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**Corso di Laurea Magistrale (o Specialistica) in**  
***International Economics and Commerce***

**A service perspective on solution development:**  
**a case study in a B2B context**

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**Lo sviluppo di una soluzione in una prospettiva di servizio:**  
**un caso studio nel contesto B2B**

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## **ABSTRACT (Italian language)**

Ad oggi, sempre più aziende stanno valorizzando i servizi all'interno delle loro strategie. E, nel mondo accademico, sempre più interpretazioni del fenomeno prendono forma. Si parla infatti di transizione dal prodotto al servizio, di offerte ibride o soluzioni integrate, e di "servitization".

Questa tesi si propone di approfondire, il tema dei servizi all'interno di una SME in un contesto B-to-B. Più nello specifico, l'obiettivo di ricerca è quello di comprendere l'evoluzione del servizio, di fronte ad una nuova tecnologia. Inoltre, la tesi si propone di indentificare le barriere o le condizioni di questa evoluzione, nello specifico caso studio.

A tal proposito, le domande di ricerca formulate sono le seguenti:

*Come nasce e come viene organizzato il servizio di una nuova tecnologia?*

*Quali sono le barriere e le condizioni che hanno avuto un'influenza nell'evoluzione dei servizi nel caso studio "APOTECA"?*

Le domande di ricerca sono state formulate nel corso di una collaborazione con l'impresa Loccioni. Questa impresa infatti, dimostra un grande interesse per i servizi, non più visti come un attributo del prodotto ma come parte integrante della soluzione stessa.

Per rispondere ad entrambe le domande, l'intera ricerca viene supportata da un singolo caso studio, affrontato seguendo un metodo qualitativo, esplorativo e deduttivo.

Il caso studio in questione ha come oggetto di interesse il progetto APOTECA; una recente area di business per l'impresa Loccioni che, in collaborazione con gli

Ospedali Riuniti di Ancona, si interfaccia col settore sanitario, offrendo un sistema d'automazione per alcuni processi interni.

Parallelamente al caso studio, la ricerca viene supportata dalla precedente letteratura, in particolare dal quadro teorico, originariamente proposto da Vargo e Lusch, di una "Service-Dominant Logic" e la complementare ricerca sul tema della co-creazione di valore.

L'analisi del caso studio in questione mostra come, la nascita e lo sviluppo del servizio, per la nuova tecnologia APOTECA, siano fondati sulla collaborazione tra diversi attori.

Inoltre, a partire da questo, viene messo in luce il ruolo della "Community". Si deduce che, tramite la "Community", sia possibile incentivare, supportare e gestire la collaborazione, e quindi lo sviluppo del servizio stesso.

Poi, in relazione al secondo quesito di tesi, vengono identificate tutte quelle condizioni e quelle barriere che hanno influenzato l'evoluzione del servizio, nello specifico caso APOTECA.

In conclusione, alla luce del caso studio APOTECA, in un contesto B2B, di fronte ad una nuova tecnologia, si deduce che lo sviluppo del servizio possa essere guidato dall'impresa tramite una "community" che favorisca la collaborazione.

## ABSTRACT

Nowadays, many firms are re-orienting their strategies towards services, and the academic communities are focusing on this topic, proposing different conceptualization. Researchers speak about servitization, hybrid offerings, integrated solutions, transition from products to services, systems selling, and product-service systems.

This master's degree thesis aims at explore the concept of service in a SME, in a business to business context. Specifically, it aims to understand how service emerges and it is organized around a new technology. Moreover, it aims at identifying the distinctive barriers or conditions which affected the case study's service evolution.

About that, the research questions are:

*How does service emerge and is organized around a new technology?*

*Which conditions and barriers have affected the service evolution in APOTECA project?*

The research question have been formulated during a collaboration of 5 months between the master's degree student and Loccioni enterprise.

Indeed, this enterprise is strongly oriented to services. It recognizes services as an integrated part of the whole solution rather than an attribute of the "product".

In order to address the questions, the research is supported by the exploratory and deductive case study of APOTECA, approached with a qualitative method.

APOTECA, the research object of this study, is a project lunched by Loccioni, in collaboration with the "Ospedali Riuniti di Ancona". This project interact directly

with the Healthcare sector, offering automatized solution to improve the internal processes of clinical environments.

Besides the case study, the research is also supported from the previous literature. Specifically, the theoretical frame of the Service Dominant Logic and the complementary literature about the concept of value co-creation.

The research findings show that APOTECA service unfolds through the collaboration among different actors, of different networks. And, it is noted that the collaboration, which leads the service evolution, is organized through the “APOTECA Community”.

Furthermore, as second point, the study identifies all the conditions and the barriers which have affected the evolution of service, in the specific case of APOTECA.

In conclusion, in a B2B context, the service evolution, around a new technology, is based on “collaboration” and it may be managed through a “community”.

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## **INTRODUCTION AND METHODOLOGY**

Nowadays, in business to business environment, many SMEs are re-orienting their strategies towards services (Kowalkowski, Witell, & Gustafsson, 2013). Service growth is open to a variety of conceptualizations (e.g. servitization, hybrid offerings, integrated solutions, transition from products to services, systems selling, and product-service systems), and has attracted interest from a variety of disciplines (e.g., engineering, innovation, marketing, operations, services, and general management). (Kowalkowski, Gebauer, & Oliva, 2016)

In that context of a business to business environment, this study aims at understanding “how” service unfolds and it is organized around a new technology, and the distinctive barriers or conditions which affected APTECA service evolution.

It aims at answering to these two research questions:

- How does service emerge and is organized around a new technology?
- Which conditions and barriers have affected the service evolution in APOTECA project?

*A note on the methodology*

This research was conducted during a collaboration of 5 months between the master's degree student and Loccioni enterprise.

During the collaboration, the student notes the Loccioni's interest for service and, exploring the topic, the two research questions have been formulated.

Specifically, the two research questions have been formulated in relation with APOTECA; a project launched by Loccioni.

So, the research is supported by the single case study of APOTECA; a qualitative case study, with an exploratory and deductive approach.

The choice of using a qualitative method was mainly dictated by the fact that APOTECA service evolution is led by human interactions and relationships. Therefore, a flexible approach would have facilitated the process' understanding and conceptualization. In fact, by coding and standardizing the research method, may have ignored or destroyed valuable data, while imposing the standardized format of the research up on the subject voice. Moreover, the flexibility of qualitative analysis has permitted the exploration of the meaning of current events.

The student participated at meetings and had an active role on team works, these became occasions to meet new collaborators and have informal short talks with them.

As mentioned, the student was involved in daily working routine with the opportunity to collect data from different sources. For example, all the conversations with Loccioni family and all other collaborators have been crucial to interpret the context and to perceive their idea about the object.

Moreover, beside these informal talks, the researcher conducted 9 unstructured interviews, that have been pivotal to outline the “story” of APOTECA project and its services evolution. 6 interviews were 90 minutes long, while 3 were shorter (30 min long).

90 min long unstructured interviews:

- Claudio Loccioni and Enrico Loccioni (entrepreneurial vision)
- 3 people involved in the Humancare market project
- 1 person from the Service team

30 min long unstructured interviews:

- The three people who are responsible for the German, American and Chinese sites.

Besides, another source of data were the internal documents of the enterprise and its reports. Finally, another source of information, was directly provided by two students from Sweden, collaborating with Loccioni for their master’s degree program. They provided the transcription of all the interviews done during their collaboration, dated 2020. In that case, the interviewees were people involved in the Humancare market project and customer, members of the Apoteca Community.

People involved in that research are not limited to the Humancare project. Indeed, the student had the opportunity to interact with more than one hundred people; and, all of them, contributed to the interpretation of the context.

### *Thesis structure*

In order to answer to the research questions, the work is articulated in 6 chapters, which start from a literature review.

More precisely, chapter 1 introduces the Service-Dominant logic; then, it presents the foundational premises which characterised the framework and finally, it focuses on those competences and capabilities required to compete within the Service-Dominant Logic construct.

The second chapter, part of the literature review, stresses the concept of value co-creation, rather than value creation. Specifically, it presents the idea of value co-creation in a service eco-system perspective. Finally, this chapter introduces the theoretical framework of “collaborative processes and activities” for the value co-creation.

Then, after the theoretical introduction, which gives support to the study development, there is an overall background of the enterprise chosen as business case: Loccioni, an Italian family-business which offers tailored technological

solutions. This chapter goes from its history to the key features which distinguish Loccioni's entrepreneurship.

More precisely, chapter 3 presents Loccioni's innovation processes, market approach, business model, and internationalization process.

The innovation processes because they are pivotal for the enterprise's evolution; the market approach to clarify the current market distribution; the business model to highlight the organization's structure and the focus on customization; finally, the process of internationalization because it is now a strategic direction for the enterprise.

After that, the work is drawn into the single case study. This is structured in two parts, chapter 4 "The connections between solution and services: the case of APOTECA" which presents all data collected and chapter 5 "Case study analysis" which presents the analysis of the previous data, in order to address the research questions.

In Chapter 4, it is described the services evolution of the whole enterprise; then it goes to the history of "Humancare" and "APOTECA" project. Beyond the solution (APOTECA robots), which is essentially presented through the history, there is also a focus on "Apoteca services". And finally, the chapter presents APOTECA Community.

Chapter 5, as mentioned, presents an analysis of data. Indeed, all the information are interpreted and organized in order to address the first and the second research questions.

Specifically, there is a section which, starting from the design of the solution, presents the process of service unfolding; with a focus on “how” the evolution of service was driven by Loccioni in APOTECA case. More generally, “how” service emerges and is organized around a new technology.

The second paragraph of this chapter, starting from the qualitative data analysis, identify some peculiar conditions and barriers which have impacted the service evolution.

Finally, the last chapter “Preliminary Conclusion” shows the research findings and discuss how those results are supported by the theoretical frame presented in the first and second chapters.

# 1 **THE SERVICE-DOMINANT (S-D) LOGIC: A**

## **SHORT LITERATURE REVIEW**

### **1.1 INTRODUCING THE SERVICE DOMINANT LOGIC**

What is currently denominated as service-dominant logic was originally presented by Stephen Vargo and Robert Lusch (2004) in a Journal of Marketing (JM) article titled “Evolving to a New Dominant Logic for Marketing”.

*“However, in a very real sense, its beginning was much earlier and more deeply rooted in marketing-associated literature.*

*S-D logics is intended to capture and extend a convergence of apparently diverse thought that has been shifting the dominant logic of marketing and economic thought away from a primary concern with tangible resources, output in the form of firm-created value (goods), and transactions.*

*It points toward a revised logic for marketing based on the application of often intangible, dynamics resources, input for co-created value, and relational economic and social processes.”*

(Malhotra, 2017).

The recognition of *service* and the awareness of its *value* is the result of an evolutionary process started more than a century ago. And, to unravel the current position of Service-Dominant-Logic it is worth to go through the economic and marketing literature, with a highlight on its fundamental ideas.

The first point is dated back to the period between 1800 and the 1920, the Classical and Neoclassical economics era.

In that period, companies designed business strategies focused on economies of scale and standardized products. And, marketing theory was focused on the distribution and exchange of goods as standardized output (commodities). The focus was limited at relationship among supply, demand, and value of tangible goods, especially manufactured ones. (Vargo & Morgan, *Services in Society and Academic Thought: An Historical Analysis* , 2005).

In that context, services were residually defined, in a dichotomy between the two concepts.

In the same years, even if the dominant logic remained product-oriented, there was a first attempt to defined services.

In 1848, Mill underlined how the production of value is based on the objects' usefulness, rather than their tangible essence. Then, in 1860, Bastiat set a milestone. *“Could he be considered as the first service scholar?”* (Vargo & Morgan, *Services in Society and Academic Thought: An Historical Analysis* , 2005)

Bastiat summarised his vision with these words:

*“The great economic law is this: Services are exchanged for services... It is trivial, very commonplace; it is, nonetheless, the beginning, the middle, and the end of economic science... Once this axiom is clearly understood, what becomes of such subtle*

*distinctions as use-value, and exchange-value, material products and immaterial products, productive classes and unproductive classes? Manufactures, lawyers, doctors, civil servants, bankers, merchants, sailors, soldiers, artists, workers, all of use, such as we are, except for the exploiters, render services. Now since these reciprocal services alone are commensurate with one another, it is in them alone that value resides, and not the gratuitous raw materials and in the gratuitous natural resources that they put to work.” (Bastiat , 1964)*

Bastiat was the one who introduced the notion “Services are exchanged for services”. He went beyond the Neoclassical distinction between tangible and intangible, productive and unproductive services. He went over the dichotomy between traditional goods and services.

The second period of this evolution went through 1900 to 1950s and it is recognizable as “the period of Early Marketing Thought”. The first marketing scholars directed their attention toward commodities exchange (Copeland 1920), the marketing institutions that made goods available and arranged for possession (Nystrom 1915; Weld 1916), and the functions that needed to be performed to facilitate the exchange of goods through marketing institutions (Cherington 1920;

Weld 1917). The focus on functions was actually the beginning of the recognition of “operant resources”.

Then, from 50s to 80s, the marketing discipline was characterised by a decision-making approach to manage the marketing functions. And, the focus was on customer. About, Kotler (1972) stated that:

*“marketing management seek to determine the setting of the company’s marketing decision variables that will maximise the company’s objective(s) in the light of the expected behaviour of noncontrollable demand variables”.*

After that period, marketing took a strategic role inside business organization and it starts to be perceived as a continuous social and economic process with a focus on operant resources.

There was a higher market orientation; and, the market itself was interpreted considering the complex network of actors and relationships.

Since these years, services become the focus of a subdiscipline of marketing and they assumed an increasing relevance. About, Gummesson stated the following:

*“Customers do not buy goods or services: They buy offerings which render services which create value.... The traditional division between goods and services is long outdated. It is not a*

*matter of redefining services and seeing them from a customer perspective; activities render services, things render services. The shift in focus to services is a shift from the means and the producer perspective to the utilization and the customer perspective.”*  
*(Gummesson, 1995)*

Briefly, in twenty-first century, the dichotomy between good and services gives ways to a new dominant logic: The Service-Dominant logic, originally presented by Stephen Vargo and Robert Lusch (2004) in a Journal of Marketing (JM) article titled “Evolving to a New Dominant Logic for Marketing”.

## **1.2 WHAT IS THE SERVICE-DOMINANT LOGIC**

Briefly, marketing has moved from a good-dominant view, in which tangible output and discrete transaction were central, to a service-dominant view, in which intangibility, exchange process, and relationship are central. (Vargo & Lusch, 2004).

Before to discuss the foundational premises of the new dominant logic<sup>1</sup>, it is worthwhile to underline the definition of “*Operand*” and “*Operant*” resources. Then, this work presents the core ideas of Service-Dominant logic, formulated into foundational premises by Vargo and Lusch.

*Definition of “Operand” and “Operant” resources:*

The definition of resource has faced an evolutionary change. It went from the limited idea of “factor of production” to a more comprehensive formulation.

If before, firm resources were only tangibles production factors, such as land, labour, and capital. In 1959, Penrose, consciously avoided the term “*factors of production*” and introduced the idea that firms are a “*collection of productive resources*”. Penrose suggested: “*it is never resources themselves that are -input- to the production process, but only the services that the resources can render*” (Penrose ). Basically, Penrose introduced the concept of intangible.

Later, in 1991, Barney defined firm resources as “*all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.*”. (Barney, 1991)

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<sup>1</sup> Even if, the Service-Dominant logic is defined as “new”, this word masks its real nature. The Service-Dominant logic is not in contradiction with the Good-Dominant logic, they belong to the same continuous process of evolution.

Then, with the theory of resource-advantage (R-A), another definition has been provided: “resources as the tangible and intangible entities available to the firm that enable it to produce efficiently and/or effectively a market offering for some market segment(s).” (Madhavaram & Hunt, 2008)

Barney categorised resources into *physical capital*, *human capital*, and *organizational capital*. Then, R-A theory extends Barney’s work by providing a more finely grained view that categorizes resources as financial (e.g., cash resources and access to financial markets), physical (e.g., plant and equipment), legal (e.g., trademarks and licenses), human (e.g., the skills and knowledge of individual employees), organizational (e.g., competences, controls, policies, and culture), informational (e.g., knowledge from consumer and competitive intelligence), and relational (e.g., relationships with suppliers and customers). (Madhavaram & Hunt, 2008)

Finally, in 1994, when the process of marketing evolution was shifting its attention on service, Constantin and Lusch (1994) subdivided resources into *operand* and *operant* resources. The former are resources on which an operation or an act is performed to produce an effect; while operant resources are employed to act on operand and/or other operant resources.

In more detail, operant resources are typically physical (e.g., raw materials), operant resources are typically human (e.g., the skills and knowledge of individual

employees), organizational (e.g., controls, routines, cultures, competences), informational (e.g., knowledge about market segments, competitors, and technology), and relational (e.g., relationships with competitors, suppliers, and customers) (Hunt, 2004).

About the division proposed by Constantin and Lusch (1994):

in a Good-Dominant logic the *operand* resources are considered more important because they are the unit of exchange.

While, for the Service-Dominant logic, operant resources are perceived as primary, they are “*producer of effect*” and source of economic growth. In that context, thanks to its operant resources, the firm aim to create a competitive advantage.

