SERVITIZATION IN THE MACHINERY INDUSTRY: AN ANALYSIS OF THE ITALIAN SECTOR

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Abstract

Rapid advancement and technological improvements have paved the way for new business models in machinery industry. Among these, particular relevance has the one of servitization which incorporates a different way of conceiving the business proposal. The offer delivered from manufacturers to customers, which are industrial machinery's acquirers, comprehends both goods and services. The approach to goods and services is blended and the two concepts are mutually dependent because only together they can help the client to reach its maximum performance. The impact of some technologies belonging to the Industry 4.0 world will be underlined. This will make possible to understand the potentialities and possibilities offered by I4.0 on the path of continuous improvement.
After an introductory part and an overview of the literature framework, this report is going to perform a detailed analysis, based on a set of secondary sources and on a structured database, of the situation in the Italian machinery sector. In a following moment, quantitative findings about the research are going to be proposed to the reader. The final part is composed of a critical discussion. Here it will be possible to focus on some concepts emerged from the analysis that have been considered particularly interesting.

Il rapido progresso e i miglioramenti tecnologici hanno aperto la strada a nuovi modelli di business nell'industria dei macchinari. Tra questi, particolare rilevanza ottiene quello della servitization, che ingloba un modo diverso di concepire la proposta di business. L'offerta dei produttori verso i clienti, che sono acquirenti di macchinari industriali, comprende sia beni che servizi. L'approccio a beni e servizi è misto e i due concetti sono mutuamente dipendenti perché solo insieme possono aiutare il cliente a raggiungere le sue massime prestazioni. Verrà sottolineato l'impatto di alcune tecnologie appartenenti al mondo dell'Industria 4.0. Ciò consentirà di comprendere le potenzialità e le possibilità offerte dall' I4.0 nel percorso che mira al continuo miglioramento.
Dopo una parte introduttiva e una panoramica della letteratura, il report si appresta ad effettuare un'analisi dettagliata, basata su un insieme di fonti secondarie e su un database strutturato, della situazione nel settore delle macchine italiane. In un momento successivo verranno proposti al lettore i risultati quantitativi della ricerca. La parte finale è composta da una discussione critica. Qui sarà possibile soffermarsi su alcuni concetti emersi dall'analisi, che sono stati ritenuti particolarmente interessanti.

1) INTRODUCTION

1.1) An opportunity for improvement: Industry 4.0

The term Industry 4.0 dates back to about a decade ago and marks the beginning of a further step forward in the evolutionary process of the industrial world, destined to change from that moment. As often happens when dealing with a huge moments of innovation, the revolution was not immediate and even nowadays the transformation it's not to be considered complete yet.

The term Industry 4.0 has been introduced for the first time at the 2011 Hannover fair and has made its first official appearance in literature in 2013 (Calabrese, Manoj Dora, Ghirona and Tiburzia 2020). The cradle of the movement Industry 4.0 has been Germany and therefore it is right to start from there, trying to give a synthetic definition, but it must be considered that it has now spread to all advanced countries.

According to Osterrieder, Budde, Friedli 2020 and Schwab (2016) the main goal of industry 4.0 is to turn factories into smart factories. To achieve this task smart equipment technologies are fundamental. As noted by Kang et al. (2016), these comprises devices that empower the monitoring, communicating, and interacting capabilities of physical objects such as sensors installed on physical objects. Collectively, these technologies are known as Cyber Physical Systems (CPS) because they connect physical and cyber tools through the cyberspace (Crnjac, Veza, and Banduka 2017; Nayak et al. 2016).

For years I4.0 has been a term used several times and in various contexts and it is not immediate to give a univocal definition that is shared by all. Despite the width of the concept the definitions above proposed have been considered as appropriate to give insights about the prevailing meaning of the industry 4.0 movement.

It is easy to understand that, being a very vast and complex journey, there are still disparities and different ways of seeing about I4.0, but one thing is clear to everyone: the potential offered is enormous, in numerous fields of application. As mentioned, the implications of I4.0 are numerous and the idea of this report is to deal with the huge impact on the value chain, understanding how the use of new technologies can bring benefits for multiple actors.

How do the potentialities introduced by I4.0 fit into this context? The innovative solutions are many and it is not immediate to summarize them, but a general framework will be proposed, since defining a guideline is essential to have solid references onto which articulate the continuation of the discussion.

A relevant first example is now proposed to make the reader understand the opportunities to be seized in order to always aim for better results. The possibility of obtaining new precious information from machines in the production department based on the combination of historical and real time data can lead to anticipate the moment of breakdown. By doing this, it is possible to minimize or even avoid the failure times with the aim of maximizing productivity. This practice is named predictive maintenance.
The application just shown emphasizes the role of digital technology as an enabler. But that's not enough, managerial and interpretative skills are also needed to progress towards new frontiers.

1.2) ETO

More in detail, the subject on which this report will focus is that of machinery. When talking about machinery and capital goods producer it is necessary to comprehend that the degree of personalization is various but can reach high level. Engineering To Order can be considered as the maximum level of personalization which is offered by some companies operating in the field under investigation. For this particular reason the concept has been explored in this introductory part.
The definition of ETO fulfilment strategy revolves around the specific request of the product by the customer. Only after this has taken place the realization of the product will begin. It can therefore be said that the customer is involved right away at the beginning from the design phase.
Specifically, as regards the manufacturing sector, the machine is produced following the direct order of the customer (in most cases the deal regards two companies, so it is a B2B transaction) who requires specifications and needs a tailor-made product. For instance, a machine tool manufacturer receives various requests and must aim to satisfy them in the best possible way to meet any particular exigency of each customer.
It is necessary to define what is the way of operating of Engineer To Order (ETO) companies. To accomplish this task it has been considered appropriate to refer to the literature review by Jonathan Gosling and Mohamed M.Naim (2009). The scope of this paper is to review the extent knowledge and scientific contribution on the ETO topic, trying to identify a unique definition comprehending all the common traits.
First it is appropriate to introduce the concept of Customer Order Decoupling Point (CODP), called decoupling point for simplicity. “The customer order decoupling point (CODP) is a stock

holding point that separates the part of the supply chain that responds directly to the customer from the part of the supply chain that uses forecast planning" (Christopher, 2000; Hoekstra and Romme, 1992; Mason-Jones et al., 2000; Naylor et al., 1999; Olhager, 2003).
According to the Wortmann classification the main production steps separating the supplier from the customer are engineering, purchasing, manufacturing, assembly and distribution.

