). *Growing opportunities in the Internet of Things. Maturing underlying technologies will make Internet of Things technologies easier to implement and help companies and investors seize new opportunities.*

Monostori, L. (2014). *Cyber-physical Production Systems: Roots, Expectations and R&D Challenges.* Procedia CIRP. Vol. 17, pp. 9-13.

Mont, O. (2002). *Clarifying the concept of Product-Service System*. Journal of Cleaner Production. Vol. 10, pp. 237-24.

Mrugalska, B., & Wyrwicka, M. (2017). *Towards Lean Production in Industry 4.0*. Procedia Engineering. Vol. 182, pp. 466-473.

Northeast Group, LCC (2018). Managed Services: Smart Metering-as-a-Service (2018 – 2027). Electricity, Water and Gas Metering. White Paper.

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation. A handbook for visionaries, game changers, and challengers.* Hoboken. NJ: John Wiley & Sons.

Paiola, M. 2020. *Costruire il post Covid-19 con i servizi e la trasformazione digitale. Risultati dell'indagine sulle strategie delle imprese manifatturiere nell'emergenza coronavirus.* Digital Transformation Lab. Università degli Studi di Padova.

Paiola, M., Saccani, N., Perona, M., & Gebauer, H. (2013). *Moving from products to solutions: Strategic approaches for developing capabilities*. European Management Journal. Vol. 31, No. 4, pp. 390-409.

Paiola, M., & Gebauer, H. (2020). *Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms*. Industrial Marketing Management. Vol. 89, pp. 245-264.

Papazoglou, M. (2003). *Service-Oriented Computing: Concepts, Characteristics and Directions.* Proceedings of the Fourth International Conference on Web Information Systems Engineering.

Paulus-Rohmer, D., Schatton, H., & Bauernhansl, T. (2016). *Ecosystems, strategy and business models in the age of digitization. How the manufacturing industry is going to change its logic.* Procedia CRIP. Vol. 57, pp. 8-13.

Porter, M. (2008). *The Five Competitive Forces That Shape Strategy*. Special Issue on HBS Centennial. Harvard Business Review. Vol. 86, No. 1, pp. 78–93.

Porter, M., & Heppelmann, J. (2015). *How smart, connected products are transforming companies.* Harvard Business Review.

Qi, Q., & Tao, F. (2018). *Digital Twin and Big Data Towards Smart Manufacturing and Industry 4.0: 360 Degree Comparison*. IEEE Access. Vol. 6, pp. 3585-3593.

Rabetino, R., & Kohtamäki, M., (2018). *To servitize is to (re)position: utilizing a Porterian view to understand servitization and value systems*. In: Kohtamäki, M., Baines, T., Rabetino, R., & Bigdeli A. (eds). *Practices and Tools for Servitization*. Palgrave Macmillan, Cham.

Rachinger, M., Rauter, R., Müller, C., Vorraber, W., & Schirgi, E. (2019). *Digitalization and its influence on business model innovation.* Journal of Manufacturing Technology Management. Vol. 30 No. 8, pp. 1143-1160.

Rajkumar, R., Lee, I., Sha, L., & Stankovic, J. (2010). *Cyber-physical systems: the next computing revolution*. Proceedings of the 47th Design Automation Conference. ACM. New York. Pp. 731-736.

Rapaccini, M., Saccani, N., Kowalkowski, C., Paiola, M., & Adrodegari, F. (2020). *Navigating disruptive crises through service-led growth: The impact of COVID-19 on Italian manufacturing firms.* Industrial Marketing Management. Vol. 88, pp. 225-237.

Reim, W., Parida, V., & Örtqvist, D. (2015). *Product–Service Systems (PSS) business models and tactics. A systematic literature review.* Journal of Cleaner Production. Vol. 97, pp. 61-75.

Reis J.Z., & Gonçalves R.F. (2018). T*he Role of Internet of Services (IoS) on Industry 4.0 Through the Service Oriented Architecture (SOA)*. In: Moon I., Lee G., Park J., Kiritsis D. & von Cieminski G. (eds). Advances in Production Management Systems. Smart Manufacturing for Industry 4.0. APMS 2018. IFIP Advances in Information and Communication Technology, vol 536. Springer, Cham.