### 1.2.1 Service-Dominant foundational premises (FPs)

The Service-Dominant logic was originally presented by Stephen Vargo and Robert Lusch (2004) and then revised with the contribution of the scientific economic community. The authors originally synthesized their theoretical approach in 8 foundational premises (Vargo & Lusch, 2004). Since then, the foundational premises have gone through modifications and extensions. (Vargo & Lusch, "Service-Dominant Logic" Continuing the Evolution, 2008) (Vargo & Lusch, 2006) (Vargo & Lusch, 2016).

At the core of S-D logic is the idea that all exchanges can be viewed in terms of *service-for-service* exchange, the reciprocal application of resources for others' benefit (Vargo & Lusch, 2004).

The authors define *service* as the application of specialized competences (operant resources—knowledge and skills), through deeds, processes, and performances for the benefit of another entity or the entity itself.

It is important to note that S-D logic uses the singular term, “service,” indicating a process of doing something beneficial for and in conjunction with some entity, rather than units of output—immaterial goods—as implied by the plural “services.” Thus, in S-D logic, goods and service are not alternative forms of products. Goods are appliances (tools, distribution mechanisms), which serve as alternatives to direct service provision. Service, then, represents the general case, the common denominator, of the exchange process; service is what is always exchanged. Goods, when employed, are aids to the service-provision process.

In conclusion, “service” is the heart of the whole model; it is what people exchange to acquire the benefits coming from the application of specialised skills and knowledge, or service.

*Service is the fundamental basis of exchange (FPI)* (Vargo & Lusch, 2008).

Following this definition, the resources owned by the enterprise are composed by specialised competences, knowledge and skills. These “operant resources” are exactly the ones which will lead to a competitive advantage and an economic growth.

*Operant resources are the fundamental source of strategic benefit (FP4) (Vargo & Lusch, 2016)*

Another idea, taking part to the 10 foundational premises, is this one:

*“indirect exchange mask the fundamental basis of exchange”  
(FP2) (Vargo & Lusch, 2008)*

Sometimes, it could happen that *service* is not directly perceivable as the unit of exchange because there are some conditions that could mask its real nature.

For example, with the Industrial revolution, pointing to efficiency, the market started to ask for micro-skilled proficiencies and, organizations to coordinate the overall integration of these skills, to produce what people want.

In that way, people, with micro-skills, work for organizations and receive a monetary compensation. That is an indirect exchange where money is exchangeable in the market for other skills.

Another example: as organization continued to increase size, the phenomena becomes complex. There are internal customers inside the same system and people exchange indirectly skills and knowledge along the chain.

To conclude, people exchange indirectly collective and distributed specialized skills, in monetized system. But, still, they are exchanging service for service. Money, goods, organizations and marketing system are only the exchange vehicles. In relation with this point, the third foundational premise is related with the distribution mechanisms of service provision; they are recognized on goods.

*Goods are distribution mechanisms for service provision (FP3)*  
(Vargo & Lusch, 2004)

About that point, knowledge and skills, that are the exchanged elements, they can be transferred 1) directly, 2) through education or training, or 3) indirectly as embodied knowledge or activities. Wheels, pulleys, internal combustion engines, and integrated chips are all examples of encapsulated knowledge, which informs matter and in turn becomes the distribution channel for skill application. (Vargo & Lusch).

So, as already underlined, in the Service-Dominant logic goods are not the exchanged element. People use the market of goods to achieve higher-order benefits and goods are now perceived only as platform or appliances for the provision of service.

Considering all the previous FPs, an evolution in the perception of economies is presented. Following the Service-Dominant logic, service has always embedded the

essence of market but, just now, service is becoming more apparent in the economy. It is because there is a higher specialization and less of what is exchanged fits the dominant manufactured-output classification system of economic activity. It is like that, all economies are finally perceived as service economies.

*All economies are service economies (FP5) (Vargo & Lusch, 2004)*

The sixth foundational premises, elaborated in the work of Vargo and Lusch, state that: *Value is cocreated by multiple actors, always including the beneficiary (FP6)<sup>2</sup>* (Vargo & Lusch, 2016). Actually, the original version was: “The customer is always a cocreator of value”.

The Service-Dominant logic emphasize that the value creation is not strictly associated with the production, nor even with tangible goods; rather it is a continuous process which always involves customer.

As highlighted before, goods are appliances that provide a service for an in conjunction with the customer. And, even when the customer is using the product, giving light to the knowledge and skills embedded on the good, it is actually creating value.

In conclusion, customers are now seen as operant resource involved in the continuous process of value-creation, acting on operand resources.

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<sup>2</sup> This topic will be deeply explored in the next paragraph, with a highlight on the FP evolution

*“Both the firm and the customer are involved in an unspecified all-encompassing process of value creation” (Grönroos, 2011)*

Following this idea, *Actors cannot deliver value but can participate in the creation and offering of value propositions (FP7)* (Vargo & Lusch, 2016).

Even if, this FP suggest the non-deliverable nature of value, it does not imply that, once value propositions have been embraced by potentially beneficial actors, nothing else can be done by the service-providing actor to contribute to value creation. To the contrary, the acceptance of value propositions implies a continuing role by the associated actors, whether afforded through resources provided directly (e.g., interpersonally) or impersonally (e.g., through a good). (Vargo & Lusch, 2016)

This theory, in coherence with all the previous statement, *A service-centred view is inherently beneficiary oriented and relational. (FP8)*.

Basically, beside the single transaction, where the services or goods are exchanged, the actors co-create value. And, the creation of value can be maximised through an interactive learning process made of interactions and relationships.

Indeed, when the organizations interact one with the other, defining needs and maximising the potential of the appliance, the value created will be maximised as well.

The Service-Dominant logic is a model which does not make sense if the one who offers is considered without the consumer, because value is co-created, and profits do not come from units of goods or service sold, but they come from the client satisfaction. (Kholi & Bernard, 1990).

About, Grönroos state that: "*Value co-creation requires that customer-supplier interaction occurs*" (Grönroos C. , A service perspective on business relationships: The value creation, interaction and marketing interface, 2010)

Beside these 8 FPs, originally defined in 2004, Vargo and Lusch proposed other three premises, finally considered as axioms.

- FP9 *All social and economic actors are resource integrators.*

(Vargo & Lusch, 2006)

The original idea was: "*Organizations exist to integrate and transform micro-specialized competences into complex services that are demanded in the marketplace*" (Vargo & Lusch, 2006)

But they immediately modified it because not only enterprises have a resource-integration role; all actors are resource integrator.

About that, Vargo and Lusch wrote: "*It is the unique application of these uniquely integrated resources that motivates and constitutes exchange, both economic and otherwise*". (Vargo & Lusch, 2006)

- *FP10 Value is always uniquely and phenomenologically determined by the beneficiary.*

Here, the word “phenomenologically” could be substituted by the word “experiential” but, this second option could have given rise to some misunderstanding. So, to highlight the phenomenological connotation, the authors did not choose “experiential”.

- *FP 11: Value cocreation is coordinated through actor-generated institution and institutional arrangements.*

This axiom, linked with the process of value creation, bring attention to “institution” and the role of “institutionalization”. The word “institution” does not mean “organizations” but, it is used to refer to a relatively isolatable, individual “rule” (e.g., norm, meaning, symbol, law, practice). In other words, institutions are what Nobel laureate Herbert Simon (1996) was referring as the “artificial”, which he defined as “man-made”.

While, “institutional arrangements” is used to refer to interrelated sets of institutions that together constitute a relatively coherent assemblage that facilitates coordination of activity in value-cocreating service ecosystems. (Vargo & Lusch, 2016).

Finally, through the last FP that is also considered as the fifth axioms of the model, another concept is introduced: “The service ecosystem”.

The concept of service ecosystem is close to what was previously defined as “service system”:

*“A configuration of people, technologies, and other resources that interact with other service systems to create mutual value”* (Maglio, Vargo, Caswell, & Spohrer, 2009)

But, the idea of “ecosystem” proposed by Vargo and Lusch in 2016 is more focused on “institution” rather than “technology”.

The final definition, provide by the two authors, is based on a zooming out from the traditional view of firm and customer exchanges. And, it goes toward a wider perspective close to a system orientation. They want to denote actor-environmental interaction and energy flow. More specifically, they want to denote critical flow of mutual service provision.

In conclusion, a service ecosystem is *“a relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange”* (Vargo & Lusch, 2016)

<b>Foundational Premises</b>		<b>Comment / Explanation</b>
<b>FP1</b>	Service is the fundamental basis of exchange	The application of operant resources (knowledge and skills), “service,” as defined in S-D logic, is the basis for all exchange. Service is exchanged for service.
<b>FP2</b>	Indirect exchange masks the fundamental basis of exchange	Because service is provided through complex combinations of goods, money, and institutions, the service basis of exchange is not always apparent
<b>FP3</b>	Goods are a distribution mechanism for service provision	Goods (both durable and non-durable) derive their value through use – the service they provide
<b>FP4</b>	Operant resources are the fundamental source of competitive advantage	The comparative ability to cause desired change drives competition
<b>FP5</b>	All economies are service	Service (singular) is only now becoming more apparent with

	economies	increased specialization and outsourcing
<b>FP6</b>	The customer is always a cocreator of value	Implies value creation is interactional
<b>FP7</b>	The enterprise cannot deliver value, but only offer value propositions	Enterprises can offer their applied resources for value creation and collaboratively (interactively) create value following acceptance of value propositions, but can not create and/or deliver value independently
<b>FP8</b>	A service-centred view is inherently customer oriented and relational	Because service is defined in terms of customer-determined benefit and co-created it is inherently customer oriented and relational
<b>FP9</b>	All social and economic actors are resource integrators	Implies the context of value creation are networks of networks (resource integrators)
<b>FP10</b>	Value is always uniquely and	Value is idiosyncratic, experiential, contextual, and meaning laden

	phenomenologically determined by the beneficiary	
<b>FP11</b>	Value cocreation is coordinated through actor-generated institutions and institutional arrangements	Institutions and institutional arrangements enable actors to accomplish an ever-increasing level of service exchange and value cocreation under time and cognitive constraints in service ecosystems

*Table 1: Foundational Premises of S-D Logic \_ (Vargo & Lusch, 2008)*

Finally, to synthesize and distinguish the core of S-D logic, Vargo and Lusch, in 2006, propose a conceptual transactional table. This table highlights all the concepts which characterized the model proposed in 2004 and already mentioned in this work.

### Conceptual transitions

Goods-dominant logic concepts	Transitional concepts	Service-dominant logic concepts
Goods	Services	Service
Products	Offerings	Experiences
Feature/attribute	Benefit	Solution
Value-added	Co-production	Co-creation of value
Profit maximization	Financial engineering	Financial feedback/learning
Price	Value delivery	Value proposition
Equilibrium systems	Dynamic systems	Complex adaptive systems
Supply chain	Value-chain	Value-creation network/constellation
Promotion	Integrated marketing communications	Dialogue
To market	Market to	Market with
Product orientation	Market orientation	Service orientation

Table 2: Conceptual transition from the Good Dominant Logic to the S-D Logic\_ (Vargo & Lusch, 2006)

#### 1.2.2 Competences and capabilities from the S-D logic perspective

This section will present a literature overview of those organizational capabilities which are pivotal to compete in the market, in coherence with Service-Dominant Logic.

The S-D logic view has radically changed the economic premises and, with them, even the concept of “value provision” shifted to “value co-creation”

*Therefore, “from an S-D logic perspective, the capabilities that facilitate and enhance value co-creation processes are strategic*

*capabilities central to an organization's competitive advantage<sup>3</sup>*

*(Karpen, Bove, & Lukas, 2012)*

Starting from the foundational premises, presented by Vargo and Lusch, Ingo Karpen, Liliana Bove and Bryan Lukas, in the article “Linking Service-Dominant Logic and Strategic Business Practice: A Conceptual Model of Service-Dominant Orientation” (2012), introduced the idea of a S-D Orientation.

They defined it as *“a set of strategic capabilities that enable an organization to cocreate value in service exchanges with what the S-D logic literature calls ‘value network partners’, such as customers, intermediaries, suppliers, or employees”*.

Basically, they identified six strategic capabilities in coherence with the strategic themes dictated by the “Service-Dominant logic”.

The strategic themes, resulting from the new dominant logic and identified by the authors are:

- a) Value in context
- b) Relation focus
- c) Value focus
- d) Co-production focus
- e) Operant resource focus
- f) Process flow focus

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<sup>3</sup> “Competitive advantage is a function of how one firm applies its operant resources to meet the needs of the customer relative to how another firm applies its operant Resources” (Lusch, Vargo, & O’Brien, 2007)

While, the six strategic capabilities proposed as Service-Dominant Orientation are:

a) Individuated Interaction Capability.

The ability to understand the resource integration processes, goals, preferences, contexts, and desired outcomes of individual customers and other value network partners

b) Relational Interaction Capability

The ability to stimulate ongoing dialogue with value network partners and develop honest relationship with them

c) Ethical Interaction Capability

Customer should be considered as partner in the value creation process, with a balanced relationship. So, this ability is about interacting without abusing of any potential power or information asymmetry, be transparent and aim for “win to win solution”.

d) Empower Interaction Capability

Once accepted the idea that customer has an active role in the process of value co-creation, this ability is about enhance and empower customer participation.

For example, involve customer into a process of co-production.

In this sense, this ability remained to a collaborative competence, that

*“will aid a firm in absorbing new information and knowledge from*

*partners or improve its absorptive competence” (Lusch, Vargo, & O’Brien, 2007).*

e) Developmental Interaction capability

The ability to support customer and assist their operant resource development.

It means, be open to share information, expertise and knowledge.

f) Concreted Interaction capability

“Facilitate and enhance the direct indirect interaction processes forming the basis for effective and efficient resource integration”

It means, for example, understanding how to best fit to customer’s processes and how it is better to synchronize them.

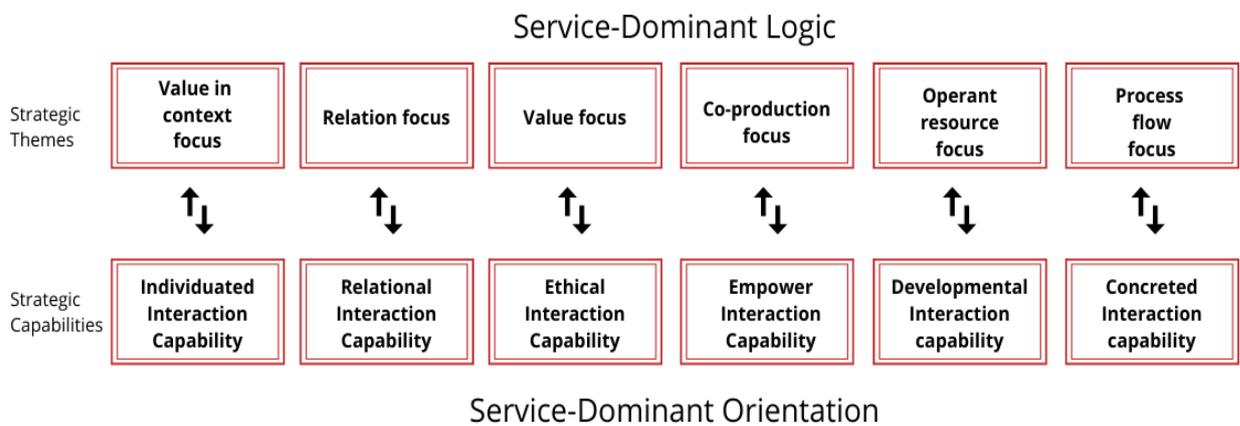


Figure 1: Aligning S-D logic and S-D orientation \_ (Karpen, Bove, & Lukas, 2012)

*More generally, “Competing through service” has to do with grasping the distinctions between G-D and S-D logic, between*

*operand resources and operant resources, between value delivery and value creation, between embedded value and the co-creation of value. It also has to do with treating employees, value network partners, and customers as collaborators that work with the firm to co-create value for all stakeholders.*

*Competing through service is about grasping and applying these ideas better than the competition.” (Lusch, Vargo, & O’Brien, 2007)*

## **2 VALUE CO-CREATION WITHIN THE S-D LOGIC**

What is value? This question has been discussed since the time of Aristotle, who create a first distinction between “value in use” and “value in exchange”.

Years later, Adam Smith faced that question and, he recognized the concept of “value in use” as the real value and, the concept of “value in exchange” as the nominal value reflected on price a person is willing to pay<sup>4</sup>. However, because the measurement of value in exchange was easier, its relevance increased, especially on business discipline.

Although the interest of business discipline was on “value in exchange”, marketing studies focused their attention on other concepts. For example, they started to consider the customer experience and his satisfaction, leading their studies to “value in use”.

This shift was a significant step forward but, it still revealed an unbalanced understanding of value creation process. Basically, it introduced a customer centric view where the value creation process was limited to customer.

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<sup>4</sup> *The wealth of nations* (1776)

Later, other research overcome that limit, introducing the concept of value co-creation. It was the time of Vargo and Lusch (2004), who introduced a new lens to understand the market. They introduced the Service-Dominant logic<sup>5</sup>.

With that light, the value creation is driven by the integration and exchange of resources among multiple actors (Vargo & Lusch, 2004).