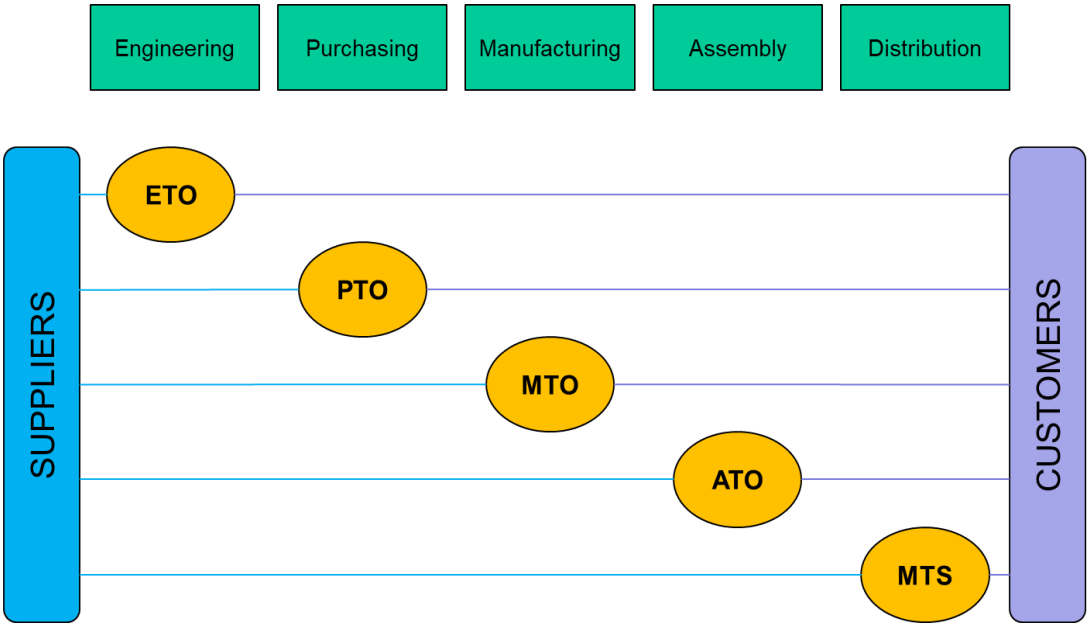

Fig.1 Wortmann classification

According on where in the supply chain the CODP is located, Wortmann identifies 5 different types of approach to describe the order fulfilment: Engineer to order, Purchase to order, Make to order, Assemble to order and Make to stock. To be exhaustive Hoekstra and Romme (1992), Naylor et al. (1999), Yang and Burns (2003), Olhager (2003) and Lampel and Mintzberg (1996) propose an additional approach successive to make to stock which is called STS, ship to stock, not showed in fig.1.
The attention of this report is on ETO where the decoupling point is placed at the engineering phase. This means that the product lead time comprehends all the production activities, also considering the engineering/design phase. The characteristics of this type of fulfilment strategy are mainly related to the specificity of the product requested and the necessity for the supplier/producer to satisfy the customer request with a tailor-made product or service. In an ETO fulfilment strategy, the complete production flow is triggered by the customer order. A consequence of the previous concept is the reduction in demand uncertainty which should be considered in trade off with an increase in the order lead time.

In the literature it is also common to find the term DTO (Design To Order) showing a lack of unity and clarity in the words used. According to Elfving et al. (2005) and Barlow (1999), one-of-a-kind (Hameri, 1997; Tu,1997), design-to-order and engineer-to-order (Hicks et al.,2000) are frequently used in conjunction with supply chain, production, organization and system to refer to the fulfilment strategy type that it is going to be treated in this paper.
To summarize, the extent literature defines some commonalities (needed to belong to the ETO fulfilment strategy) and identify some possible differences among the supply chains adopting Engineer to order.

Commonalities (must have)	Differences
Decoupling point is at the engineering stage (first step of the realization of the product).	Already existing designs could be partially modified to order. The alternative consists of creating a whole new design to order.
Customisation is as high as possible since ideally each product is different to the previous.	Different structure of the process and supply chain, which could be not linear as indicated by Wortmann, according to the different industry of application.

Tab 1 Commonalities and differences in ETO

Finally, according to Jonathan Gosling and Mohamed M.Naim (2009 for Elsevier), the ETO companies are set to receive an increasing importance as more customised products are demanded across a range of industries, for instance machinery.
Another concept which is necessary to introduce has to do with machinery producer being considered capital goods supplier. Here the distinction between capital goods and consumer goods where the latter are the one that are bought by the final client, while the former are necessary to produce the latter one.

1.3) Machinery industry

The concepts above cited assume particular relevance in the machinery industry where, thanks to some of the I40 features (for instance Internet Of Things), it is possible to obtain numerous data from the operations department. Data alone are not able to communicate

useful information, while if interpreted with a critical eye and with a systematic approach they can suggest detailed indications on how to improve.

But, as previously mentioned, one of the reference words is interconnectivity and therefore the direction in which the companies should move is the one of sharing data along the supply chain to create a win-win situation, generating additional value to split between multiple actors.

Trying to keep it extremely simple, I4.0 brings improvements in terms of efficiency (cost reduction) and effectiveness (revenue increase).

Until a decade ago, the highest aspiration of a machinery producer was to offer the best product, intended as the most technologically advanced, to customers. After having analysed numerous secondary sources including scientific papers, literature reviews, consulting company reports and company relations, the presence of an increasing attention to services and not just to the product emerged.