Rejikumar, G., Sreedharan, V. R., Dr.Arunprasad, P., Devarajan, J., & Sreeraj, K.M. (2019). *Industry 4.0: key findings and analysis from the literature arena.* Benchmarking: An International Journal. Vol. 26, No. 8, pp. 2514-2542.

Ritala, P., Golnam, A. & Wegmann, A. (2014). *Coopetition-based business models: the case of amazon.com,* Industrial Marketing Management. Vol. 43, No. 2, pp. 236-249.

Ritala, P., Agouridas, V., Assimakopoulos, D. & Gies, Otto. (2013). *Value creation and capture mechanisms in innovation ecosystems: A comparative case study*. Int. J. of Technology Management. Vol. 63, No. 3, pp. 244 - 267.

Rogers, D. (2016). *The Digital Transformation Playbook: Rethink Your Business for the Digital Age*. Columbia University Press. New York.

Rüßmann, M., Lorenz, M., Gerbert, P., Waldner, M., Justus, J., Engel, P., & Harnisch, M. (2015). *Industry 4.0 the future of productivity and growth in manufactory industries*. BCG.

Salesforce. (2018). *Stato delle vendite*. Terza edizione.

Scheer, L.K., Miao, C.F., & Palmatier, R.W. (2015). *Dependence and interdependence in marketing relationships: meta-analytic insights*. Journal of the Academic Marketing Science. Vol. 43, pp. 694–712.

Schwab, K. (2016). *The Fourth Industrial Revolution*. Coligny: World Economic Forum.

Sestino, A., Prete, M.I., Piper, L., & Guido, G. (2020). *Internet of Things and Big Data as* *enablers for business digitalization strategies*. Technovation. Vol 98.

Sisinni, E., Saifullah, A., Han, S., Jennehag, U., & Gidlund, M. (2018). *Industrial Internet of Things: Challenges, Opportunities, and Directions*. IEEE Transactions on Industrial Informatics, Vol. 14, No. 11, pp. 4724-4734.

Sjödin, D., Parida, V., Kohtamäki, M., & Wincent, J. (2020). *An agile co-creation process for digital servitization: A micro-service innovation approach*. Journal of Business Research. Vol. 112, pp. 478-491.

Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019). *Organizing for digital servitization: A service ecosystem perspective.* Journal of Business Research. Vol. 104, pp. 450-460.

Slavik, S., & Zagorsek, B. (2016). *Relationship between Business Strategy and Business Model Studied in a Sample of Service Companies.* Journal of Competitiveness. Vol. 8, No. 4, pp. 72-84.

Sniderman, B., Mahto, M., & Cotteleer, M.J. (2016). *Industry 4.0 and manufacturing ecosystems. Exploring the world of connected enterprises*. Deloitte University Press.

Souza, G. C. (2014). *Supply chain analytics.* Business Horizons. Vol. 57, No. 5, pp. 595-605.
Stefan, S., & Branislav, Z. (2016). *Relationship between Business Strategy and Business Model Studied in a Sample of Service Companies.* Journal of Competitiveness. Vol. 8, No. 4, pp. 72 – 84.

Suppatvech, C., Godsell, J., & Day, S. (2019). *The roles of internet of things technology in enabling servitized business models: A systematic literature review.* Industrial Marketing Management. Vol. 82, pp. 70-86.

Swisslog. (2018). *How Industry 4.0 Design Principles Are Shaping the Future of Intralogistics.* White paper.

Teece, D. J. (2007). *Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance.* Strategic Management Journal. Vol. 28, No. 13, pp. 1319-1350.

Teece, D.J. (2010). *Business models, business strategy and innovation*. Long Range Planning. Vol. 43, No. 2-3, pp. 172-194.

Teece, D.J. (2018). *Business models and dynamic capabilities*. Long Range Planning. Vol. 51, No. 1, pp. 40-49.

Töytäri, P. (2018). *Selling Solutions by Selling Value.* In Practices and Tools for Servitization: Managing Service Transition. SPRINGER. Pp. 269-289.