Basically, all actors do the same things: integrate resources and engage in service exchange, all in the process of co-creating value.

It means that value creation does not take place through the activities of a single actor (firm or customer); all actors, involved in the reciprocal and mutually beneficial relationship, participate in the process of value co-creation.

In synthesis, value creation can only be fully understood in terms of integrated resources applied for another actor's benefit (service) within a context (Chandler & Vargo, 2011), including the institutions and institutional arrangements. (Vargo, Akaka, & Vaughan, 2017)

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<sup>5</sup> Since that time, the topic of value creation become more attractive for practitioners

## **2.1 TRANSITION OF VALUE UNDERSTANDING: FROM THE GOOD-DOMINANT LOGIC TO THE S-D LOGIC**

The S-D logic view has radically changed the economic premises.

Before the introduction of the new lens, the tradition vision was based on a Good-Dominant logic; where, the purpose of economic exchanged was laid on manufacturing and distribution of things to be sold. In that context, as anticipated in the previous part, the manufacturing process embeds the value into a good; and, the value that good is reflected by the market price. From this perspective, the way thorough standardization and economies of scale is coherent with a maximisation of firm wealth (profit) and value.

In synthesis the value was assumed to be:

- embedded with the property of things, or their derived quality and price;
- able to be produced and distribute;
- unidirectionally created in the value chain, only the producer create value;
- generalizable, the same for everyone
- unidimensional
- “consumed”, it is used up<sup>6</sup>

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<sup>6</sup> Normann (2001) provides two distinct definition: “consume” as “destroy”, “use up” or “waste”, and “consummate” as “complete” or “perfect”.  
Source: Normann, R. (2001) Reframing Business: When the Map Changes the Landscape.

(Vargo & Distinguished, 2018)

On the other side, in a S-D logic, all exchanges are based on service; and when goods are involved, they are tools service-delivery vehicles. (Vargo & Lusch, 2006). For S-D logic, value is rooted on the beneficial application of operant resources, such as knowledge and skills, which are sometimes transmitted through operand resources or goods (Vargo and Lusch, 2004).

Thus, value is co-created through the integration of resources of all economic and social actors.

In synthesis, with a changing understanding, value is assumed to be:

- Actor specific<sup>7</sup>
- Co-created<sup>8</sup>: provider, beneficiary and actors are involved
- Bidirectional<sup>9</sup>
- Multidimensional<sup>10</sup>
- Experiential<sup>11</sup>, with a phenomenological connotation

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<sup>7</sup> Original source: Moeller and Toerroenen 2003

<sup>8</sup> Original source: Prahalad and Ramaswamy 2000, Wikstrom 1996

<sup>9</sup> Original source: Gummesson 2002

<sup>10</sup> Original source: Badinelli 2015

<sup>11</sup> Original source: Prahalad and Ramaswamy 2002, Woodall 2003

- Relational, contextually integrated<sup>12</sup>: Resource availability is specific and complexly composed
- Generated through service exchange (Bastiat , 1964)
- Emergent<sup>13</sup>

(Vargo & Distinguished, 2018)



Figure 2: Value Co-creation through Resource Integration & Service Exchange \_ (Vargo & Distinguished, (Re)Considering Value, 2018)

To conclude, the following table highlights the main differences among the two frameworks

<sup>12</sup> Original source: Palmatier 2008. Moeller & Toerrenen 2003, Amit and Zott 2001

<sup>13</sup> Original source: Hebel, M. 1999

<b>G-D logic vs. S-D logic on value creation</b>		
	<b>Good-Dominant logic</b>	<b>Service-Dominant logic</b>
<b>Value driver</b>	Value-in-exchange	Value-in-use or value-in-context
<b>Creator of value</b>	Firm, often with input from firms in a supply chain	Firm, network partners, and customers
<b>Process of value creation</b>	Firms embed value in “goods” or “services”, value is ‘added’ by enhancing or increasing attributes	Firms propose value through market offerings, customers continue value-creation process through use
<b>Purpose of value</b>	Increase wealth for the firm	Increase adaptability, survivability, and system well-being through service (applied knowledge and skills) of others
<b>Measurement of value</b>	The amount of nominal value, price received in exchange	The adaptability and survivability of the beneficiary system

<b>Resources used</b>	Primarily operand resources	Primarily operant resources, sometimes transferred by embedding them in operand resources-goods
<b>Role of firm</b>	Produce and distribute value	Propose and co-create value, provide service
<b>Role of goods</b>	Units of output, operand resources that are embedded with value	Vehicle for operant resources, enables access to benefits of firm competences
<b>Role of customers</b>	To 'use up' or 'destroy' value created by the firm	Co-create value through the integration of firm provided resources with other private and public resources

Table 3: "Good-Dominant Logic vs. S-D logic" on value creation\_ (Vargo, Maglio, & Akaka, 2008)

### 2.1.1 Value driver: Value-in-use or Value-in-context

In the previous section, the transition from value-in-use to value-in-exchanged was mentioned. Essentially, as Smith recognised, value-in-exchanged was reflected by the price a person is willing to pay: the nominal value

However, contemporary marketing researches have progressively abandoned this perspective, considering value as jointly created phenomenon, emerging from interaction. More precisely, they consider value as the result of a collaborative integration of resources among different actors.

*“According to the service-dominant logic viewpoint, actors are connected through value propositions which are “reciprocal promises of value, operating to and from suppliers and customers seeking an equitable exchange” (Ballantyne & Varey, 2006)” (Jaakkola & Hakanen, 2013).*

In this context, Macdonald E. K. et al. define value in use as *“all customer-perceived consequences arising from a solution that facilitate or hinder achievement of the customer’s goals” (2016).*

While Grönroos wrote different articles related to the topic. More specifically, he analyses value creation and co-creation in service, by analytically defined the role of the firm and the role of the customer, as well as the scope, the locus and the intrinsic nature of value and value creation. (Grönroos C. , Critical service logic: making sense of value creation and co-creation, 2012)

In his papers, the author emphasized that the definition provided by Vargo and Lusch is too generic. Indeed, following their framework, it seems that every actor could influence value in some way.

Following the position of Grönroos, the generic idea that “*Value is cocreated by multiple actors, always including the beneficiary*” (Vargo & Lusch, 2016) is misleading.

Therefore, Grönroos propose a specific conceptualization of that phenomena. First of all, he recognizes in the expression of “value creation” more than one phenomenon. On one side, value creation means the customer’s creation of value in use; and, on the other side, with value creation it is intended the whole process of development, design, manufacturing and delivery as well as back-office activities and also including the customer’s creation of value in use.

So, in order to distinguish the two concepts, Grönroos adopts, in the first case the term “*value creation*”, while in the second case he speaks about “value generation”.

At that point, Grönroos recognized that “production” and “*value creation*” (value in use) are both part of the “*value generating process*”.

Production take place in the supplier sphere; while, value creation take place in the customer’s sphere.

During non-interactive production phases, the supplier can be considered as a “*value facilitator*” because it aims at producing an output which support the customer’s value-creating process.

While, when interaction take place, there is a joint value generation. Indeed, in these cases, the customer could participate as co-designer in the firm’s process and, the firm, in addition to its role of value facilitator, could also become a co-creator of value. (Grönroos C. , 2010) (Grönroos, 2008)

In conclusion, summing the different perspective presented in this work, it is possible to state that the concept of value-in-use, is strictly related with the customer sphere but, it could be also perceived in a jointly created phenomenon, emerging from interaction.

### 2.1.2 Value co-creation in a service eco-system perspective

The value creation, in a Service-Dominant logic, as already outlined, is rooted on the idea that value is phenomenological, co-created, multidimensional and emergent.

In line with that, different studies have designed a complex conceptual framework oriented to a systemic perspective. That is the “service-ecosystem”.

In 2016, Vargo and Lusch defined the service ecosystem as:

*“relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange”.*

Essentially, in that context, value represent a “change in the viability (well-being) of a referent system” (Vargo & Lusch, 2017) (Vargo, Maglio, & Akaka, 2008).

This framework set out the idea that phenomenological value is created through different levels of interaction and institution, in a service-for-service system.

Interactions are laid within network of actors, with different levels of aggregation (macro, meso and micro), of which the dyad “firm-costumer” is just a small part.

About that, there are some key characteristics which distinguish the eco-system framework from the other networking conceptualizations.

The first characteristic is that interactions represent a dynamic set of processes, based on service-for-service exchange, rather than just connections of resources, people, or product flow. Second, actors are considered, not only in light of their involvement on service provision but also, considering the process of resource integration. Finally, the network has a purpose, not in the sense of collective intent but rather in the sense of individual survival/well-being, as a partial function of collective well-being (Vargo & Lusch, 2017).

The following figure, proposed by Vargo and Lusch, synthesize the continuous process of value co-creation in a service eco-system perspective.

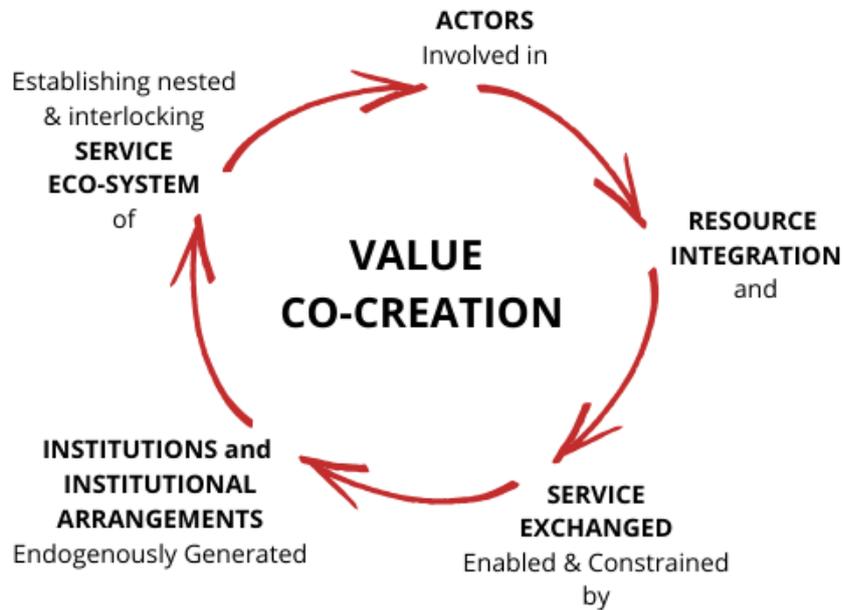


Figure 3: The process of value co-creation in a service eco-system perspective\_ (Vargo & Lusch, Institutions and axioms: an extension and update of service-dominant logic, 2016)

## 2.2 THE COLLABORATIVE PROCESS OF VALUE CO-CREATION

In line with the conceptual thinking of the S-D logic (Vargo & Lusch, 2004) and the service logic (Grönroos, Service logic revisited: Who creates value? and who co-creates?, 2008), this section will propose a focus regarding the value creation in the context of complex, knowledge based, processual offerings (Aarikka-Stenroos & Jaakkola, 2012). Indeed, in view of the above sections, it was deemed appropriate to present a study which explore the joint activities constituting value co-creation.

Specifically, in this part the process of value co-creation is proposed as a conceptualization of the joint problem-solving process.

#### *2.2.1.1 Introducing a relevant framework*

Until now, following the Service-Dominant logic, value has been presented as “the integration and exchange of resources among multiple actors”. More generally, in a service eco-system value is created through different levels of interaction and institution, in a service-for-service system.

Now, to better understand the concept of value creation, it is proposed a theory insight concerning the activities which constitute that process.

About that, in 2012, Leena Aarik ka-Stenroos and Elina Jaakkola, in the article *“Value co-creation in knowledge intensive business services: A dyadic perspective on the joint problem solving process”* published in the Industrial Marketing Management, proposed a framework of the collaborative value co-creation process, considering the joint activities which characterized it.

More precisely, they present a framework which is focused on those contexts where a complex solution, a customized offering or an intensive knowledge-based services are the exchanged elements. Basically, it focuses on those contexts where there is a high level of complexity and an unstructured decision and production process.

In these contexts, the primary value creating activities are focused on knowledge integration, in order to provide what satisfies client needs. Essentially, there is a problem-solving process which gives a tangible interpretation of “value co-creation”.

Many authors describe the problem-solving process in knowledge intensive business as complex and time consuming (Lindberg & Nordin, 2008; Tuli et al., 2007). It always begins with the identification of exchange content and goals: what does the customer need, and how to accomplish those needs.

In other words, the problem-solving process starts from the problem identification and then, it goes through the “solution phase”, the “implementation phase” and finally to the “value-in-use phase”.

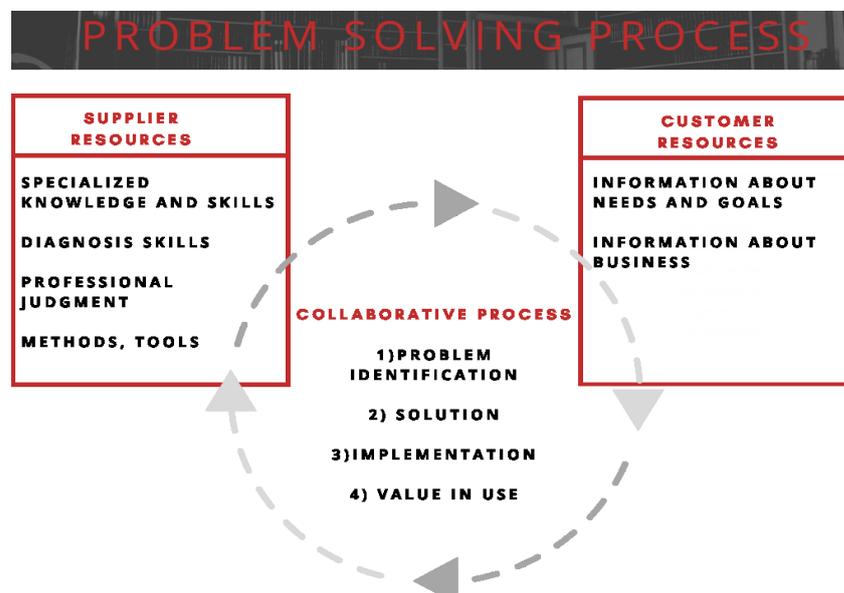


Figure 4: Collaborative problem solving process. \_ (Aarikka-Stenroos & Jaakkola, 2012)

Starting from this conceptualization, Leena Aarikka-Stenroos and Elina Jaakkola propose a framework where “*value co-creation occurs through a dyadic problem-solving process encompassing five key activities: diagnosing needs, designing and producing the solution, organizing the process and resources, managing value conflicts, and implementing the solution. In contrast to some earlier conceptualizations (e.g. Tuli et al., 2007), our findings indicate that the process does not necessarily progress in a linear fashion – the activities*” (Aarikka-Stenroos & Jaakkola, 2012)

#### 2.2.1.2 Collaborative activities

Before to present, the set of collaborative activities, which identify the value co-creation process, it is worth to mention that: in knowledge intensive based context, there is often an asymmetric level of information and a limited understanding of clients’ needs.

*“The complexity and information asymmetry inherent in knowledge intensive business challenges both supplier and customer in value co-creation: it might be difficult for the supplier to communicate the value proposition in advance and to manage the service process to achieve the best service outcome; the customer might find it difficult to understand and evaluate the value potential” (Aarikka-Stenroos & Jaakkola, 2012).*

The collaborative activities identified by Leena Aarikka-Stenroos and Elina Jaakkola:

- *Diagnosing of needs*

At the beginning of the process, it could happen that actors are not on the same page. There are difficulties to identify which is the goal and difficulties to communicate which are the sacrifices and benefits attached to each solution.

So, in that activity, the customer covers the role of *co-diagnoser*, despite the information asymmetry. In that sense, it is crucial that it participates at the value creation process, even at the beginning. He should contribute, sharing information about needs, budget, schedule, usage, and business context.

On the other side, the supplier often covers the role of *value option advisor*, leveraging on its knowledge. Basically, with the customer support, it drafts different solution-opportunities, with various combination of benefits and sacrifices. Basically, it proposes different potential value-in-use.

*Designing and producing the solution*

After diagnosing the need, there is a kind of negotiation to identify the best value proposition for the problem resolution. In this activity, it is crucial that parties' have an effective dialogue to communicate the value-in-use expectations and potential of each option.

Then, the customers could participate at the value co-creation process, covering the role of co-producer of the solution.

And, suppliers may act as value amplifier. This is the case of “suppliers with long experience and augmented expertise can predict the potential consequences of different decisions for the customer's business, which enables them to help customers make favourable decisions and prevent them making detrimental ones.” (Aarikka-Stenroos & Jaakkola, 2012)

#### *Organizing the process and resources*

Another activity about the value co-creation process is strictly related with supplier's project management skills. Indeed, supplier is often considered as the value process organizer because, it has to facilitate the resource integration, in order to make the whole process possible.

#### *Managing value conflicts*

In an asymmetric information situation, where parties have different competences, it is not easy to integrate resources, ideas and expectations. In depth, the customer could have unrealistic expectation; while, suppliers strengthened by their knowledge and competences, could close every channel of collaboration with clients.

So, it is fundamental to have an effective and open dialogue, in order to overcome this challenge

### *Implementing the solution*

During the implementation phase, in complex environment that parties keep collaborating in order to maximise value-in-use.