In Italy machinery occupy a relevant sector and some information have been extracted from the source Federmacchine which is the national federation of associations of manufacturers of capital goods intended for industrial manufacturing processes. Here some interesting data are proposed to better understand the dimension of the sector:

- 48,3 billion euro revenue for 2019
- 67% of export
- About 200.000 employees

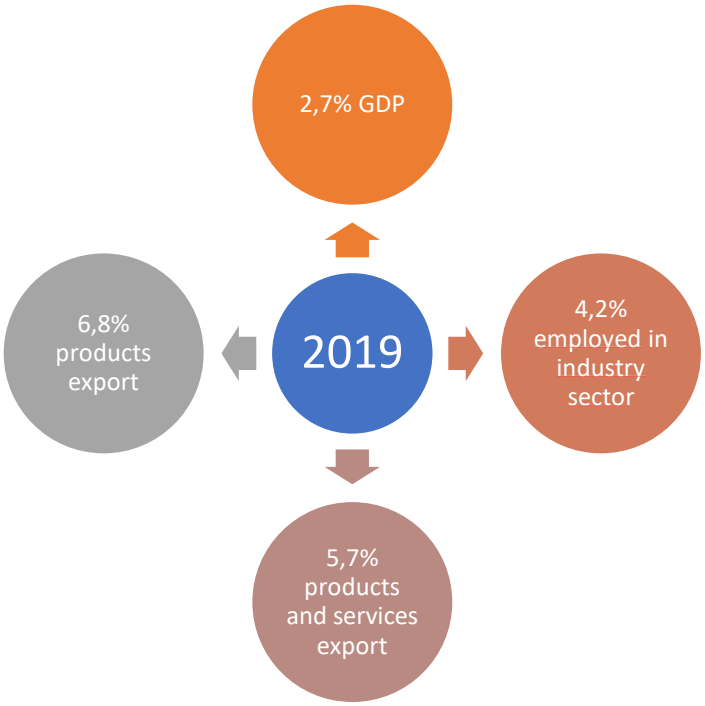

Fig. 2 Machinery in Italy, from Federmacchine in collaboration with ISTAT

From the sectoral report taken into consideration, it emerges that “Made in Italy” is appreciated all over the world for its extremely high technological standards and the strong customization of the offer.
Italy is fourth in terms of contribution to European GDP (with a share of 11.2%) but in terms of contribution to Machinery and Equipment, Italy's role is noticeably more important: it is second after Germany, with a share of 16,7% doubled if compared to the following player. In conclusion it is clear how the machinery sector in Italy occupies a role of main importance in the European context.

1.4) Business model innovation

The business model is like a blueprint for a strategy to be implemented through organizational structures, processes, and systems (Osterwalder et al., 2010). The definition proposed has been considered as appropriate because it highlights the relevance of a business model inside a company. It has the aim of defining the logic of how a firm expects to make a profit. Furthermore, business models provide the direction to be followed by each single unit of a company.
When addressing the topic of business model innovation, this report has the intent to raise the attention on a twofold perspective. On one side there is the always arising importance of services in company offers. On the other, Industry 4.0 works as an enabler for servitization and continuous technological improvement. For what it concerns the former, it is necessary for companies in the sector to understand that services and products are strongly connected. The mutual dependency that ties service and good is the reason for which firms have to adopt a new mindset to properly deliver the blended offer. Always referring to the framework proposed by Osterwalder et al. (2010), it is possible to define value proposition as the bundle of products and services that create value for customers. This definition entails the distinction between services and goods as part of the proposal, but the new value proposition, according to servitization, is composed by both. Since the final proposal is different from the past, it would not be wise to carry out all the activities as they were done before. Taking this into account a complete and new proposal requires an innovative understanding and a related change in business model.
I4.0 opens the door to the shift of how business is developed, creating space for innovative new ways of carrying out industrial practices. To be more precise, I4.0 requires a holistic

approach with the aim of fully understanding the pervasive changes to processes, to the decision-making activities and value distribution among the different players of the supply chain. One of the key words, for what concerns Industry 4.0, is interconnectivity. This concept can be summarized as that all parts of a system interact with and rely on one another simply by the fact that they occupy the same system, and that a system is difficult or sometimes impossible to analyse through its individual parts considered alone. This has been explained to show how it would not be possible to achieve interconnectivity without a clear change in the way activities are performed. Business models created using Internet of Things technology are completely different from the traditional ones. They demonstrate departure from conventional linear oriented value streams to creating values within a network of units. This means that when defining business models, the focus is on the entire ecosystem, including supply chain, rather than on a single company, so that all parties involved improve their processes in order to maximize benefits for the end customers. [Atzori, Iera, Morabito 2010]. For this particular reason, it is clear how companies should embrace the Industry 4.0 challenge with appropriate modifications in their business model.

The role of the actors along the value chain results strongly modified because I4.0 brings the possibility of substantial improvement by following the principle of interconnectivity. This is a keyword in the 4th industrial revolution and the aim is to analyse how all this influences the machinery sector, also referring to some stories of producers that successfully implemented this approach to gain a sensible increase in their performances.

In the world of today a lot of data are produced at every moment and it is clear now more than ever that the collection of them and the subsequent functional interpretation can be a source of success for companies capable of doing this. Data analytics can help decision makers and guide them towards a better choice. This is not the only advantage that comes from a correct and improved data management. On this proposal, the power of data relies in the possibility of enabling key strategic initiatives, but also to improve relationships occurring between customers and business partners. The information extracted from operational data must be considered for all intents as a fundamental resource. From this reasoning, once again, comes the necessity of companies to bring a change in their business model in a way that entails and exploits at the best the potentiality offered by data.

McKinsey [Industry 4.0, How to navigate digitization 2015] conducted a research, based on interviews with more than 300 experts working in production and service companies in USA, Japan and Germany. One of the results of the study was that 80% of companies expect the Fourth Industrial Revolution to have an impact on their business models for what concerns service delivery. The focus of this report is on the Italian manufacturing sector but the study

by Mckinsey can be taken as a reference of the importance that the topics discussed in this paragraph have in the industrial reality.