Töytäri, P., & Rajala, R. (2015). *Value-Based Selling: An Organizational Capability Perspective.* Industrial Marketing Management. Vol. 45, pp. 101-112.

Töytäri, P., Keränen, J., & Rajala, R. (2017). *Barriers to implementing value-based pricing in industrial markets: A micro-foundations perspective*. Journal of Business Research. Elsevier. Vol. 76, pp. 237-246.

Tukker, A. (2004). *Eight types of product service systems.* Business Strategy and the Environment. Vol. 13, No. 4, pp. 246-260.

Ulaga W., & Kohli, A.K. (2018). *The role of a solutions salesperson: Reducing uncertainty and fostering adaptiveness.* Industrial Marketing Management. Vol. 69, pp. 161-168.

Ulaga, W., & Reinartz, W. J. (2011). *Hybrid offerings: How manufacturing firms combine goods and services successfully*. Journal of Marketing. Vol. 75, No. 6, pp. 5-23.

Valkokari, K., Seppänen, M., Mäntylä, M., & Jylhä-Ollila, S. (2017). *Orchestrating Innovation Ecosystems: A Qualitative Analysis of Ecosystem Positioning Strategies.* Technology Innovation Management Review. Vol. 7, pp. 12-24.

Vendrell-Herrero, F., Bustinza, O. F., Parry, G., & Georgantzis, N. (2017). *Servitization, digitization and supply chain interdependency*. Industrial Marketing Management. Vol. 60, pp. 69–81.

Vermesan, O., Friess, P., Guillemin, P., Gusmeroli, S., Sundmaeker, H. Bassi, A., Jubert, I., Mazura, M., Harrison, M., Eisenhauer, M., & Doody, P. (2009). *Internet of Things Strategic Research Roadmap*.

Viio, P., & Grönroos, C. (2014). *Value-based sales process adaptation in business relationships.* Industrial Marketing Management. Vol. 43, No. 6.

Voss, C., Tsikriktsis, N. & Frohlich, M. (2002). *Case research in operations management*. International Journal of Operations & Production Management. Vol. 22, No. 2, pp. 195-219.

Wang, L., von Laszewski, G., Younge, A., He, X., Kunze, M., Tao, J., & Fu, C. (2010). *Cloud Computing: a Perspective Study.* New Generation Computing. Vol. 28, pp. 137–146.

Weking, J., Brosig, C., Böhm, M., Hein, A., & Krcmar, H. (2018). *Business Model Innovation Strategies for Product Service Systems. An Explorative Study in the Manufacturing Industry.* Research Papers. 34.

Witkowski, K. (2017). *Internet of Things, Big Data, Industry 4.0. Innovative solutions in logistics and supply chains management.* Procedia Engineering. Vol. 182, pp. 763-769.

Xu, L., He, W. & Li, S. (2014). *Internet of Things in Industries: A Survey*. IEEE Transactions on Industrial Informatics. Vol. 10, No. 4, pp. 2233-2243.

Xu, L., Xu, E. L., & Li, L. (2018). *Industry 4.0: state of the art and future trends,* International Journal of Production Research. Vol. 56, No. 8, pp. 2941-2962.

Zahra, S., & Nambisan, S. (2011). *Entrepreneurship in global innovation ecosystems.* AMS Review. Vol. 1, pp. 4-17.

Zambetti, M., Pinto, R., & Pezzotta, G. (2020). *Industry 4.0 Data-Related Technologies and Servitization: A Systematic Literature Review.* In: Lalic B., Majstorovic V., Marjanovic U., von Cieminski G., & Romero D. (eds). *Advances in Production Management Systems. Towards Smart and Digital Manufacturing*. APMS 2020. IFIP Advances in Information and Communication Technology. Vol 592. Springer. Cham.

Zancul, E.d.S., Takey, S.M., Barquet, A.P.B., Kuwabara, L.H., Cauchick Miguel, P.A., & Rozenfeld, H. (2016). *Business process support for IoT based product-service systems (PSS).* Business Process Management Journal. Vol. 22, No. 2

Websites

Bellini, M. (2019). *Dai prodotti connessi ai clienti connessi: la servitization apre a nuovi modelli di business.* Industry4Business. Available at: https://www.industry4business.it/servitization/dai-prodotti-connessi-ai-clienti-connessi-la-servitization-apre-a-nuovi-modelli-di-business/ Access Date: 09/11/2020.