Finally, the framework proposes some considerations about the value created by all the above activities.

From the customer side, *“the value-in-use they experienced originates from 1) direct monetary benefits, i.e. decreased costs or increased revenues, 2) indirect monetary benefits such as the solution's usability, reliability and compatibility with future solutions, and 3) non-monetary benefits, such as decision making aplomb, sense of relief due to expert support, and a revamped image through a relationship with a distinguished expert.”*

While sacrifices are mainly related with the identification of the optimal solution, considering cost, risk and time. Then, there are other sacrifice which could impact the whole experience, for example those conflicts which could arise during the relations.

Instead, on supplier side, beside financial benefits, all the interactions with customer are considered a source of knowledge and, the collaborative process could benefit also to the market development.

For example, when there are meaningful interactions among parties, the supplier could gain a wide understanding of others, until that the customer itself is considered as a market co-developer.

Concluding, in order to face all the challenges arising from the collaborative activities presented, the involved actors are called to accomplish an effective dialogue<sup>14</sup> and not hesitate on sharing critical information.

In the following figure, it is illustrated the value co-creation process, as joint problem solving, to attain optimal value-in-use.

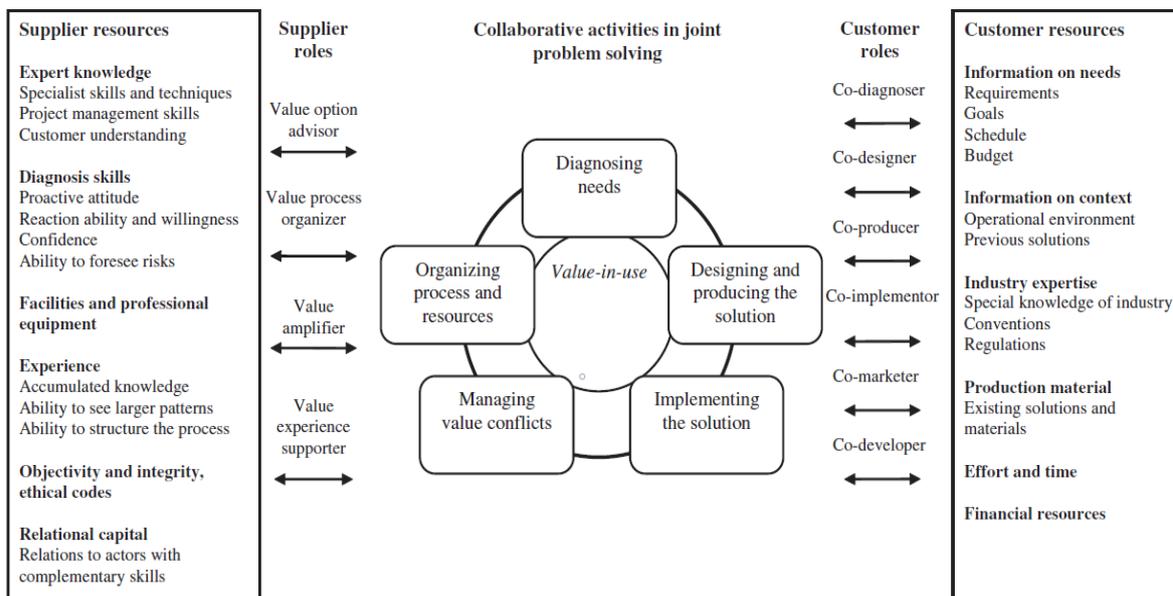


Figure 5: Collaborative activities in joint problem solving \_ (Aarikka-Stenroos & Jaakkola, 2012)

<sup>14</sup> Dialogue between participants should be based on trust, learning and adaptation, with co-created outcomes (Ballantyne & Varey, 2006)

### 3 OVERVIEW OF LOCCIONI COMPANY

The story of Loccioni, chosen as business case, is characterized by people, innovation and technology.

The story begins in 1968 when Enrico Loccioni and his wife Graziella started the adventure. They went through the growth, step by step, reinforced by the strength of their origins and now, Loccioni is one of the most interesting case of Marche region.

They interact synergistically with their territory, producing positive waves to enhance Marche lands. It is about people, innovation, respect, tradition, nature and VALUE. From that commitment, numerous projects born. One example is the “2 km of future” project. In that case, Loccioni invested on the river which border its campus and energy park; now, it is providing hydroelectric energy to Loccioni’s microgrid, a laboratory for the infrastructure safety and the flood monitoring, a new cycling path and landscape design for the entire community, that together with river accessibility recover also the value of its stories and traditions.

*“I was lucky enough to be born in this beautiful land, from which I gathered the values of the monastic and sharecropping culture that I have applied in these 50 years of business. Now we return these values to the earth, applying technologies, innovation,*

*energy efficiency and the intelligence of the networks.” (Loccioni*

*E. )*

In 1968, Enrico Loccioni set up ICIE, a little company that works mainly with Merloni<sup>15</sup>, in Angeli di Rosora<sup>16</sup>. Then, in 1971, with General Impianti, he signed the starting point of his entrepreneurship. General Impianti, focused on electrical system, decided to work on-order with big local players. In 1980, AEA is founded. It produces monitoring and testing systems for household appliance.

These are just the first steps of what Loccioni represents today. Now, it has an international shape with a significant market diversification.

The core of this story is the well-being of people and planet in a world that consumes less and better. Loccioni hardly believes in that goal and it works every day to increase quality, safety and to reduce the costs of goods and services produced by its customers.

The central competence behind this commitment is “measure”. Indeed, it is possible to define Loccioni as a technological ‘tailor’s shop’, designing and manufacturing tailor-made solutions for the automatic measurement and quality

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<sup>15</sup> Merloni company is better known with its commercial brand: Indesit (ex Ariston).

<sup>16</sup> Angeli di Rosora is a small village next to Jesi, in Marche region.

control of customers products and processes. Each project is customized on the customers' requirement.

Concisely, it is possible to state that Loccioni transforms data into value, improving present and anticipating future. Data are Loccioni's starting material, they are collected, elaborated, transferred, measured, compared and managed to increase awareness and knowledge. Then, the transformation of data into value is the result of several interactions among people. Collaborators, customers, suppliers and partners cooperate in a synergic way to integrate the best competences and technologies. Because of this attitude, which has always distinguished the way to work of Loccioni, now a day it is recognisable as an Open company. Open to young people and to long experienced ones, to customers, suppliers, competitors, to the scientific and public communities.

They are all linked in a network of relations in order to simplify the complexity of problems and find solutions. Specifically, Loccioni is a knowledge-based company.

### *Loccioni's values*

What are values and why are they so important? Values tell others who you are and how you will act; they give consistency to your action.

These values represent the common language of the enterprise and they become relevant in every interaction with the market, even for the choice of who Loccioni wants to collaborate with.

The growth and internationalization experienced by Loccioni would not have been possible without its embedded culture and its values.

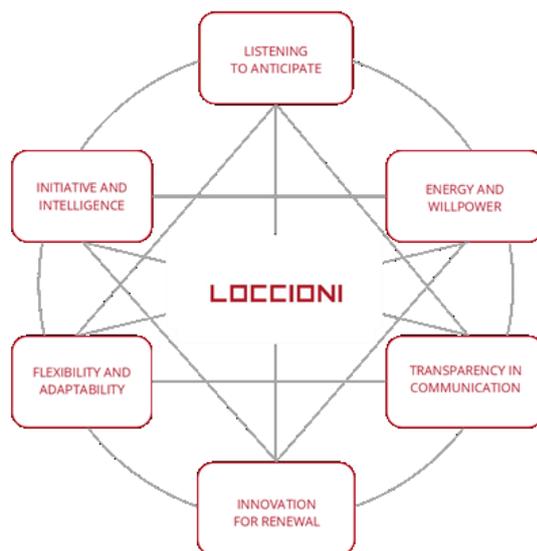


Figure 6: Loccioni's Values

As it is possible to see, the values are organized in couple: “initiative and intelligence”, “energy and willpower”, “innovation for renewal”, “flexibility and adaptability”, “transparency in communication” and “listening to anticipate”.

As core of all these values Loccioni has the respect and trust for people; then, all of them are strictly interconnected, and they represent the starting point of each activity.

Working in businesses that change every day, Loccioni need to be proactive and to refuse stacticity. Innovation is the common thread. If there is willingness and energy everything is achievable, it is just about listen others, identify problems and always seek for new solutions. It is never an arrival point but just a starting one. Moreover, integrity, honesty and flexibility are other values felt by Loccioni.

### 3.1 THE ORGANIZATION OF INNOVATION PROCESSES

Another peculiarity, which distinguishes Loccioni from many others, is the honest willingness to innovate, the willingness to not follow in the loop of routine.

*“Innovation is a behaviour, not an output” (Loccioni E.)*

Even if this definition of innovation is quite exhaustive, it is wise to highlight all the different perspectives of it.

As first approach, there is the traditional view of a technological innovation supported through update competencies and innovative organization models. Beyond this one, going deeper, there are other views of that concept. Indeed, innovation should be seen as an attitude which totally embrace the enterprise. It touches people, clients, partners, and all the other cores. It is the result of interactions, curiosity, focus, concreteness and creativity.

The root of “technological innovation” is not on competencies or great ideas, technological innovation starts from problems. In fact, it is essential to not overlap a great idea with where it came from. Everything takes origin from a problem that becomes a need, which is a new market opportunity.

So, following this logical process, if the proper competencies are own by the enterprise, the invention of a new solution (object practice or idea) become the outcome. Then, the solution needs to be refined and it is also part of the

technological innovation process.

An example which reflects those steps, coming from the Loccioni's experience, is the "invention" and development of FELIX solution. A system used for measuring those data which guarantee the security of the national railway system.

In this case, the concept of innovation is not just the starting point, the actual invention. Innovation is perceived as a continuous and never-ending process.

Looking the big picture of technological innovation, from Loccioni point of view, to get through a high value innovation process, it is important to identify those solutions that have also a future prospective of development. It does not make sense to invest on those paths that are already at the final stage. So, even in that field the enterprise should always has clear the pursued direction and the final goal.

To do that, beyond the ones who work on clients, profit and the traditional business' activities, Loccioni counts on people to look forward and anticipate future. Many of its collaborators work just on that.

Going beyond the strict technological approach, as said, there are other perspectives to be highlighted. Indeed, for example, what is not visible from the previous figure is the contamination created by that process of innovation and all the internal and external interactions.

In fact, the developed competencies and the gained experience will permeate to the whole organization, hitting all the projects and synergistically integrating with them. This aspect is emphasized by the cross-functional organizational model chosen by Loccioni.

Another crucial interaction, starting from the market and its “problems” is the one with clients. Their network, in that case, should be a key net of the process of innovation; especially if the enterprise works as an engineer to order.

The key suppliers as well, collaborate and give their contribution; their knowledge became a strength for Loccioni. So, that they are considered as partners.

In the case of Loccioni, even the territory is seen as a link of the innovation path.

Then, another perspective that should be always considered is the organizational innovation. It considers all the competencies and processes and keep shaping them in new and diversified ways.

Making some example related to Loccioni, the concept of “lean” is a working method introduced as innovation and “data science” is a new competency introduced as innovation as well.

To conclude the behavioural approach is another perspective that is worth to be analysed. Enterprises are made of people, they are the soul of businesses, without them anything is possible. So, even innovation starts from them. The first organizational and technological innovation relies upon the people’s attitude of

innovate themselves, that is based on the willingness to question oneself and never be stuck on personal convictions and behaviours. It means to be open.

So, to innovate and innovate oneself people need a strong motivation. People need the determination to move against the routine and identify previous mistakes. That is what Loccioni expect from its collaborator.

To sum up, innovation can be seen from different point of view. The most common idea is the one related with the invention of new products or technologies, but it is important to not forget the innovation of oneself and organization.

The structure, behind this ongoing process is an interrelated network of hub, characterized by a continuous flow of knowledge.

### **3.2 THE MARKET APPROACH**

Before to describe how Loccioni operate into the market, a brief story about the first “project” of Enrico L. will clarify the current market distribution.

*“Lots of fascinating entrepreneur origin stories begin in the city suburbs.*

*This one begins in a rural house. More precisely, inside a barn.*

*But in a very particular barn that welcomes customers, practicing hospitality.*

*When he was 15 years old, Enrico often had to go get water from the well and transport it to his house and cows.*

*A real nuisance. An annoying problem.*

*There must have been a different way to do it. Enrico set-up his office where he treasured the biggest invention that ever arrived at the countryside at that time: electricity! A pump, electricity, pipes, and now the water reaches home on its own.*

*It is the first automation project.*

*An annoying problem, of a poor comfort, has been solved using technology. Enrico's dad is enthusiastic and tells the story to the neighbouring farmers, trying to take home other projects and improve the quality of their work." (Loccioni)*

This is how Loccioni is born.

As the years went by, the concept didn't change. Everything starts from the client needs; Loccioni designs solutions that help with crucial problem. Indeed, businesses face problems every day and Loccioni wants to focus on those that are costly because of inefficiency and waste and those that are critical cause of legislation.

So, as already said, Enrico Loccioni defines the customized solutions as the outcome of a “technological tailor” which works to realise integrated system of automation, measure and testing. The idea is to work with the top players in the market.

The story of Enrico’s first project is aimed to introduce the simple idea which lead the current Enterprise strategic decisions. Loccioni identify four core needs that are common to everyone. As in the story Enrico’s family needed water for its everyday life, as in a bigger spectrum people are concerned about wellness, mobility, environment and energy.

For example, in the past, when women were responsible for keeping the house in good condition and for taking care of the whole family, they had no choice. They were forced to go outside and clean cloths. Thus, the well-being brought by a washing machine is something that everyone can understand. It has contributed to the wellness of people.

This example is just one of the many, but it lets perceive the idea behind it.

Then, another needs that people have always felt is the “mobility”. Since the ancient times, people tried to make easier the movement, form one place to another.

Think about the invention of the wheel, which need was it addressing to? Mobility.

Well, even now, after years it is something that people need. Being concrete, the mobility is achieved in two ways: through electric and internal combustion or through engine propulsion. That is what Loccioni is focused on.

Going on, in a world where emissions need to be monitored for the well-being of planet and the conformity with norms, Loccioni work with the “environment”.

Then, as fourth need, Loccioni identifies “energy”. Everything that is related with the energy efficiency, starting from the production to the storage and management.

As shown, wellness, mobility, environment and energy reflect the human needs, which lead every market project. These needs are typical of the human being and do not change, except over very long times.

The picture of “Polaris” will clarify the architecture of Loccioni diversification which ensure a greater sustainability (Figure 7).

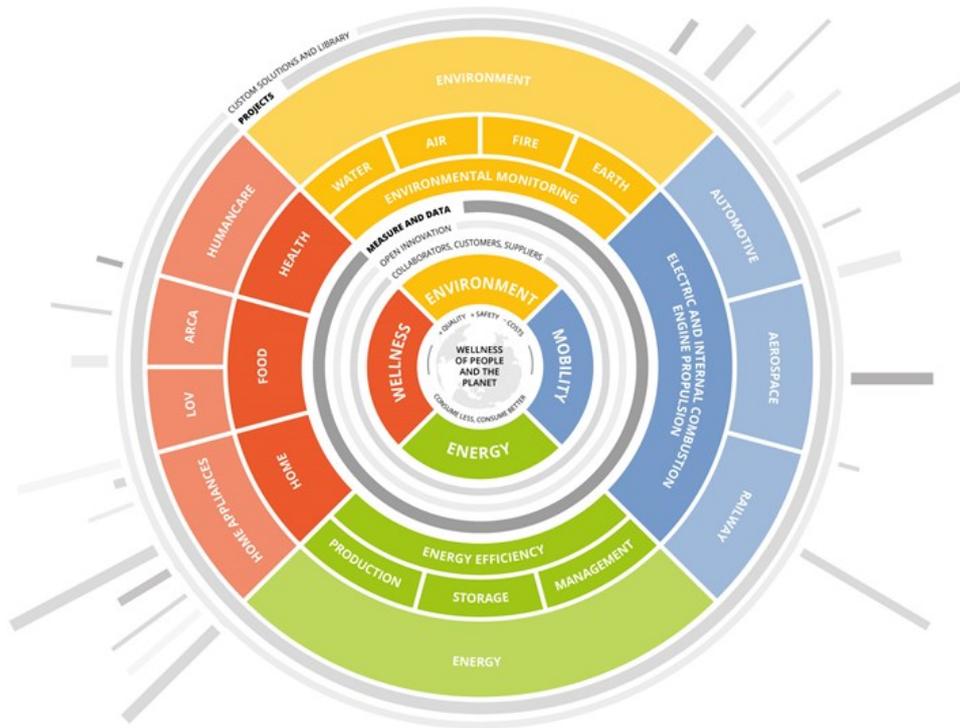


Figure 7: Loccioni's Polaris

Market projects<sup>17</sup> are the organizational mirror of Loccioni work. They evolve every three years; so, they are peripheral with respect to identity, but central to the market.

The library is a transversal project, aimed at developing the measuring instruments and the replicable components, which make up the Loccioni solutions.

Currently, Loccioni is focused on 13 market projects.

<sup>17</sup> Market project is an internal name used for the better-known concept of “business unit”.