1.5) Service orientation and deployment of the research

The shift described in the previous paragraph is strongly influenced and facilitated by the I4.0 technologies that function as enablers and offer new opportunities to develop business models. In this direction it is possible to introduce the term "servitization". According to Kowalkowski C, Gebauer H, Kamp B. (2017), servitization stands for 'transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic'. According to the extent literature the evolution from traditional business models, based on the product sales, to new service-oriented business models (BMs), has received increasingly attention in the managerial community. Nowadays, increased competition in the capital goods sector challenges product-based competitive advantage and manufacturers should embrace new strategies based on other sources of competitiveness. As a result, capital goods manufacturers are moving from product-centric offerings to services and solutions in order to increase and provide steady/balanced revenues during time, and to build sustainable competitive advantage. In particular, services represent one of the main elements to design such new strategies where firms' value propositions move from selling products to provide product-service-systems (Adrodegari et al., 2018). The topic of servitization has been discussed many times during the year and it has been possible to assist to a continue evolution of the situation in the machinery industry. This must be considered as the result of the effort put in place by manufacturers to reshape their business model so that to meet the progressive market requests. Servitization has nowadays become nearly synonymous with companies moving from selling products and basic services to selling product-service systems (PSS). These PSS typically include advanced lifecycle services and involve changes in companies' business models (Durugbo, 2013; Rabetino et al.,2015). This concept will be furtherly deepened in the next chapter where a more detailed literature review will be proposed.

As said, the arising attention dedicated to services was present several times in the sources examined. Consequently, the idea has been to investigate, with regard to the machinery sector in Italy, if the theory matches with the reality, with the goal to present an overview of the current situation.

At this point, after having showed the relevance of the sector considered, the investigation has continued. More in detail, all the different types of services offered have been identified

and listed. A statistical survey will be carried out to understand how widespread these services are among the various companies in the Italian machinery sector. In addition, it has been considered important to cite particularly excellent companies in this field (i.e. Biesse S.P.A) that offer a complete catalogue of services capable of satisfying every need. These can be taken as a reference and indicate the direction to other Italian companies.

2) LITERATURE REVIEW

The literature review has been centred on servitization and related concept. The topics is wide and in recent years more and more studies have been published. By the way, it has been decided to start from the reviews present on Scopus. More deeply, only the most relevant have been considered. A summarize of the research methodology is here proposed:

- Search engine: Scopus
- Document type: review
- Key word for research: “servitization” or “servitisation”
- Sorting: cited by

The results of the research show a total of 47 documents. It has been decided to base the analysis on the first 10 reviews according to the number of citations. These have been considered as suitable to depict with precision the topics under investigation. The list of review is hereafter proposed and it is important to notice how some papers have been cited many times. This can be an important clue about the reliability of the sources analysed for this report.

Document title	Authors	Year	Source	Cited by
The servitization of manufacturing: A review of literature and reflection on future challenges	Baines, T.S., Lightfoot, H.W., Benedettini, O., Kay, J.M.	2009	Journal of Manufacturing Technology Management 20(5), pp. 547-567	805
“Industrie 4.0” and smart manufacturing-a review of research issues and application examples	Thoben, K.-D., Wiesner, S.A., Wuest, T.	2017	International Journal of Automation Technology 11(1), pp. 4-16	327
The servitization of manufacturing: A systematic literature review of interdependent trends	Lightfoot, H., Baines, T., Smart, P.	2013	International Journal of Operations and Production Management 33(11), pp. 1408-1434	213
Product service system: A conceptual framework from a systematic review	Annarelli, A., Battistella, C., Nonino, F.	2016	Journal of Cleaner Production 139, pp. 1011-1032	132

Servitization and remote monitoring technology: A literature review and research agenda	Grubic, T.	2014	Journal of Manufacturing Technology Management 25(1),17103630, pp. 100-124	70
Structuring servitization-related research	Rabetino, R., Harmsen, W., Kohtamäki, M., Sihvonen, J.	2018	International Journal of Operations and Production Management 38(2), pp. 350-371	63
Reversed servitization paths: A case analysis of two manufacturers	Finne, M., Brax, S., Holmström, J.	2013	Service Business 7(4), pp. 513-537	52
Challenges of servitization: A systematic literature review	Zhang, W., Banerji, S.	2017	Industrial Marketing Management 65, pp. 217-227	51
Servitization: A contemporary thematic review of four major research streams	Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J., Gebauer, H.	2019	Industrial Marketing Management 83, pp. 207-223	45
A survey of smart product-service systems: Key aspects, challenges and future perspectives	Zheng, P., Wang, Z., Chen, C.-H., Pheng Khoo, L.	2019	Advanced Engineering Informatics 42,100973	38

Tab. 2 Literature review references

In addition, another important paper was considered for the study. It is the work provided by Sandra Vandermerwe and Juan Rada. The title of the document is “Servitization of Business: Adding Value by Adding Services” and it is particularly relevant because it has been cited in all the review above mentioned. This document, from 1988, is considered as the first reference of literature about servitization.

Looking at the last column of the table, where the number of citations has been written, it is possible to see big differences in the numbers. More precisely the first reviews of the table have been cited much more than the ones closing the table. For this particular reason, it has been arbitrarily decided to focus the attention only on the 10 most cited. Going further and increasing the number of reviews analysed would not probably have brought any tangible additional benefit.

The first step is to find a proper definition of servitization. The concept has been reprised by many authors in different times. The following table is going to illustrate how the concept of servitization is conceived by various sources. The table has been extracted from the work of Baines, T.S., Lightfoot, H.W., Benedettini, O., Kay, J.M. entitled "The servitization of manufacturing: A review of literature and reflection on future challenges".

Authors	Definition of servitization
Vandermerwe and Rada (1988)	"Market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service and knowledge"
Desmet et al. (2003)	"A trend in which manufacturing firms adopt more and more service components in their offerings
Tellus Institute (1999)	"The emergence of product-based services which blur the distinction between manufacturing and traditional service sector activities"
Verstrepen and van Den Berg (1999)	"Adding extra service components to core products"
Robinson et al. (2002)	"An integrated bundle of both goods and services"
Lewis et al. (2004)	"Any strategy that seeks to change the way in which a product functionality is delivered to its markets"
Ward and Graves (2005)	"Increasing the range of services offered by a manufacturer"
Ren and Gregory (2007)	"A change process where in manufacturing companies embrace service orientation and/or develop more and better services, with the aim to satisfy customer's needs, achieve competitive advantages and enhance firm performance"

Tab. 3 Definitions of servitization

The definitions just presented have been considered all relevant. They all provide different points of view about this topic, trying to synthetize in a sentence the essence of servitization. From the table above several different definition emerged but some points in common can be found. The common line among all of them is the will of companies to not limit their offer to

the mere physical product. The focus of the research is on manufacturing but servitization can be broad and potentially successful in various sectors. More in detail, all the efforts of the managers in a precedent stage were aimed at producing and selling the best possible product. The evolution comes with servitization where the product itself is no more the only concerns of companies. By doing this, companies have changed due to the understanding of the importance of adding something more to the offer. In this direction the broad concept of service-solution can help manufacturing firms in their path of continuous improvement.