Crandall, B. (2018). *See how the growing use of smart water meters can reduce water losses and improve billing accuracy, according to this report.* FMLink. Available at: https://fmlink.com/articles/frost-sullivan-smart-water-meters/ Access date: 04/01/2020.

Di Deo, I., & Balabio, B. (2020). *Big Data Analytics in Italia: un mercato da 1,7 miliardi di euro, +23% rispetto al 2018.* Osservatori.net digital innovation. Available at: https://www.osservatori.net/it/ricerche/comunicati-stampa/big-data-analytics-in-italia-un-mercato-da-1-7-miliardi-di-euro-plus23-rispetto-al-2018#:~:text=Nel%202019%20il%20mercato%20Analytics,sono%20i%20software%20(47%25). Access date: 27/09/2020.

Gutta, S. (2020). *Data Science: The 5 V's of Big Data.* Available at: https://suryagutta.medium.com/the-5-vs-of-big-data-2758bfcc51d Access date: 23/09/2020.

INAP. (2020). *What are the Differences Between IaaS, PaaS and SaaS?* INAP THINKIT. Available at: https://www.inap.com/blog/iaas-paas-saas-differences/ Access date: 29/09/2020.

Kowalkowski, C., Rapaccini, M., Saccani, N., Paiola, M., & Adrodegari, F. (2020). Navigating the COVID-19 crisis through servitization. The Future Factory. Available at: https://www.thefuturefactory.com/blog/55 Access date: 05/10/2020.

Rapaccini, M. (2015). *Smart Services: la tecnologia a supporto di nuove opportunità nei servizi.* Fabbrica Futuro. Available at: https://www.fabbricafuturo.it/smart-services-la-tecnologia-supporto-nuove-opportunita-nei-servizi/ Access date: 02/10/2020.

Salvadori, G. (2019). *Smart Metering: presente e futuro dei contatori intelligenti in Italia.* Osservatori.net digital innovation. Available at: https://blog.osservatori.net/it_it/smart-metering-contatori-intelligenti-italia Access date: 10/01/2021.

SIT Spa. (2020). *SIT continues to invest in the "connected economy": Crm Salesforce adopted*. Press Release. Available at: https://www.sitgroup.it/wp-content/uploads/2020/11/20201119_CS_SIT-adotta-il-CRM-Saleforce_ENG.pdf Access date: 20/12/2020.

Statista Research Department. (2018). *Number of internet of things (IoT) connected devices worldwide in 2018, 2025 and 2030.* Available at: https://www.statista.com/statistics/802690/worldwide-connected-devices-by-access-technology/ Access date: 15/10/2020.

List of Figures and Tables

Appendix

First-order categories	Second-order themes	Aggregate dimensions
Metering technology is a distinctive component of MeteRSit, which leads to competitive advantage	Technological Know how	Technology
Innovations in metering technology		
Software innovations		
Technology can change the way you interface with the customer	Technology impact on customer relations	
Technology enables effectiveness and efficiency in delivering services to customers		
Technology can simplify and accelerate the sales process		
The authority of each country dictates the minimum requirements for the devices to be installed	Role of authority in establishing necessary product/service requirements	Regulatory framework
The authority may or may not accept innovations proposed by the distributor		
The English authority has planned a compulsory digital service aimed at the final consumer		
Italy was the first country to adopt the smart meters, as indicated by the authority	Role of authority in deciding future developments	
The authority decides how many and which meters must be replaced and also within what time frame		
The authority is responsible for accepting or not accepting innovations proposed by distributors		
The introduction of renewable gas into the grid must be approved by the authority with a code amendment	Distributor tendency to promote innovations to authority	Positioning
Natural gas distributor can promote innovation by investing independently		
Natural gas distributors withhold consumption data as a strategic asset for industrial policies	Distributor power to retain data	
In the UK, data collection is carried out by a single company		
Gas distributors rarely outsource digital services to third parties		
In the future, the data will remain property of the device owner		