These are:

- 1) Aerospace: it is about aerospace, avionic and helicopter's robotic. The main clients are GE Aviation, Leonardo, Airbus
- 2) E-axle: it is about testing electric axes, electric engine and battery. The main players with Luccioni works are Nidec, BorgWarner, Bosch, Jaguar and Ferrari.
- 3) Electric components: it works across the appliance and automotive sector, the main clients are Continental, Nidec, Valeo, Magneti Marelli. For the future, the strategic it will be important to develop also Bosch BorgWarner and SEG.
- 4) Electronics: manage the realization of banks and lines for what concern the electrification of cars. The current and future main clients are: Continental, Bosch, Magneti Marelli, Daimler, Aptiv, BorgWarner, Delphi, Ford and Nidec.
- 5) Energy: design solutions for the creation, management and storage of energy, Luccioni works with Enel, Terna ed E-ON.
- 6) Environment: work with the emission monitoring of air and water, preserving natural resources. The main customers are: GE, Saipem, Enel Wartsila, MHPS.
- 7) Home (ex-Eldo): It is the iconic market project and since 40 years it works to offer solutions to achieve efficiency, sustainability on the production

phase and solutions for the testing phase of the appliance market. The strategic clients are BSH, Whirlpool, Electrolux, Haier and Samsung.

- 8) Powertrain: is about system of measure for the testing phase of engine's components, such as injector. The main clients are Delphi, Magneti Marelli, Continental, Bosh, Kefico, Cummins, Westport, Denso.
- 9) Railway: design standardized solutions, such as Felix<sup>18</sup>, and offer service of data mining and Control Emission Toilet system. The target clients are Rete Ferrovie italiane (RFI), SRT, Salcef, Network Rail, Tesmec Rail, Rail for London and others.
- 10) Sensors: it is a quite new market project which is focused on sensors for the automotive and appliance market. The main client are Bosch and Continental.
- 11) Transmissions: deal with valves and sensors of automotive market. The current main clients are BorgWarner, Continental, Magnate Marelli, Delphi.
- 12) Leaf Community: The Leaf Community is the result of the strong ambition to create a positive meeting between technology and nature. It is the first eco-friendly community in Italy, born in 2008 thanks to the partnership with other organization.

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<sup>18</sup> It is a mobile robot for automatic railroad switch inspection. It measures switch dimension parameters and geometrical railway ones, increasing the quality and the consistence of the measures and it offers the chance to increase safety of operators and ultimately of final users.

13) Humancare: for health care, nutrition and wellness sectors. It operates in the medical field, integrating technology for the well-being of people.

Loccioni starts this project in collaboration with the Marche Regional Hospital. The first solution installed is dated 2007, it is a robotic compounding system for hazardous drugs. Then, other solutions have been developed.

Until 2019, Loccioni works in these countries: USA, Italia, Kuwait, Taiwan, Denmark, Switzerland, China, Germany and Turkey.

### **3.3 A FOCUS ON THE ORGANIZATION AND BUSINESS MODEL**

Behind measure, Loccioni transforms data into value, for the well-being of people and planet. It works with the top players in the world and takes part to the process of innovation. In fact, Loccioni is focused on niches where an annoying problem, of a poor comfort, can be solved using technology.

So, in this process, where every client needs a specific solution for its business, Loccioni plays. Setting aside the exceptions (Humancare and Railway projects), it is possible to cluster Loccioni as an engineer-to-order environment; a “pure customization” strategy.

In coherence with all these previous points, the concept of “project” is the common element embedded in all the organization. Loccioni works side by side with its

clients, involving them along all the project. Thus, it is possible to state that clients are considered as an active part along the process, with a key role in the decisional process.

To conclude, in front of such strategical structure, where Loccioni can be defined as a “Technological tailor”, there are continuous interactions that lead to success. So, a win to win solution can only be developed if both parties are honestly engaged in the relation.

Considering Loccioni as enterprise that is growing day by day, with more than 500 employees, different market projects and its international shape; it is not possible anymore to think that everyone manage all the aspects of the business.

Facing such exponential growth, it was necessary to structure the organization in such a way that the enterprise system reach the final goals in a more efficient way. By the way, this process of optimization of the whole structure was led by the awareness that “it is not true that the sum of the optimized subsystems is always equal to a real optimization of the whole system” (Varvelli & Varvelli , 2019).

Starting from this concept, it is important to state that one of the most common and basic division of the organization’s resources are the “business functions”. Those are “purchase”, “production”, “commercial”, “administration”, “Human Resource”<sup>19</sup>

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<sup>19</sup> In Loccioni this function is called “People”. To highlight the real focus of it; this function is responsible not only about the hiring process, it is also the one which manage the personal development of people inside the organization.

“ IT”, “Finance” and others. Generically it is possible to state that new functions get born from new needs inside the organization. For example, the IT function is quite essential nowadays but, in the past, it was not so crucial.

The sum of all the functions is actually the organizational structure. Its shape can change in different ways, and it depends on how all these functions are managed and how they interact one to the other. Which are the communication flows? What about the decision-making directions? Is there a standardization of process? Of input? Or output? And the flexibility? All these points are just a brief of the different variables that will shape the organizational model.

Loccioni is an organization that continues to change its shapes, augmenting or reducing the hierarchical level, becoming more or less lean and merging or dividing roles; everything in coherence with its strategic objective.

Its structure could be synthesised with one word: “interfunctionality”. This concept is actually the gap among the static and the dynamic phase of the whole business system. It is the source of flexibility and responsiveness needed in such a complex environment.

To achieve this abstract condition, there are different mechanisms of interfunctionality. As definition, Maria Ludovica and Riccardo Varvelli present them as: “All the formal ways and official relations existing inside a complex organization, these are intended to facilitate the dialogue and the interactions among the different functions of the enterprise”. And then, they list the most common ones.

Those are: hierarchical relation, norm and procedures, informative meetings, teamwork, advisory committee, coordination roles, plan and programs, roles rotation, interfunctional training and finally, values. (Varvelli & Varvelli , 2019)

As it is possible to perceive, the word “Interfunctionality” wants to reflect all the vertical, horizontal and oblique relations that take place into the enterprise environment.

If some specific mechanisms predominate respect to the others, it is possible to identify which organizational structural model has been adopted.

In Loccioni, as shown in the survey presented in Varvelli’s book, “Quaderno di cultura manageriale”, the core mechanism adopted are: teamwork, plans and programmes, values and an increase on the “internal role rotation” mechanism.

The teamwork is a situation where the group, composed by limited resources coming from different functions, cope to achieve a shared result. In that context the hierarchical levels are not considered.

Plan and programmes, this mechanism could seem similar to the one characterised by norms and procedures, but it is not like that. Plan and programmes are a mechanism that lead the collective and individual decision of the organization, trying to anticipate the future. To do that it is necessary to clearly identify the objectives, through the vertical, horizontal and oblique interfunctionality.

Values, as already seen in a previous paragraph are the common language of the organization; they are intended to motivate, incentivise the communication and the integration among the whole organization.

Finally, the rotation of role is an individual mechanism which help the horizontal and oblique interfunctionality.

These four mechanisms are the ones that characterized the structural organization of Loccioni. Those are the ones which reflect the matrix model.

(Varvelli & Varvelli , 2019)

There are several reasons behind this structure, many reasons that continuously push the organization to change its shape. For example, the technological progress which characterized the market in which they operate, the growing trend of the company, its business model based on customized solution, and others.

### **3.4 THE INTERNATIONALIZATION PROCESS**

Starting from a local reality, Loccioni has been able to create a discontinuity with the past and redesign its shape. Now, it is an enterprise that has “internationalization” as a core principle of its business model.

The international branches around the world borned year by year, reflecting the willingness to stay next to the client. It is about historical clients that have now an international pattern and potential clients, around the world, which belongs to

unexplored niches. Moreover, looking the big picture, going international is also coherent with a strategy of diversification and competitiveness.

*“Without clients there is no enterprise and the relation with them  
it is crucial” (Loccioni E.)*

The visibility of Loccioni in an international context started in 1986. A German company of home appliance, Bauknecht, has shown Loccioni's testing system on its exhibition stand. Then, in 1996, Loccioni participated in the same exhibition with its own stand. In that occasion, the enterprise had the possibility to share its strengths with others; trying to enforce them with new synergic relations.

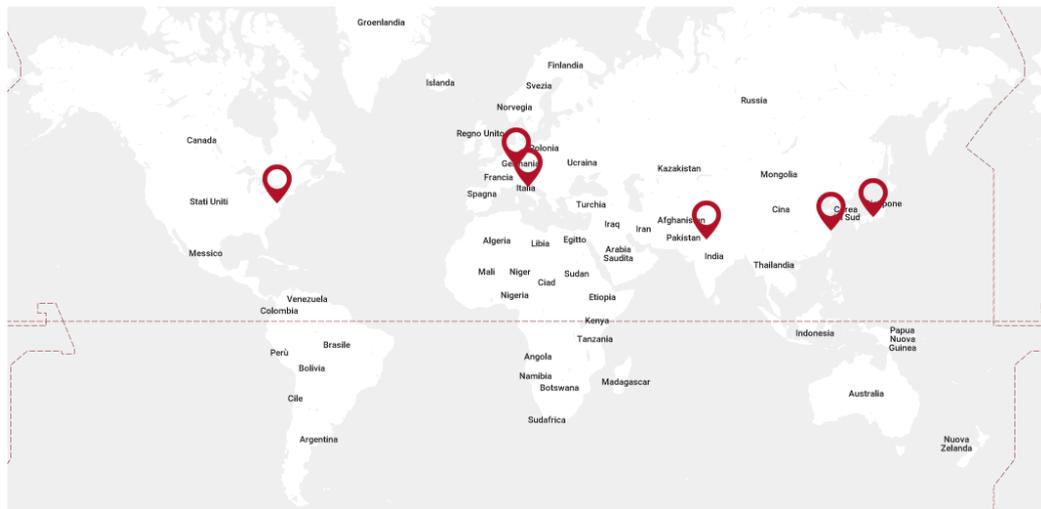
This approach to internationalization is coherent with the value given to the idea of network and interpersonal relations; the driving forces of an incremental and reactive process of internationalization. This process is based on a deep interaction among the two reality; where, both parties are expected to dedicate time on understanding the other culture, values and needs.

For Loccioni, who wants to be surrounded by those enterprises that are coherent with its culture and that can see Loccioni's vision (Bonti & Cori, 2006), it is important to have a deep interaction.

Because of the importance given to relations and enterprises' identity, it is not possible to imagine the entry strategy in an international market with agents or distributors. In fact, Loccioni rely on direct interactions with its clients,

understanding the complex problems that characterised their business. Initially, as first step, the Enterprise can develop its market from Italy, going periodically to visit its clients but then, to be close and support them, for Loccioni was necessary to invest directly in the new market.

About that, the first experience was with Loccioni USA between the years 2005 and 2008. Then, it was the turn of Loccioni Deutschland and Loccioni China. In 2017, Loccioni Japan and finally, in 2019, Loccioni India.



*Figure 8: Map of Loccioni's international sites*

With a direct strategy of internationalization, the enterprise leads personally all the activities needed to develop the new markets. To do that, it is required a consistent amount of organizational and financial resources, but the advantage is visible, the enterprise gains a direct control of the market in which it is operating. So, to sum

up, the trade-off is between the risk of a direct investment and the control which the enterprise gains.

About Loccioni and its internationalization strategy, beyond the concept of direct entry in the market, there is another feature that need to be mentioned. It is the willingness to not decentralise the production but just create commercial branches that are close to the client, develop new relations and give support. Until now, this strategic feature, has been pursued because the solutions developed are complex and technologically advanced. So, for a new branch is not easy to perform with the same standards of quality, effectiveness and efficiency that characterised the Italian base, with its 50 years of experience.

Nowadays, Loccioni has only commercial function decentralised, the five sites take cares of the pre and post sales activities.

Another specific dimension of the internationalization process is about coordination and Loccioni is actually facing it. The organization is much more complex than before and it needs to be coordinated. Until now, the focus and the objectives of the international offices were to perform as much as better they can. They had to stay next to clients and actively listen them. That was the priority. But there was not a clear and uniform guideline from Italy.

Now, that Loccioni can be considered as a global enterprise, with some branch in a mature stage (Loccioni USA, Loccioni Deutschland), it is time to create homogeneity among the whole group.

First of all, the role of these international sites needs to be clear, they are not there to produce. They are there to develop the relations with clients and to provide insights from all around the world.

Second, the IT systems used in the headquarter should be implemented and used also in the international branches. They are clearly smaller realities but, even that, using a unique and interconnect IT-system will help the coordination of the whole group. It is about record new data and access to already storage ones. Having everything in one system will help to have an immediate sign of what others are doing and how. This is particularly important for those sites that are in a mature stage, such as Loccioni USA and Loccioni Deutschland.

Moreover, using a coordinated IT-system, will lead the internationals to align themselves with the Italian processes. Indeed, those systems highlight and reflect all the structured process defined and used by the headquarter.

Another point is about the communication channels with the headquarter that need to be regularised. It is important to clarify who is the responsible for every single activity in order to avoid an inefficient and deviating flow of information.

Furthermore, to increment the understanding and the interconnection among Italy and the other sites it is essential to have a direct contamination among them. Who

work in Italy should experience the reality that permeate the international sites, with its criticisms and strengths. While, for collaborators who are directly hired abroad, it is crucial to visit the headquarter at least one time.

This contamination is about culture, values and modus operandi. Moreover, it will help the international teams to work better, more synergically. This aspect was important to be mentioned because enterprises are made by people and if they are not aligned and integrated, having homogeneity among the group is though.

## 4 THE CONNECTIONS BETWEEN SOLUTION AND SERVICES: THE CASE OF APOTECA

What is service? How is it perceived in Loccioni?

*“In a traditional way, service is equal to maintenance; make our technologies works, keep them updated and functional to clients need.*

*More generally, in Loccioni, service is everything we do, the solutions we provide can be considered as service. From that prospect we are more a service enterprise than an engineering one” (Loccioni C.)*

### 4.1 EVOLUTION OF SERVICES AT LOCCIONI

Over the years, “services<sup>20</sup>” in Loccioni faced an organizational and conceptual evolution.

Its importance was always embedded in Loccioni mission and now, even the economic value is clear. When the volume was increasing, it appears that the

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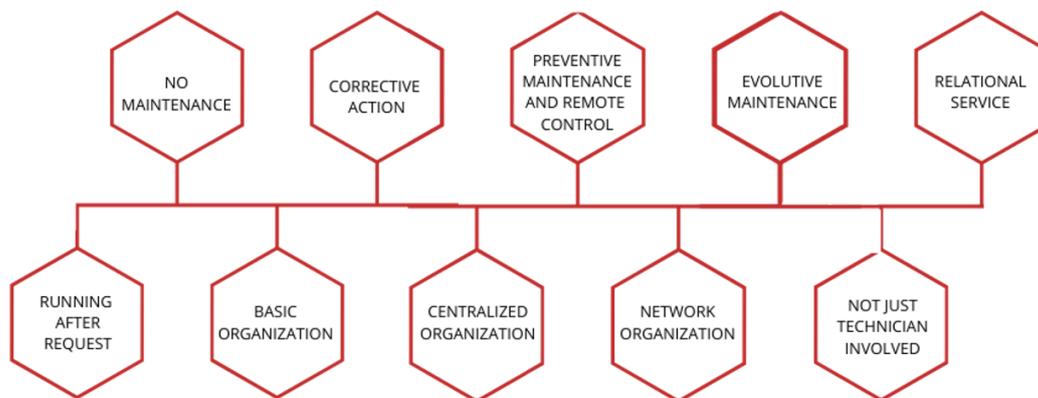
<sup>20</sup> In this chapter the word “services” will be used in a traditional way. For example, it is referred to all the post-sales activity.

revenue generated from service could have been compared to those generated from sales of systems.

So, in a continuous process of improvement, the internal organization was designed and re-designed again.

The goal is to engineer systems that are easy maintainable with a high value service. To do that, Loccioni did not get inspiration from a precise theoretical model; it was stimulated directly by clients he was collaborating with, the top player in the world.

*“It is about listening clients, observing competitors and adapting what we perceive to our reality” (Loccioni C. )*



*Figure 9: Milestone of service evolution in Loccioni*

At the beginning, Loccioni was not really structured to face clients requests and it was continuously running after clients needs.

In 2001 the service team starts to define its identity and in 2002 the Customer Care team was formed.

In 2007, the HelpDesk service was introduced. It was an important step because all the activities that were not methodize, became measurable. It was possible to track the quality, efficacy and efficiency of Loccioni service activities.

Summing up, that was the transition toward a service based on corrective action and a centralised organization.

Then, thanks also to remote system of control, the preventive mantainance become another form of service.

In 2006, Humancare project was lunched and there was a dedicated service team.

In 2011, Loccioni decentralised the Customer care team among all the projects. So, after this internal re-orgaization, every market project was directly supported by a service team. While, before, having a dedicated budget, the Customer Care was too focus on revenus and it used to provide as much service as possible, even if not choerent with the core business.

By the way, the general activities of customer care remained external, operating in a transversal way.

In front of new challenges, coming up from the undertaken internationalization process, Loccioni follow the idea of an internal organization based on network.

As said, all the projects were directly supported by a dedicated team and all the international site were forming people responsible to manage service activities.