The following step, after having understood the need for companies to rely also on services in their activities, is to investigate about the proper definition of these. The explanation of service revolves around the concept of tangibility. The action of providing services to customer can be considered as an "economic activity that does not result in ownership of a tangible asset" (T.S. Baines, H.W. Lightfoot, O. Benedettini and J.M. Kay). This definition is extensive, but it conveys the message that distinguish the act of implementing services from the act of selling physical products. The addition which can be made to be more precise is that service must be considered as an economic activity with the purpose of generating value. In this way the final aim of services and product is the same, the difference relies in the way the two are carried out. On this regard, S. Vandermerwe and J. Rada affirms that services are performed and not produced and that they are essentially intangibles.

What emerged from the research is that services and products in manufacturing coexists and the relationships between the two is of mutual dependency. The two concepts mix together and bring to the birth of servitization. On this regard, a concept necessary to be introduced is the one of product service system (PSS). The meaning of product service system is very similar to the one of servitization and it is reprised by many studies and reviews. Essentially it can be said that the concept at their bases is the same. The definition that has been taken as a reference is the one stated by Baines et al, in 2007 which says that a Product Service Systems is a market proposition that extends the traditional functionality of a product by incorporating additional services. Given that in manufacturing services and products exist side by side, the company only providing services have not been taken into account because considered out of scope.

Now that the coexistence of service and product have been highlighted, it is necessary to point out that it has not always been like this. In the past the situation was different from the one just described. The evolutionary path, as proposed by S. Vandermerwe and J. Rada in their research, is particularly relevant and is now going to be discussed. The first stage consisted in a clear distinction between goods and services. The managers affirmed to be placed into one

or other camp. In a following moment, stage 2 has seen the convergence of the concepts also favoured by technological advancement. It emerged the need for manufacturing companies to sell both product and service. The idea of “inseparability of goods and services” was shared amongst the majority. The third and last stage proposed by literature is the further improvement of the second stage. The offer is pervasive and complete, the manufacturers have established a strong relationship with the consumer, which goes further than the single sale of product or provision of a service. Finally, the producer is closer than ever to the customer and can offer support and knowledge to create a higher value for both parties. These three successive stages clearly illustrate the evolution of the manufacturing industry and how this affected the way business is carried out.

The servitization can be considered for all intents as a business model. The shift from traditional business model to new and more and more innovative comes with time and it is justified by the presence of growing opportunities. These are going to be described in detail later. What is important to underline is that marrying the servitization paradigm comports many changes in the way activities are managed. To embrace the service orientation business model, it is necessary to understand the huge impact it can have not only on the manufacturers, but on the way business relationships are established among players belonging to the industry.

After having showed how servitization entails a business model shift, it is necessary to underline the implication of this change. More in detail, the perspective of tangible benefits is what pushes companies in this evolution, but as often happens, possible improvements come with potential threats. An analysis of the benefit is now going to be proposed, referring to the list presented by Alessandro Annarelli, Cinzia Battistella and Fabio Nonino in 2016:

- Differentiation: having an appealing proposal can help the single producer to distinguish a product or service from other similar product or service offered by the competitors in the market. In this way the goal for the seller should be to innovate its offer to make it inimitable for competitors. This is going to have a double positive effect. In fact, differentiating the offer can be utilized to obtain a higher value from customers but it can also help in creating barriers against competitor and locking them out. As the degree of personalization increase so does the importance of differentiation.

- Lock in customers: customers are locked into manufacturer's world constituted of product and services. The option of switching to another provider comes with additional costs, so it is economically not convenient. Wise and Baumgartner (1999) affirm that "in the new world of manufacturing, the sturdiest barrier to competition is customer alliance. The goal is not necessarily to gain the largest share of customers but to gain the strongest relationship with the most profitable customers". In this context, locking in customers represent a strategy to avoid losing clients to competitors. The parameters about customer loyalty are something to be assessed frequently and the renewal of a service after the first subscription is helping in the enhancement of customer retention.

- Market opportunities: the servitization approach can lead to gain a larger share of customer base. This will bring to a significant revenue increase even if this is not the only way to boost sales. The other possibility relies in selling more product and services to the customer already belonging to the existing customer base. In this way, once again, it is important to underline the mutual dependency of goods and services. The selling of one could have a positive impact on the selling of the other. According to literature, the sales margins for services are assumed to be higher and/or revenue streams more stable than for products (Oliva and Kallenberg 2003; Auramo and Ala-Risku 2005). Furthermore, as stated by Cohen et al. in 2006, services may require fewer assets than physical products and increasing sales by adding services should be considerably cheaper than finding new customers for existing products, yielding another cost advantage.

- Reduce environmental impact: "Servitization and Product Service System are conceived and designed so as to prolong products' life cycle and utility, in order to allow a better exploitation of resources and less waste production" (Cook et al., 2006; Armstrong et al., 2015). In this way it is possible to preserve the environment with the aim of a more sustainable production process. Such perspective can also result in a direct benefit for the producer for what it concerns reuse and recycling policies. The manufacturer, in fact, can recover used components and parts which is for sure convenient than producing entirely new ones. This could lead also to a positive reputational effect on the company's image.

- Consumption reduction: similarly to what stated above, the delivery of services can help the optimization of machine efficiency. In this way the inputs utilized in the process would be used at their best potentiality without incurring in wastes.

- Production efficiency: efficiency is one of the key parameters when talking about operation department and some services, such as remote monitoring, can help to increase productivity at its maximum level.

- Customer engagement: the relationship with customers is a key success factor for manufacturers. With servitization the distance between the two parties, producer and client, is reduced to the minimum. The establishment of a solid relationship brings many benefits. The machine's producer can get access to customer data and understand how to improve its product. In the same way, being constantly close to the customer offers the possibility to understand the client's needs as soon as they arise and sometimes even before they realize. In addition, frequent interaction can bring to increase the level of mutual trust with consequent benefit on loyalty. From cooperation it also possible to develop new form of innovation both for products and services.

It is now opportune to proceed with the following logical step which consists of highlighting the possible barrier or threat that are important to consider when dealing with the implementation of a service-oriented business model:

- Economic convenience: Fang et al. (2008) have identified a circumstance where servitization negatively affects company value. In fact, if critical mass of service sales is not reached, services are not related to manufacturer's core business and available service resources are very few and not profitable. Of course, it is not possible to know in advance for sure if the service proposed will have enough success amongst customer to reach the critical mass. For this specific reason companies producing machinery and equipment should be as accurate as possible during sales forecast and service design phases.

- Relevant investments: strongly linked with the above mentioned threat, the initial investment should be carefully considered. The introduction of a new service in the catalogue requires investments to be assessed. Considering the continuous

technological development, if a firm wants to constantly be on the cutting-edge, it must be able to sustain important investment also for research and development after the service is already established.

- Manufacturers' organizational change: as mentioned in the precedent paragraph, fully embracing servitization inside the boundaries of a company is not an easy task. It requires in fact a radical change in the organizational structure. This will lead to a new mentality necessary to conduct business. Gebauer et al. (2010a) as well as Raddats and Burton (2011) argues for the need to align organizational design with service strategy. From the literature it emerged that servitization has been a trend in the last decade. Here comes the risk of wanting to join the service delivery world without having the right competencies. These are all risks that must be assessed before developing servitization.

- Customers' acceptance: finally, it would be wrong to automatically assume that the customer is going to eagerly accept the service proposal. It is necessary a shift in the mentality also for what it concerns the client's part. The change can happen only if the buyer sees concrete benefits and chances for improvement in the offer. Not all the customers are willing to share their data with the producer, but transparency is a prerequisite for the provision of some services (i.e. remote monitoring). The machine's manufacturer has got the task to convince the customer by pinpointing the benefits for both parties and building mutual trust.

The literature review here proposed has started with definitions and related meaning of servitization. Then the evolution of the concept through the years has been showed. To conclude the portrait of servitization according to literature the benefits and barriers have been highlighted. It is now possible to proceed with the report having a clear picture of the fundamental concept that are going to be treated.

3) OBJECTIVES AND RESEARCH METHODOLOGY

3.1) Research deployment

The report consists of an investigation about the always arising tendency of offering service in the machinery industry. Companies, exploiting some technological features from Industry 4.0, can now offer services more and more personalized to satisfy the customer. The concept just mentioned is to be considered wide and in continuous progress. The approach followed has started from the description of the general framework and then has evolved in the study of a subset of companies.

The six consecutive steps on which the research is built are schematized in the following table and then discussed more deeply.

The table below has the aim to explore them in detail:

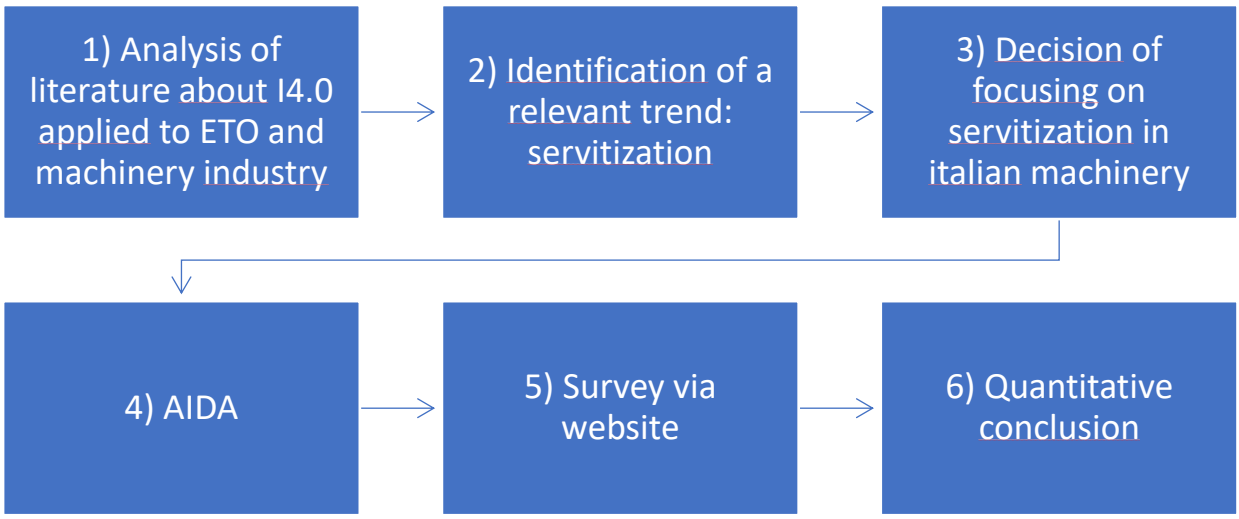

Fig. 3 Research deployment

1) The starting point was the investigation of literature for what concerns the themes of industry 4.0 regarding in particular the ETO fulfilment strategy and machinery industry. In tab. 4 the sources exploited have been highlighted. Particularly relevant for the effectiveness of the research has been the construction of the query to insert in the search engine. Next to the sources utilized the key words have been listed. Sometimes

the single key word was sufficient for the purpose of the report (for instance when it was necessary to investigate the meaning of a concept or the extant knowledge of a topic), sometimes the key words have been combined to explore the implication between two concepts.

2) From the previous step some recurrent pattern emerged, the most relevant and shared across the many author encountered was servitization. The knowledge about how important services can be is not limited to the industry investigated in this report, but is something shared also by sectors which do not operate following the ETO fulfilment strategy.