And finally, as last step, there is what is better-known as relational service. This last point include activities like the “Apoteca Community” and others.

It is not just about “make the systems work” but it is something more. There are different competences required and the client become actively part of that service.

## **4.2 THE HUMANCARE PROJECT**

*“Behind measure, we transform data into value, for the well-being of people and planet”*

That is the mission of Loccioni, that is what they work for. They are actively engaged on improving present and anticipating future.

The business started from the industrial world. Data are Loccioni’s starting material, they are collected, elaborated, transferred, measured, compared and managed to increase awareness and knowledge. Essentially, it designs tailor-made solutions for the automatic measurement and quality control of customers products and processes.

By the way, even if the starting point was the industrial world, the focus for the well-being of people was a core commitment of the enterprise since the beginning. So, the humancare project born as concrete expression of that willingness. The race is to anticipate, encourage, and design healthier, sustainable living.

The story of Humancare-project started with a first interaction among Loccioni and the hospital of Ancona.

The idea was to apply the technological competences owned by the enterprise in what concern the health system. Basically, the same technology used in the industrial world, could have been used in a different field for the well-being of people.

At that time, the general director of the Marche Regional Hospital (Ospedali Riuniti di Ancona, ORA) was Mr. Menichetti; he saw the potentiality of that project, even if it was at an embryonic stage.

Thus, as first step, a team of chief physicians and he went to visit Loccioni. That first meeting is dated 2005. Its aim was to understand which were the annoying problems, of a poor comfort, that could have been solved through the technological and managerial competences of Loccioni.

In a real brainstorming of ideas, several proposes come out, and the priority was set.

*“Since that first approach, it was perceivable the willingness of both parties to collaborate”.*

After that first step of investigation, one problem was clear; the safety of the oncological therapy’s process needed to be revised. In the oncology pharmacy, each

admixture is tailored for the individual patient based on the physician's orders, real-time lab results and input from the pharmacy team.

Starting with that point, in order to be part of a process of change and innovation, the Marche Regional Hospital and Loccioni decide to set a partnership agreement.

It was based on three pillars:

- The development of new technologies
- Process engineering
- Continuous education

That is actually the origin of Lab@AOR, a laboratory of innovation and growth started in 2006.

The public sector shares with Loccioni its scientific knowledge and clinical experience, while Loccioni, the private one, shares its technological competences and managerial experience. Lab@AOR also represents the clinical site where healthcare technologies developed by Loccioni are tested and validated in a real clinical practice environment.

Thinking big, the idea was to create a health district in the Marche Region with the leading force of an “open innovation<sup>21</sup>”. That ambitious project could not be defined as completed yet.

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<sup>21</sup> Henry Chesbrough coined the concept of open innovation in 2008



*Figure 10: Lab@A.O.R. collaboration*

Now, physicians, pharmacists and engineers cooperate to redesign the therapy processes, develop new technology and train people to work differently. In order to improve safety and quality of patient care

After Mr. Menichetti, the general director of the Marche Regional Hospital was Mr. Tosolini. He immediately understood the opportunity that was taking form and become a key person for the further development of the machines.

After Tosolini, other two directors have followed this project. First, Mr. Galassi and now Mr. Caporossi.

#### 4.2.1 From the oncology department to APOTECA

As already highlight the problem was related with the oncological therapy's process and that is exactly what Loccioni worked for. The oncology sector is characterized by a pathology with a high level of complexity, which requires personalized

therapy. On that field, there are many ongoing research studies which strive to give a contribution for the future.

In this department, it is difficult to plan activities, due to patients' conditions and drug stability. Moreover, there is a high level of complexity due to the workflow and the number of actors involved. There are oncologist, pharmacists, technicians and nurses. All of them have a risky activity, which requires precision and control. The workflow goes from the "prescription" to "data transcription", "manual preparation", "distribution" and "administration". The oncologist writes down the prescription and data are digitally transcribed by someone else. Later, the pharmacy manually prepares the treatment, following the indications prescribed by the oncologist. Finally, going through an administrative process, the nurses are responsible for delivering the treatment to patients.

*"None has a complete view of the whole process and the only one who is always responsible for error is the general director of the Hospital. The one who is not actually an expert of any of those activities."*

In the following table, all the criticism of the process is highlighted, step by step. And a focus on the "manual preparation" phase is also presented.

Loccioni put a lot of effort into understanding this new environment and identifying all its needs. They mapped the workflows and they collaborate day by day with the

Hospital. The first result become reality in 2007, when the first robotic system (APOTECACHemo) has been installed in Ancona Hospital.

From Loccioni humancare research, APOTECA is born: the automation and information system for the hospital pharmacy. Product automation becomes a system and coordinates the flow of materials, data and activities in a human dialogue, with the common goal of maximum efficiency and total risk reduction.

### PRESCRIPTION

- not complete or with mistake (drug, dose, patient, time)
- not clear understanding of manual prescription

### DATA TRANSCRIPTION

- wrong data-entry
- misunderstanding of prescription

### MANUAL PREPARATION

- wrong dosage/wrong dilution    - not correct material supplying
- wrong labelling                      - wrong drug

### DISTRIBUTION

- wrong therapy delivered

### ADMINISTRATION

- wrong patient
- wrong order of drugs



## MANUAL PREPARATION PHASE

### RISKS AND CRITICALITIES

#### RISK FOR HEALTHCARE PROFESSIONALS

- exposition or contact with cytotoxic drugs
- hand manipulation (CTS)
- possible needle injuries

#### HUMAN FACTORS

- manual activity related errors
- lack of experience
- discontinuous attention
- Inappropriate behaviour and bed habits
- stress

#### MANAGERIAL CRITICALITIES

- high rotation of technicians
- difficult recruiting of experienced people
- continuous monitoring missing
- Lack of communication
- Lack or inappropriate report

Currently, APOTECA technologies include the robotic compounding system for hazardous drugs APOTECAchemo, the robotic compounding system for non-hazardous drugs APOTECAunit, the compounding workflow system APOTECAs, and a production management software APOTECAsmanager. Since 2018, APOTECA also comprises APOTECAsped, the robotic system for the aseptic compounding of pediatrics formulations. The system is part of a development project for pediatric patients and pediatric hospital pharmacies and is now installed in Cleveland Clinic US as part of a partnership agreement.

### **APOTECACHemo**

APOTECACHemo was actually the first step, the first output of the collaboration between Loccioni and the Marche Regional Hospital. It is a robotic system capable of weighing active ingredients and solutions, reconstituting powdered drugs, dosing the components by operating with a mechanical arm and dedicated actuators, setting up syringes, bags, infusion devices, and downloading used materials safely. Patients are protected by state-of-the-art technological solutions such as automatic product recognition, control of all weighs and a total traceability labelling system.



### **APOTECAs**

APOTECAs system is a semi-automatic system of support to the manual preparation of injectable solutions containing chemotherapy drugs.

### **APOTECAUnit**

APOTECAUnit system is an automated system for preparation of injectable solutions of non-hazardous drugs in a controlled atmosphere.<sup>1</sup> The system prepares injectable solutions by means of a robotic arm, following prescription and procedure planned by a responsible operator. Individual preparation steps are checked by means of precision scale, sensors and optical scanner. Materials loading/unloading and solutions preparation are carried out in hygienic, contamination-free and safety conditions for patients and health care operators.

Thanks to the collaboration with Loccioni, the Hospital of Ancona is internationally reconized as an example of innovation. It has fully autometed the complex and critical tasks associated with preparations of intravenous chemotherapeutic compounds. It has redesigned its workflow and, thanks to technology, it has introduced intermediate checks, traceability and performance measurements that avoid any error in the chemotherapy compounding process. Basically, APOTECA is positioned in between all the actors, ensuring a reliable

flow of information and a significant reduction of risks; for the well-being of patient and all the professionals.

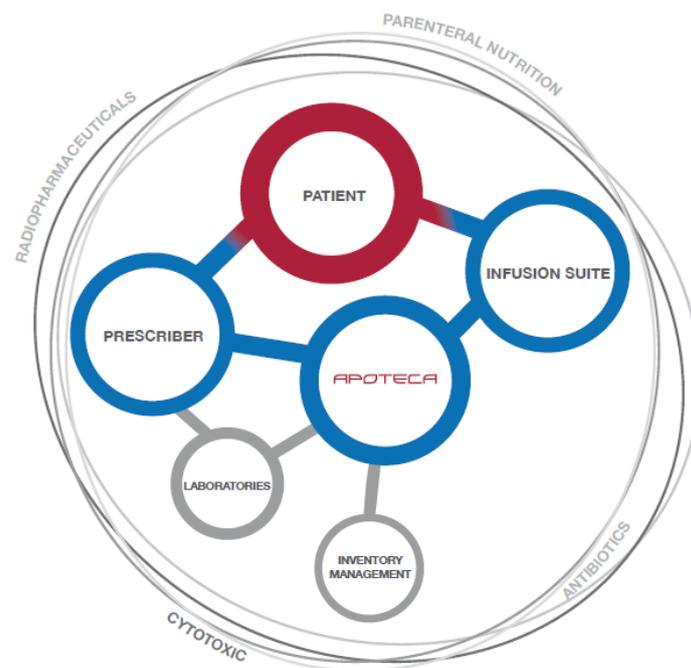


Figure 11: Patient centred workflow

#### 4.2.2 Market evolution

*“Loccioni decided to start the Humancare business in Ancona to bring innovation to its territory”*

The collaboration among Loccioni and the Marche Regional Hospital was the starting point of an exponential growth.

*“In the first year, technicians and engineers from Loccioni were almost every day at the hospital”*

They mapped all the workflow and they put effort into understanding all the criticism, the needs and the risk of the clinical environment. They tested and validated their solution together, keeping improving them. After one year, in 2007 the first version of APOTECA system was born. It was a success for both, the Marche Regional Hospital did not pay for the machine and Loccioni had the possibility to test the technologies in a clinical site.

They organized conferences with other hospitals to present the project and Loccioni had the opportunity to develop its own network of relationships. Moreover, they publish scientific articles to certify the value of APOTECA.

*“This conference was a success. Telling its experience to others, the Regional Marche Hospital was actually promoting APOTECA”*

Step by step, new potential customer demonstrate interest. In these cases, Loccioni always invited them to visit the Hospital of Ancona. It was important that they could see how APOTECA works in the routine and to speak with who uses it every day. After a while, when they start to have some installation around Italy, they received different feedback and requests. Every hospital was asking for different features, but the original idea was a standardized medical system. To solve this situation, Loccioni decided to organize a meeting with all its customers in order to brainstorm and find out a unique request. After that Loccioni worked on that and came out with a software update. It was a unique and integrated response to all its clients.

This meeting was the first one several others. It was the first event of the “community”.

Nowadays, APOTECA Community represents the scientific network where healthcare professionals and technology developers chart the evolution of hospital pharmacy robotics (Yaniv, et al., 2017). Nowadays, it joins leading healthcare organizations from US, South America, Europe, and Asia. The aims of the Community are:

- to share best practices and knowledge for optimal use of healthcare technologies;
- to foster a collaborative environment that enables the improved design of robotic solutions based on the users’ needs;
- to engage members in scientific collaboration, and propelling advancements in pharmaceutical services and healthcare;
- to establish guidelines for hospital pharmacy robotics to share with the international scientific community (The future of hospital pharmacy regarding robot technology, 2019)

Then, even if the community is not born with a marketing purpose, the indirect action of fostering new contacts is also important.

*“The community itself started to encourage the designed market strategy, based on scientific publication, hospitals’ references and frequent visits to customers.*

*We observed that community members wanted to publish what it was discussed during the events. Moreover, we receive feedback by our community members about other hospitals visiting them.”*

Thanks to different actions, the market was getting bigger. The installation were not anymore just in Italy. In 2013, the US market was launched. Then, the German one, the Nordics and finally the Spanish market. Beyond these markets, Loccioni has also other dotted installations around the world.

The target client of Loccioni are big institution, such as specialised cancer center or University-Hospitals. Loccioni looks for clients that have a proactive attitude and a financial stability enough to plan innovation.

*“The goal is to find innovators customers that appreciate and understand the importance of the project.”*

*“When we are targeting one customer, we are targeting a partner.  
It will be part of the co-designing process for the next 10-20 years”*

Sometimes happen that are the potential customers themselves contact Loccioni. Maybe they have read a scientific article about APOTECA or they have spoken with other hospitals who already knows Loccioni. Then, before to sell robots, they are invited to visit Ancona Hospital or the closest one.

Before to sign the contract, they must see the potentiality of APOTECA, they must see how it works in the routine.

*“For example, in Taiwan we have five robots and the first contact was by their side. That was through connections of our community members in Singapore. [...] Then, they came to Italy and we went to Taiwan. We began the normal process of selling.”*

In other case, is not the potential customer who contact Loccioni but vice-versa.

#### **4.3 THE APOTECA SERVICES**

In 2007, with the first installation of APOTECACHemo, several other considerations took place. At the beginning, Loccioni was not structured to provide all the services which offers now. They started from the most traditional such as installation, training, spare parts and emergency repair. But what they made differently was to base everything on relationships. In this cluster the community is set.

At the beginning the focus was on *“make the robots works”*. There was not a structured internal organization dedicated to service. But, following a learning curve, they introduced a corrective maintenance and later a preventive one. Finally, a predictive analysis has been developed.

In Loccioni, that is going through an evolutionary process of service, there are frequent brainstorming about “what service is” and “what it is going to become”. To better understand this wide “world” there is the willingness to cluster different typologies, to examine their evolution and to figured out the future development. In conclusion, there is now a strategic focus on what concern service.

The goals set for the next years reflect that position. By 2027, Loccioni aims to achieve a service-oriented revenue distribution. It means that disposable and general services must cover the 58% of the total revenue; more than what is generated through the systems sold.

#### 4.3.1 Internal reflection about services

That work proposes the final considerations of an internal brainstorming. They will be helpful to understand the Loccioni vision.

First of all, there is a primary distinction about what service is. In a wider perspective, APOTECA and the whole business is considered as service.

To the question “is the humancare project more oriented to its product or more to its services”, Claudio Loccioni answer: “*Apoteca without services does not exist. It is actually a service project*”.

On the other hand, analysing the concept in differently, services are defined as something that is related with the sale of robots, but they are not embedded in the robot itself.

This work will not deny the first point of view, but it will be focused on the latter.

Given that consideration as starting point, it is important to understand that not all the service have an associated economic return, with a defined price. It could happen cause of a strategic choice and/or simply because not all the services are easy to be dimensioned and listed.

For example, speak the client's language is a service which creates value, but it is not specified as all the others. In the medical market the value created by speaking the same language is particularly true; Loccioni interacts with people who often cannot speak English. In fact, for their profession is not required to have a good level of it.

However, most services have been priced and listed. That is part of the work done in the last few years, when the economic relevance of services has become strategically important.

The ones who are formally defined have been internally clustered into typology groups. There are "tangible" or "intangible", "evolutive" or "of maintenance", "based on technology" or "based on competences" and "pre-sale" or "post-sales".

Moreover, nowadays, in Loccioni there is a distinct service approach between the industrial market and the medical one. The core strategical approach it's the same but the expression of it appears differently. Probably it depends on the market in which the projects are embedded, and the solutions required; also, it depends on the standardization level of solutions.

In the following list there are some examples of the mentioned cluster, in Humancare business.

- Pre-sales:
  - on-site visit for a specialised consultancy about the preparation of the site for the system integration (with a previous workflow analysis)
    - Intangible
    - Evolutive
    - Based on competences
  
- Post sales:
  - Spare parts
    - Tangible
    - based on technology
    - maintenance
  - Training
    - Both tangible and intangible
    - Evolutive
    - Based on competences
  - Community
    - Intangible
    - Evolutive
    - Based on competences
  
  - Predictive maintenance
    - tangible
    - Maintenance
    - Based on competences and technology

#### 4.3.2 State of art

Currently, the listed service offered by Loccioni Humancare are the ones in the following table.

Helpdesk	It is the first touchpoint with clients. In front of every issue, clients can use this channel to contact Loccioni. This touch point relies on tools, such as skype, mail, etc. This service is available from Monday to Friday but there is also the 24h/7 extension.
Remote maintenance	In working time, after 2h from the moment that the request is taken in charge, there is a diagnostic response, an immediate resolution within 4h and/or the communication of a needed on-site intervention.
Corrective action	Corrective actions within 24h from the authorization of client.
Preventive maintenance	There is a continuous scheduling of all the actions needed for each installation. Clients are always informed one month in advance.