Sources	Key words
Scopus	Servitization, Product Service System
Google scholar	Machinery
General secondary sources (i.e. literature review, scientific papers)	ETO
	I4.0

Tab. 4 Sources and key words

3) The concept of servitization is very broad and the direction chosen was to concentrate the attention on the Italian machinery industry. The importance of this sector has already been emphasised in the introductory part. The novelty relies in the application of new technologies in this field because it can bring to new changes not only in product's production but also in how business is carried on.

4) To pursue the secondary sources analysis, it has been revealed necessary to rely on a structured and exhaustive database. The chosen one was AIDA (Analisi Informatizzata Delle Aziende Italiane). AIDA collects comprehensive information of companies in Italy, with a history of up to ten years. It allows to search for individual companies, companies with similar profiles and perform detailed analyzes. For what it concerns coverage, on Aida it is possible to find information on the Italian companies obliged to file the financial statements, reaching the amount of about one million companies. This portal also offers some features particularly useful for the purpose of the research.

One of these consists in the possibility of listing the companies according to the ATECO code, fundamental to group all the companies belonging to machinery sector in Italy. It is also possible to sort the firms looking at the revenues.

5) From AIDA database it was possible to go back to the website of each company. The research continues with the inspection of every single website, with the aim of gathering as much information as possible about the themes emerged in step 1 and 2. More precisely the objective was to understand the range of service offered by each company.

6) All the information collected in the previous steps has been categorized in a table with the aim of reaching an overview on the current situation of the Italian machinery industry. The purpose of this table was to start from some qualitative information and develop them to obtain numerical results.

3.2) Creation of the table

All the data gathered have been inserted step by step to fill in the following table, that is now going to be explained in detail.

	Company 1	**Company 2**	**…**	**Company n**
Service 1				
Service 2				
…				
Service n				

Tab. 5 Layout

On the rows all the services have been listed. The list of services has been built starting from the reference provided by Federico Adrodegari, Andrea Bacchetti, Nicola Saccani, Aitor Arnaiz and Thomas Meiren in their research article called “The transition towards service-oriented business models: A European survey on capital goods manufacturers”. The purpose of this list is to be as exhaustive as possible, in fact it would not have been correct to miss some service offered. For this reason, the list has been integrated with new types of service encountered during the path. It is important to underline that if a company offered a particular service which was not present on the original list, this one has been added. Operating in this way it is safe to say that the list is complete and adequate to describe all the possible solution offered to the client. On some occasion a particular version of the service, only if relevant, has been unbundled from the general family to which it belonged. This has been done to underline the specificity of the particular service that differentiates it from the similar ones. The final result is comprehensive of all possible services proposed because it has been built starting from a theoretical framework which has been step by step enriched with empirical findings coming from reality.

On the columns it is possible to read all the companies whose have been studied. Here the list of criteria utilized to choose the companies is proposed.

a) Among all the Italian companies, the interest was only about the ones operating in the machinery sector and for this particular circumstance a specific filter has been used to keep only the companies corresponding to the ATECO code of interest. The ATECO code is used by the Italian Chambers of Commerce to identify the production sectors. The code chosen was 28.4 that corresponds to the manufacturing of machine tools for forming metals and of other machine tools.

b) The second step was to sort the companies according to the revenue of last year, 2019 for instance. The revenue was considered as an indicator of the dimension of the company in line with the following sentence: the higher the revenue the bigger the company.

c) Last step was to determine the dimension of the sample to analyse. The total of the companies was 2350 which is a huge number considering that the aim is to investigate in detail the website of each one. The choice was to analyse the first 100 Italian company with the higher revenue.

After having described the column and rows the next step was to complete the table. For each cell it has been inserted either a 0 or a 1.

0 – the company does not offer the selected service.

1 – the company offers the selected service.

At the end of this laborious process, the result obtained consisted of a big table depicting the situation of the one hundred more relevant Italian companies showing the portfolio of services offered to clients.

4) FINDINGS

4.1) Table

Here the table only theoretically described before will be shown. It has been divided into 4 pages purely for a matter of dimension. To obtain a clearer visual impact, the cells containing the number 1, meaning that specific company offers the service, have been coloured with green, while the cells containing a 0 are red since those companies do not offer the service.

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	1
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	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
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97	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	1
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99	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	1	1	1	1	1	1	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0

Tab.6 Output

4.2) How to read the table

The final table here reported has been slightly modified always with the intention of making it more comprehensible to the reader. As already mentioned, on the rows the companies have been listed with an increasing number from one to one hundred (i.e. number 1 stands for the highest revenue company in Italy operating in the machinery sector, for instance Biesse S.P.A).

The full list of companies with the name, size in term of revenue and respective website will not be provided here but in the attachments at the end of the report.

More relevant to the purpose of this study is the list of the services. In the table it is possible to find them on the columns where each letter is associated to a service. Here the full list is proposed and then every single service will be described to highlight its relevancy.

a	Documentation
b	Repair
c	Spare parts
d	Basic training
e	Advances training
f	Maintenance contracts
g	Predictive maintenance
h	Optimization of customer processes
i	Product mechanical, hardware and/or software upgrade
j	Warranty extensions
k	Product mechanical , hardware and/or software retrofit
l	Product remote monitoring
m	Product remote diagnosis
n	Remote troubleshooting
o	technical assistance
p	24/7 technical assistance
q	Financial services
r	Consultancy services (not related to your product enabled processes)
s	Second-hand products
t	Relocation
u	Leasing services
v	Rental services
w	Product disposal

Tab. 7 List of services

4.3) Description of the services

After having seen the full list of services available on the market, it is now necessary to understand what they consist of. The description will be a combination of the information found on the websites of the different companies. During this research it has been noted how it is common behaviour of the firm, when providing a service, to describe it and show the potential benefit or relevance that it entails for the customer.

- Documentation: the capability of providing to the customer detailed information about the correct functioning of the machine. More complete documentation offers knowledge about maintenance operation, need of spare parts and respect of the standards. When documentation is not complete, or a customer does not understand the machinery, issues could arise. Since in most of the cases machines represent a very expensive investment, ensuring that the documentation is in order and complete ahead of time is common practice.