Predictive analysis	<p>Every day the helpdesk receives automatic mails that signal all the fails happened, even the ones that are not made known by the client. Then, there are all the diagnostic activities.</p> <p>Moreover, every week, the helpdesk receives a summary about all the potential critical situations.</p> <p>It is possible to have this predictive analysis only if robots are always connected with the internal software of Loccioni.</p> <p>The collected signals are then managed as unplanned diagnostic or corrective actions.</p> <p>It is also monitored the productivity of each robot.</p>
Spare parts	<p>All the spare parts request by clients will be provided to the client on time. Loccioni manages the splitting up of consignments, the packaging and the shipment of all the spare parts. The tracking is also guaranteed.</p>
Upgrade	<p>Upgrade, recurrent training on-site or off-site and testing procedure.</p>
Shipment	<p>Loccioni ensure the shipment service to its clients, managing all the process.</p>
Installation	<p>There is an initial on-site visit for a specialised consultancy about the preparation of the site for the system integration, robot installation, testing phase and management of all the required documentation.</p>
Part maintenance and repair	
CAD simulations	

Initial training	The training consists of 30h, final test and practical exercise. The presence of technician nurse and physician is recorded and monitored. If necessary, this training is suitable for credit recognition.
Extra training	If required by clients, Loccioni provide an extra training. It could be dedicated to new staff members or it could be focused on specific functionality, productivity or workflow consultancy. The extra training could take place on site or at Loccioni Italy.
Software integration	
New drugs	Robots are projected to work with specific drugs. The robots work with precise indications about all the technical parameter of these drugs and their workflow. If client needs to work with other drugs, it is possible to insert them in the database. Then, there are all the monitoring test related with this new it.
Statistical analysis	Loccioni offers to client a statistical analysis of robot utilization and its report if required.
On site residency	
GMP documentation	

Project management consultancy	In the preinstallation phase Loccioni offers an on-site visit, as mentioned with the installation service, and a workflow analysis. It offers an organizational consultancy, considering the future development of the processes, the project timetable, the possible customization needed, and the documentation require. Loccioni will be also responsible to communicate the project status to its clients.
Customized software changes	
Configuration (clamp, etc.)	Loccioni respond to its client request, collecting all the specifications, supporting the development of them, managing the order, the installation and the final testing.
Reallocation and decommissioning	Loccioni take charge of all these phases, covering the management of the order and the offer, organizing the activity, contacting external company if needed and executing the activity. Loccioni in this case is also responsible for providing all the documentation required and for being compliant with the safety standards.
Disposable	Loccioni ensure the delivery (maximum lead time of 2 weeks) all the disposable needed by its clients. Loccioni takes charge of the whole delivery process, supporting clients with a splitting up of the supplied quantity. Moreover, Loccioni offers a clear price list, with associated picture.
Community	

Table 4: Apoteca's Services

In the past, the client used to contact the salespeople for every request.

Now, Loccioni wants to methodize and clearly divided what concern the sales phase and the service one. There is the willingness to flatten the organization.

Basically, step by step, the role of the salesman will be split from the post-sales activities. He is the one who has a first contact and who remains the touchstone in the initial phase.

The first step, already done toward this direction is this one: if there are some fails, the helpdesk is the main channel of communication, taking charge of it.

More generally, the second step will be this one: all the other services already mentioned, will have a dedicated team who is able to present a service offer and manage it. And, for the relational sphere, which include the community, there are other dedicated people.

The person in charge of the Humancare project imagine three key roles in the organization. The salesman, the one who develops the relation along years and finally the “customer care” role. The latter is the more horizontal one, it crosses the other’s activities.

To realize this project and make it effective, it will be crucial to work in network and share information about clients. About that, the PRM (Partner-Relationship-Management), that is actually mutating into XRM, will help. As this tool, other

elements will facilitate the communication; such as, periodical meeting and shared reports.

This internal working approach is also relevant because clients are supported not only from Italy but also from the international sites. Thus, the network approach is crucial to remain aligned; especially now that the international sites have a strategic role in the Humancare project.

#### **4.4 THE RELEVANCE OF A COMMUNITY WITHIN SERVICES**

The community project started in 2009. It is the formalization of what has always characterized all the relationships of Loccioni; the propensity of listening clients and collaborate with them.

Claudio Loccioni synthesize all the different aspect of this project in less than ten words: *“the community is the client itself”*.

This definition will remain as reading key of all the feature considerations.

Going more in detail, the story of the community starts as a technical tool. Basically, there were many feedbacks to collect, and some problem to be solved. Loccioni, instead of contacting every client, one by one, decides to organize a unique meeting where all of them were invited.

It was a success, everyone came with different suggestions and complains, but at the end of the meeting there was just one common idea shared by everyone.

It was extremely positive because, given the sector in which the Humancare people operate, it was better to have not a customized system for each client, but it was preferable to have a standardized offer.

After that experimentation, Loccioni decide to give a method this event.

Thus, the first event was the first situation where all the clients together had the opportunity to brainstorm and openly express their idea. But now, the community has broadened its function and it is playing a leading role for future implementation and strategic decision.

It can be described as a scientific network. Pharmacist, researchers and physician collides with the technological world of Loccioni. They exchange intuition and they design together the future.

From one side there are the evidences of who works every day in the health sector, with their precise knowledge and professionalism, and, on the other side there is who has a significant experience and competence on what regard the technical and managerial aspects.

Besides that, another important activity is the researches' publication. For clients, it is functional to what they do; while, for Loccioni, it becomes a kind of reference

signed by a leader hospital. Loccioni takes part as co-write and sometimes it coordinates the knowledge flow, involving researchers from different hospitals.

To clarify what the community is, it is important to not confuse it the recurrent events that take place at national and international level.

The community, as Claudio L. said, is the client itself. It embeds all the activities, contacts, suggestions, vision and shared goals which concern that market.

The clients are actively part of all these processes, they are members as Loccioni is. It is a user-community where the role of Loccioni could be considered as pioneering but not as predominant.

As mentioned before, there are events at international level and others at national. Then, there is the “community on the road” and other initiatives.

The international event takes place every second year, with a duration of two days. As indicative base, it involves the first hospital of each national community, but it is not always the rule.

Sometimes happen that even the second hospital is involved cause of its marked innovative approach. It happens with USA clients, for example. By the way, it is even happened that someone who was not a user was invited to participate. That is the case of important personalities from healthcare sector, such as the health minister of Singapore.

The willingness to select few participants is due to the fact that the international community should not become an autoreferential occasion. Instead, there should be the possibility to discuss and have a real interaction with others.

Even that, the market is getting wider and the number of innovative people who is getting higher. Thus, as one collaborator of Loccioni said: *“Nothing stop us from change the current criteria selection”*

The international community events are focused on APOTECA solutions, but they have also a higher market goal. They aim to understand and anticipate the future trends of that sector. They aim to understand which are the future technological needs, the future chance of processes and the new challenge of that sector.

Loccioni wants to keep its position among the internal supply chain of hospitals, between pharmacy, hospital and patient. Furthermore, Loccioni would like to identify new technological niches related with clinical processes, to transform data into value.

Then, there are the national community event. They take place every year, in each country where there are at least 3 clients.

The current national communities are set in Italy, US, Germany, “Nordics countries<sup>22</sup>” and from the 2020 was planned a national community in Spain.

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<sup>22</sup> Finland, Norway, Denmark

*“In Italy it is the 12<sup>th</sup> edition<sup>23</sup> and clients actually expect that meeting every year. Initially, in the USA, from Loccioni side we just promote the international community and Cleveland Clinic, on its own, propose to organize the first national meeting. Then, the second user was also interested on it, and they decide to organize the second edition. So, nowadays, every year the national community in the USA is organized in a different hospital. In Germany, we organized the first one in our company site and now they organize it in different cities. In Nordics as well.”*

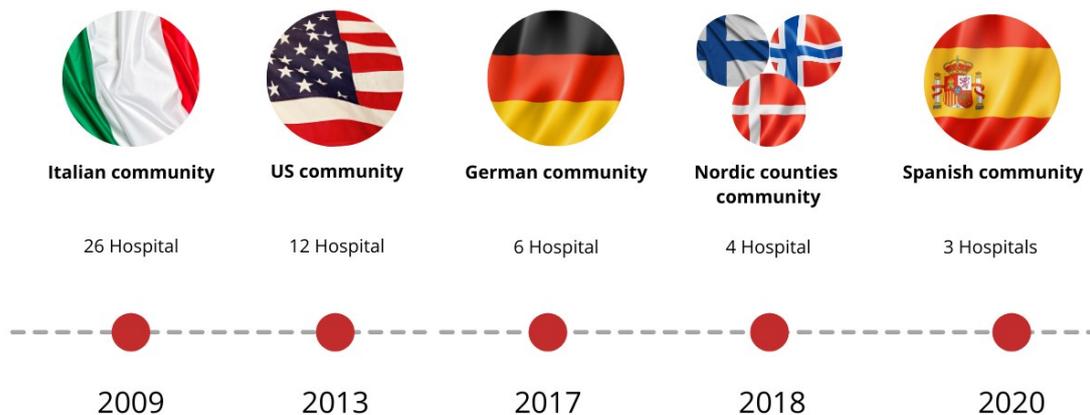


Figure 12: National Communities

During these events, the topic is more related with APOTECA than the argument faced during the international ones. For example, they could speak about the existing technologies embed in APOTECA.

<sup>23</sup> This numbers are update at the year 2020

All the users of that country are invited to participate, and they have the possibility to give feedback directly to Loccioni, to establish new relations and to propose ideas.

From Loccioni side, they collect all the feedbacks coming from members, and they use them to improve the offer and drive new developments. Essentially, the user gets a key role in the process of innovation.

*“National communities meet every year to encourage the continuous engineering of APOTECA and share the lessons learned.*

*During these meetings, the annual upgrade of APOTECA is presented to users. The upgrade is then installed in every hospital in the following months and feedback is collected during the Community on The Road meeting.”*

Beside the international and national level, there is another shape of what the community represents. That is the “Community on The Road”.

Basically, Loccioni provide value to clients starting from listening them. Thus, it is crucial to have a situation where Loccioni can directly interact with its clients. In this case, in contrast with the events, there is a “one to one” conversation.

It is important for clients and Loccioni as well. In that context Loccioni provide a direct support on-site and the relationship become stronger.

Finally, another element that should be considered is the “network of relationships”.

Thanks to community, hospitals have the possibility to enlarge their own network, becoming part of a high qualified cluster of members.

Often, beyond APOTECA, they start new collaborations. And, as positive externality, there is a continuous flow of information and knowledge, beneficial for innovation.

## **5 CASE STUDY ANALYSIS**

All the information, collected during the study and presented in chapter 4, are analysed in this chapter. In order to address the two research questions, these information are selected, interpreted and organized.

The first part reflects “how” the evolution of service unfolds in APOTECA project, and once there is a clear understanding of how service evolved, it is presented a generalised model of “how” service emerges and is organized around a new technology.

While, the other part, starting from data, aims at answering the second question of this study: “Which barriers and conditions have affected the service evolution in APOTECA project?”.

### **5.1 HOW DOES SERVICE EMERGE AND IS ORGANIZED AROUND A NEW TECHNOLOGY?**

With APOTECA project, Loccioni was entering a new market, completely different from the one which it was used to. It means that Loccioni had no experience about all the features which characterised the Healthcare organizations. There was not an internal knowledge about the processes, clinical solutions, criticalities, prospects, existing technology, and so on. Thus, to identify and develop those solutions which may be valuable for hospitals, Loccioni studied and entered the market creating deep relationships with those who belong to it.

As first step, Loccioni start interacting with the general director of Marche Regional Hospital. With him and a selected team of chief physicians, the enterprise organized a first meeting, dated 2005.

It was the first structured occasion to brainstorm with those who represent the Healthcare market and understand their priorities. Organizing this meeting, Loccioni had the possibility to perceive different point of view, coming from different roles. Different ideas come out and everyone agreed on the necessity to revise the oncological therapy's process.

At that point, Loccioni was living this situation:

- A market niche was recognized: the oncological therapy process
- There were personal and professional relationships with the Marche Region Hospital
- The project goal was defined

The next step was to verify the economic feasibility of the project and to implement the final solution with all those services which facilitate the client experience.

Following this path, because the Healthcare market was something unexplored, Loccioni synergistically integrate its knowledge and competences with the wide experience of the Marche Region Hospital. So, a partnership was signed in 2006 and it was formally based on three pillars:

- The development of new technologies
- Process engineering
- Continuous education

Basically, it was a knowledge-based collaboration, where the exchange of information, experience, competences and knowledge were the core value.

Moreover, the Marche Regional Hospital became the clinical site where technologies were tested and validated.

In synthesis, Loccioni designed a partnership aimed at co-creating value, in collaboration with experts from the approached market.

Thanks to this partnership:

- Loccioni practiced the most effective way of communicating with people who work in such different market, from the one which Loccioni was used to
- Loccioni had the possibility to understand the process which characterized the pharmaceutical and clinical environment and to map all the workflows
- Loccioni observed that every role inside this complex environment had a different perception of what is valuable.
- Loccioni developed a network of relationships valuable not only for the future commercialization but also for HumanCare's team expansion

Finally, in 2007, the first robotic system (APOTECACHemo) was installed in Ancona Hospital.

In fact, it was the result of a strict collaboration between parties; Loccioni team went nearly every day on-site. That approach was particularly important because, some information are not easy to be capture and communicated by people who are not expert of automation. In other word, a doctor has not the managerial and technological sensibility to perceive which are the relevant information for the engineering enterprise. Moreover, working side by side, facilitated the mutual learning.

In synthesis, APOTECACHemo solution is the result of a co-designing process.

Beside the implementation of this robot, there is another point that is worth to be mentioned: Loccioni, mapped all the workflows and optimized them.

Basically, through its managerial competences, Loccioni integrated APOTECA solution into the existing clinical processes, giving support to the Hospital.

Then, after the first robot installation, another phase started.

Loccioni kept working inside the hospital, giving a continuous support to its partner, until 2009. Loccioni was there to train people, to monitoring the robot performance and to improve them. Besides, it was learning from its partner, becoming an expert of that environment.

After this first experience, Loccioni developed new contacts and installed robots all around Italy.

In these cases, the services formally offered were the most traditional ones: training, spare part provision, maintenance and a general warranty.

But there was one point, not written down in the contract, which may be considered as an important service. This was the support provided to clients, through the continuous interactions.

In fact, clients were followed in each step and feedback were continuously required. It is possible to notice that this approach led the robot and the services frame development.

Loccioni realised the importance of this approach and it conceptualized into the “community<sup>24</sup>” what was already done without method.

With the community, Loccioni was offering a methodized system of communication, networking and innovation.

In conclusion, “the community”, based on relationships and collaboration, reflects the service model of this project. In that sense, the community is the methodized framework which enhanced the evolution of service.

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<sup>24</sup> Apoteca Community is a user-community, firm driven

In that transition, Loccioni formed an internal team, dedicated to conceptualized and methodize the complexity of the “Community”. Also, it valued the fact that every person inside Loccioni had honestly understand the essence of that project.

It had to be clear that APOTECA was a service-oriented project, based on multidirectional linkages of numerous network partners instead of the traditional supplier-customer relationship. In other word, it had to be clear that the project was based on the complex net of relationships, embed in the community.

As already mentioned, the Community cannot be synthesized only on the periodical “events” which occur every year, they are only the manifestation of the complex system of interactions which the community embeds.

In depth, as described in chapter 4 , the community was launched in 2009 as a technical tool. There were many feedbacks to collect, and some problem to be solved. So, instead of contacting every client, one by one, Loccioni decided to organize a meeting where all of them were invited.

In other word, Loccioni lead clients to converge into a unique homogenous request, rather than several different suggestions. Basically, with that approach, Loccioni was pursuing the solution standardization, without renounce to actively listening clients’ requests.

Thus, after this first try, Loccioni decide to methodize this networking system of collaboration, organizing regular meeting every year.

- “International community”<sup>25</sup>
- “National community”<sup>26</sup>
- “Community on the Road”<sup>27</sup>

What Loccioni achieved, following the Community:

- CLIENT UNDERSTANDING

Loccioni collect information about operational environment, previous solutions, special knowledge of industry, innovative studies, regulations.

Generally, Loccioni has a better understanding of the environment.

Different roles of client’s organization are involved in the Community and that enables Loccioni to perceive what is worth not only from one side.

- DIALOGUE:

Loccioni, conversating with clients, can detect prior needs, and lead innovation toward new solutions.

The development of APOTECA and its services is based on a co-designing approach. Loccioni continuously dialogue with clients, improving existing solutions.

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<sup>25</sup> Detailed description at pages 98-99 (Chapter 4)

<sup>26</sup> Detailed description at pages 99-101 (Chapter 4)

<sup>27</sup> Detailed description at page 99-101 (Chapter 4)

- INTEGRATION OF DIFFERENT RESOURCES:

There is the possibility to integrate different competences and knowledges, of specialised actors.

- RELATIONSHIP

There is a collaboration, not only between two parties but among a whole community of actors which in turn belong to their own network of relationships. So, the wide net of relationship creates also a market developing effect.

There are direct relationships among the same clients. Once they get in touch through the community, they keep developing the relationship, even beyond the APOTECA project.

So, it is possible to deduce that: through the community, Loccioni enhanced the collaboration among actors.

Now, thanks to the existing collaboration among actors, Loccioni designed new APOTECA solutions, upgraded versions of the previous robots and new services in support of clients.

Currently, these are the services offered:

*Helpdesk, Remote maintenance, Corrective action, Preventive Maintenance, Predictive analysis, Spare parts, Upgrade, Installation, Part maintenance and*

*repair, CAD simulations, Initial training, Extra training, Software integration, New drugs, On site residency, GMP documentation, Project management consultancy, Customized software changes, Configuration (clamp, etc.), Reallocation and decommissioning, Disposable.*

*And, an opportunity of scientific research collaboration.*

Even though the community prompts all the subsequent phases on the service evolution, it is also true that Loccioni had to organize its internal resource in order to better manage the evolution.

So, beside the community, the following list will highlight what Loccioni did to implement the current offer of services:

- It was necessary a technological development to evolve from the traditional corrective maintenance to the most sophisticated predictive one.

Moreover, Loccioni worked to fully respect the privacy of all the private information used for data analysis.

Generally, Loccioni exploits the potential of technology in order to provide a better experience to customer, reducing down-time and guaranteeing support in every moment, thanks to the predictive maintenance and the remote controlling.

- Implement an “Helpdesk” service, which is functional for all HumanCare’s clients. All the request coming from clients are collected by the Helpdesk and then managed by the whole organization. It is interesting to notice that when this service was not implemented in Loccioni, clients used to call the sales manager for every issue. Now, with the Helpdesk, information flow directly to the right role into the organization. Moreover, it is possible to track all the data which could be helpful to improve or to implement new service activities.
- Dedicates people to manage the flow of disposable and spare parts. They have contacts with different supplier around the world.
- The initial training is now standardized, with specific materials to be used (PowerPoint presentation, documents, etc.). The process which led Loccioni to provide a complete training, compliant with the standard required, was initially led by a consultant.
- Extra training is now formalized as a specific service offer. If it is just one hospital who is requiring it, Loccioni goes on-site; while, if there is more than one client who is requiring an extra training (for example for new physicians) Loccioni prefer to organize it on its own facility, with the support of the Marche Regional Hospital. That allows Loccioni to have save time.

- There is a dedicated team who keeps working on implementing new upgrades, widening the drugs' portfolio. As highlight before, the initial phase, where Loccioni has to understand what should be improved, is supported by clients. Then, those upgrades implemented by Loccioni are tested in the "Lab" of Ancona's Hospital.

It is also interesting to underline that those clients who have already an APOTECA robot, will exclusively benefit of the upgrade for one year. It means that, new clients will not have the last upgrade. In that case, clients, will act as Beta tester, providing ad hoc feedback.

- With the collaboration of Nordic clients, Loccioni worked on the compliance with GMP regulation<sup>28</sup>.
- Loccioni enhanced scientific collaboration with all the clients which were interested on publishing articles about APOTECA solutions.

This service is relevant for three reason:

It is a way to foster the collaboration among different actors; it let the information flow in a clear and exhaustive way; and, sharing information

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<sup>28</sup> Good Manufacturing Practice (GMP) is a system for ensuring that products are consistently produced and controlled according to quality standards. It is designed to minimize the risks involved in any pharmaceutical production that cannot be eliminated through testing the final product. GMP covers all aspects of production from the starting materials, premises, and equipment to the training and personal hygiene of staff. Detailed written procedures are essential for each process that could affect the quality of the finished product. There must be systems to provide documented proof that correct procedures are consistently followed at each step in the manufacturing process - every time a product is made. (Good Manufacturing Practice (GMP) Resources, 2020)

and knowledge, new ideas could raise.

Moreover, beside this point, it is interesting to notice that this reference become a valuable reference for the market.

- In order to be close to clients and effectively support them Loccioni has five international sites, mainly dedicated to services.

Which is the interpretation of this list?

All the points of this list could be generalised in one sentences: Loccioni enlarges its internal knowledge and competences (technological, managerial) in order to create an higher value when these internal resources are integrated with other actors' resources.

In conclusion, in a complex business-to-business environment, with a high level of complexity and knowledge-specialisation; the main elements which reflects how service emerge and is organized around a new technology, may be conceptualized on the following map.

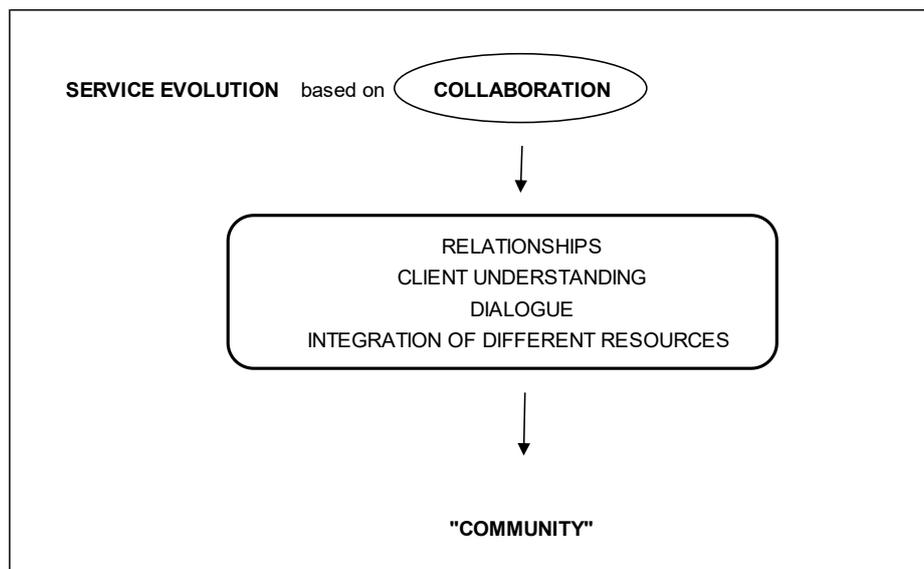


Figure 13: How does service emerge and is organized around a new technology?

Figure 14: How does service emerge and is organized around a new technology?

Figure 15: How does service emerge and is organized around a new technology?

Figure 16: How does service emerge and is organized around a new technology?

According to this conceptualization, it is possible to notice that every service in APOTECA is the result of numerous interactions. Essentially, in Loccioni, the

service evolution is based on “collaboration”.

Hence, all the services which Loccioni designs are co-created with clients.

In that framework, as shown in the map, collaboration is enhanced by a firm orientation which values the following concepts:

- personal and professional relationships among all actors;
- a deep understanding of client environment, processes, criticalities, previous solution, innovative studies, regulations, etc.;
- an effective dialogue based on trust, learning and adaptation;
- an integration of resources, especially complementary knowledge and skills.

Finally, it comes how the firm values these four principles. Basically, the enterprise leads the service evolution through the “community”, which actually is a “networking system of collaboration”.

Concluding, the evolution of service around a new technology emerges through the collaboration among actors, and it is organized through a “networking system of collaboration: the “community”.

## **5.2 WHICH CONDITIONS AND BARRIERS HAVE AFFECTED THE SERVICE EVOLUTION IN APOTECA PROJECT?**

Starting from the qualitative data analysis, the aim of this section is to answer the second question of this study.

*“Which barriers and conditions have signed the service evolution in APOTECA project?”*

Within the frame of this study, it was possible to identify some peculiar conditions and barriers which have impacted the service evolution.

### **5.2.1 Conditions**

- **Impact of previous project**

Along years, Loccioni experienced how important is to have a direct contact with clients, or more precisely, with who directly use the solution.

By the way, before APOTECA, there was another project called “Cytocare”, which approach was completely different. In that case, Loccioni did not used to have any relationship with final users but, it used to rely on intermediary.

This experience has signed Loccioni orientation, underlining all the criticalities of not having relationship with users and strengthening the enterprise willingness to collaborate with them.

Indeed, with Apoteca project, the starting point of service development is based on relationships.

- Limited number of competitors

With Apoteca project, Loccioni entered a niche market without any competitor, providing a solution for the criticalities of the oncological therapy process.

In this scenario, Loccioni was not focus on providing a “product” which performed better than existing one; because there were not similar solution, Loccioni had the possibility to undertake an incremental process of innovation with its own clients.

So, because the limited number of competitors, the services evolution has followed an exploring path.

- Pharmaceutical industry: new drugs

Apoteca evolution is strictly related with the oncological drug development, characterised by a continuous innovation.

For example, when there is a new drug, Loccioni must expand its portfolio in order to not narrow the potentiality of APOTECA. This is a service which Loccioni offer and it is mainly enhanced by the industry’s feature.

In conclusion, it is possible to state that this industry feature offer to Loccioni a never-ending occasion for collaborating with clients.

- Disposable

APOTECA robots automated the tasks associated with preparations of intravenous chemotherapeutic compounds.

These tasks, because of regulations, use high quantity of disposable every day. And, even if they are now automated through APOTECA, they still use disposables. For this reason, Loccioni had the opportunity to evolve services also in this direction. Loccioni now is responsible for providing all the disposable which the hospital could need for a proper use of the solution.

So, the fact that APOTECA is embedded into a market which rely on disposable have enhanced the development of another sphere of services.

- Complementary know how

The knowledge, competences and skills embedded in APOTECA's market are complementary to the technological and engineering ones of Loccioni.

It means that hospitals are completely dependent by Loccioni's support.

Thus, Loccioni services' evolution is also influenced by this condition.

- The partnership with Marche Regional Hospital

The partnership with the local hospital was pivotal for the project development. Thanks to it, Loccioni could start engaging with users, learn how to approach the public market and use the clinical site as their APOTECA's lab.

Besides, there are two characteristics of this partnership which were not mentioned before.

1. "Marche Regional Hospital" is a University Hospital

The "Marche Regional Hospital" is also a research centre. Thus, the attitude for innovation is supposed to be valued by the whole organization.

In this case, Loccioni is not prompting something never done before, Loccioni is actually participating in the process of innovation, integrating its complementary knowledge.

Moreover, because of the University influence, there is a high percentage of young people working in that environment. Those people are the one who can better approach the technological innovation proposed as solution.

They will take part of APOTECA project since they are still student and then, they will become ambassador of their experience.

2. "Marche Regional Hospital" is just few km from the main facility of Loccioni. This condition allows Loccioni's team to go there nearly every day, even to have a conversation. It enhanced the relationship development

with the partner and as consequence it impacts the service evolution.

- The Nordic Community

The development of this community is something unexpected but desirable at the same time. Basically, at the time when Loccioni had just one installation in Denmark and one in Norway, the head of the pharmacy in Denmark proposes to Loccioni to develop a Nordic Community. It was the case when the clients took steps to develop the Community in its region.

- Loccioni international sites

The fact that Loccioni has five international sites allows the enterprise to be close to its clients and directly support them in each circumstance.

Moreover, it is possible to better develop all this service which imply a personal relationship with clients (for example: “Community on The Road” service)

<b>Partnership with Marche Regional hospital</b>	Market insight Understanding the clinical environment Clinical spot to use as technological Lab
<b>The partner is a University-Hospital</b>	Attitude for research and innovation Young people involved, with a better approach to technology
<b>Partner: few km from Loccioni</b>	Face to face interactions
<b>Nordic community</b>	Strong engagement shown by one client
<b>Limited competition</b>	Progressive implementation of service with clients. There is an exploring innovation path, not possible if the solution was already in the market
<b>Complementary know how</b>	The knowledge and competences integration is crucial
<b>New drugs</b>	Give the opportunity of a long term service collaboration. So, a long term relationship
<b>Disposable</b>	Give the opportunity of a long term service collaboration. So, a long term relationship
<b>Previous experience</b>	Loccioni realised the value of a direct approach to the market, based on relationship
<b>Loccioni international site</b>	Be close to clients, in order to have direct interaction

*Table 5: Conditions which affected the evolution of service in APOTECA*

### 5.2.2 Barriers

- Bureaucracy

APOTECA project mainly interacts with public organizations, in the HealthCare sector.

In public organization, the implementation of any change become challenging. In fact, there is a high level of bureaucracy.

For example, in front of any significant purchase it is mandatory to have a tendering procedure.

Generally, these over-structured procedures could affect the flexibility of services and therefore its evolution.

- Decision-making process for APOTECA solutions

APOTECA solution cross more than one organization. It consists in the automation of the oncological therapy process which directly touches the interest of physicians, pharmacists, technicians and nurses.

So, because they will be indirectly part of the decision-making process, it is crucial to communicate the value of each new service to all of them.

It is possible to state that the decision-making process is typically articulated into different layers, in different organizations. For example, pharmacists have a pivotal role because they usually provide all the information needed to the Hospital director while users could be asked to fill a survey about.

- Regulations

The healthcare system's problems, like quality, could become a cause of death. Thus, there are strict regulation which avoid these situations and protect those who work with this environment. There are ever-changing rules and numerous certifications required.

Moreover, from one nation to another this rule changes. For example, the rules of the Nordics country are particularly strict in comparison with the Italian ones. So, it is not about be compliant with the specific parameters of each country and about obtain (and maintain) the certification; this process is significantly time consuming and constrain the service evolution.

- Low-tech environment

The APOTECA device is a high technology device introduced in a low-tech environment, this is a device where a robot replaces manual procedures transforming the staff's task from manually preparing chemotherapy to operating a robot (Fornstedt & Perna). This could lead to a resistance from the staff members and obstacle the more technological services.

- Specific know how required

the development of new service, in this niche market, imply the knowledge of all the processes and its criticalities. If there is not an in-depth analysis of the environment, it is difficult to evolve.

- Communication

Because actors are specialised in two different knowledges areas, the communication between the two become challenging. The information

relevant for one side are not competence of the other side and vice versa.

So, if on one side there is Loccioni who that rely on customer requirements, on the other side hospitals' personnel may not have the necessary knowledge and skills to articulate these elements to Loccioni

So, creating an effective dialogue, in order to enhance the service development, may be particularly challenging.

<b>Bureaucracy</b>	Any change become challenging
<b>Multiple layer decision-making process</b>	Complexity
<b>Regulations</b>	Complexity
<b>Different regulations for different countries</b>	Customized solutions
<b>Low-tech environment</b>	Resistance from people
<b>Intensive-knowledge environment</b>	Need to become expert of that environment
<b>Complementary knowledge</b>	Difficult communication

*Table 6: Barriers which affected the evolution of service in APOTECA*

## 6 PRELIMINARY CONCLUSIONS

In a business to business environment, this work aims at understanding “how” service emerges and it is organized around a new technology. Then, it aims at identifying the distinctive barriers or conditions which affected the case study’s service evolution.

About, the two research questions answered on this study are:

- *How does service emerge and is organized around a new technology?*
- *Which conditions and barriers have affected the service evolution in APOTECA project?*

The two questions have been answered, through a qualitative analysis of the single case study, with an exploratory and deductive approach. Specifically, the research questions have been answered interpreting, organizing and conceptualizing all the information collected about Loccioni and the APOTECA project.

The two answers proposed are in line with the Service-Dominant logic framework and the concept of value co-creation proposed on the literature review. Indeed, the conceptualization designed in response to the first question (Figure 13, page 118) is actually supported by the main constructs highlighted in the first and second chapters.

The research shows that, in a complex business-to-business environment, with a high level knowledge specialization, service evolution emerges from the “collaboration” among different actors. Moreover, the research shows that, the collaboration, which enhance the service evolution, is organized through the “Community”.

Assuming that, the service evolution goes towards value creation, these finding are supported by the theoretical framework proposed on the first chapter.

First of all, the concept of collaboration, is a recurring vision in the Service-Dominant Logic model. About, Vargo and Lusch explained that, the value creation process does not take place through the activities of a single actor (firm or customer); all actors, involved in the reciprocal and mutually beneficial relationship, participate in the process of value co-creation (Vargo & Lusch, 2016). That is why, this view is “inherently beneficiary oriented and relational”. “Organizations exist to integrate and transform micro-specialized competences into complex services that are demanded in the marketplace” (Vargo & Lusch, 2006). Then, always about the central concept of collaboration, in line with the conceptual thinking of the S-D logic (Vargo & Lusch, 2004) and the service logic (Grönroos, Service logic revisited: Who creates value? and who co-creates?,

2008), Leena Aarik ka-Stenroos and Elina Jaakkola sustained the idea that value co-creation process occurs through the collaboration of actors.

Finally, the idea which shows the community as the model which enhance the service evolution is supported by the theoretical framework of the first and second chapters.

Specifically, this correlation is rooted on the theoretical concept of “institution” and “institutional arrangements”. Institutions are mechanisms for the facilitation of resources integration and service-for-service exchange activities. While, Institutional arrangements refer to higher-order assemblages of interrelated institutions (Vargo & Lusch, 2017).

And, the service co-creation process, in a systemic view is based on the idea that the co-creation of value occurs in system of resource-integrating actors connected by shared institutional arrangements (Vargo, Akaka, & Vaughan, 2017)

Therefore, following this logic, the Community may be interpreted as the institutional arrangement which facilitate the collaboration among actors.

The Community is perceived as the element which enhance the value co-creation among actors, and thus the service evolution.

Concluding, in accordance with theory, the enterprise does not work to add value

for clients, the enterprise is focus on creating a system which support the interactive process of value co-creation.

Given that conceptualization of service evolution. The second research question is focused on the conditions and barriers which affected the service unfolding, in APOTECA specific case study.

The main conditions which affected the service evolution could be synthesized in those point: the partnership with the Marche Regional Hospital, some features of the pharmaceutical and the clinical environment, the characteristics of APOTECA solutions and finally, the internal organizational features which distinguish Loccioni.

While, the main barriers depend on the fact that APOTECA project is mainly based on interactions with public organizations, in the HealthCare sector. So, the barriers are rooted on market features.

So, from these evidences it is deduced that the market attributes are those elements which have the highest influence on service development.

In conclusion, both the research questions were managed to be answered.

In a complex business to business environment, with a high knowledge-specialisation, the “Community” become an effective model to enhance the service evolution, around a new technology.



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