- Repair: this service is fundamental when breakdowns on machines occur because, thanks to a timely intervention, it is possible to restore the machine to its full potential. More in detail, when needed, the producer of the machine sends its competent workforce on-site to solve the problem. It is important that the stepping in is immediate and effective. Every second the machine is not working the customer is potentially losing money due to productivity decrease so it is necessary to be as reactive as possible.

- Spare parts: this service's object is to provide the customer with new pieces for the machine when needed. Spare parts are parts that you can buy separately to replace worn out or broken parts in a piece of equipment. This represent a recurring theme in the machinery sector since it is certain that sooner or later every machine will need some spare parts. The evaluation of the goodness of this service mainly depends on the quality of the spare parts, often dependent on their originality, and on the speed with which the order is processed. Some excellent companies in this field have developed an innovative conception of the spare parts service leveraging on technology to obtain a continuous connection. For instance, Biesse S.P.A. in collaboration with Intermac has built a portal for the order. When the need of a new part arises, it is possible to access to the web portal available 24/7 via application through a mobile phone, tablet, or computer. Then it is possible to proceed with the interactive search of spare parts, navigate through the machine's diagrams and BOM (Bill Of Material) and finally complete the order request submitting to the supplier. Another company, SCM group S.P.A. offers the possibility to subscribe a contract which comprehends the spare parts replacement. More precisely they provide the access to

a spare parts warehouse that allows maximum speed of supply and advantageous purchasing conditions.

- Basic training: this service consists in teaching to the customer's employees how to properly use the machines. The documentation provided might be not sufficient considering the level of complexity of the machines, this justifies the need of training. The courses offered focus on the use of the machine in combination with its software and maintenance at a primary stage.

- Advanced training: this service is the evolution of the previously described basic training. It emerged that, given the always arising importance of training, some companies are proposing a more complete and advanced education for their customer. This might include:

    - a higher level of detail and variety about topics to promote an understanding of interrelations as well as independent, target-oriented thinking.
    - possibility of delivering refresher courses to master potential new functionalities of machines.
    - providing courses on customer's site if preferrable or in the supplier's location perfectly equipped with all the suitable tools.
    - offering training courses in various languages and in small groups of people to maximize the effectiveness of learning.
    - training offer available in different ways: classroom, e-learning, webinar.

- Maintenance contracts: it is defined as the contract between the suppliers and the customer which creates the agreement that one party will maintain an asset owned by the other party. Maintenance operation are carried out periodically and have the goal to keep the machine in perfect condition limiting downtimes and the respective slowdown in the production.

- Predictive maintenance: as happened for basic and advanced training, predictive maintenance can be considered as the progression of the more elementary service of

maintenance, with some relevant novelty. The operations of maintenance as intended nowadays are also known as preventive maintenance but hereafter the three types of delivering maintenance operation are confronted in detail:

- Reactive maintenance can be considered as repair operation which occurs only when a piece of machinery breaks down. Nowadays it is an obsolete way of operating.
- Preventive maintenance, as said, is the standard for the basic service. The interventions are scheduled periodically whether or not the upkeep is actually needed. Preventive maintenance is designed to keep parts in a good health but does not consider the state of a component or process. During the maintenance operation the machine is not producing items so the overall capacity decreases, but it is still preferrable than random and unplanned downtime with the reactive maintenance approach.
- Predictive maintenance follows a different approach intervening only when needed, drawing on real-time collection and analysis of machine operation data to identify issues at the nascent stage before they can interrupt production. The strength of the predictive approach is built around its proactivity which offers the possibility to anticipate the arising of a problem. This is possible leveraging on the innovative technologies of I4.0 allowing interconnected measurement and data collection as well as tools and personnel to analyse the data. According to McKinsey Global Institute, the implementation of these new maintenance practices will have a 240-627 dollar billion cost savings across on the manufacturing industry, despite its greater complexity. On its website, Biesse S.P.A. affirms it is using predictive maintenance to reduce labour costs and improve customer service, expanding their after-market business.

- Optimization of customer processes: the aim of this service is to reach the highest level of productivity as a result of the optimum use of available machines. To make the process as smooth as possible data gathering is fundamental and once again this is made possible by a set of sensors installed on the machines. When the data will be available, the supplier of the service will be able to critically analyse them and suggest improvement for the whole process. Emag Milano S.R.L. declares on his website that

there are reasons for losses in productivity, such as long retooling times or the non-perfect use of the available options. This results in potentials that can be utilized and so they offer support to the customer in the optimization of their production processes.

- Product mechanical, hardware and/or software upgrade: this service is immediate to describe. As time passes the technology advances and both the hardware and the software get better. The possibility to exploit new technology to achieve better performances thanks to technology improvement is nowadays something that service providers are used to propose.

- Warranty extensions: the purchase of an industrial machine comes with a warranty, but this normally lasts only for a predetermined period. The lengthening of coverage by warranty is a service agreement provided only by some companies. Usually, the terms and conditions for the extension are different and comes at a cost because the condition of the machine has been worsened by the flow of time.

- Product mechanical, hardware and/or software retrofit: the boundaries between retrofit and upgrade is thin. As previously discussed, upgrade has to do with raising to a higher standard or grade if compared to the earlier version. Retrofit operations, as described on EMAG Milano S.R.L. website, regard used machines, or machines already in customer's line-up which are precisely overhauled, modernized, and perfected in every way. In conclusion retrofit consists of adding a component or accessory to a machine that did not have it originally.

- Product remote monitoring: once the data coming from the machines are gathered, they are shared automatically through the cloud and so they become accessible everywhere and at any second. In his literature review "Servitization and remote monitoring technology", Toni Grubic in 2012 affirmed that the key principle behind remote monitoring technology is a combination of software and hardware technologies which enable remote collection of data about the performance and usage of a product in the field to determine its current and predicted condition and health. The relevancy of this practice can be found in the importance of having all the process'

parameter under control. Starting from here analytics can be developed and decisions made as well. Remote monitoring is one of the fundamental building blocks for predictive maintenance operation. The benefits are to be shared between producer and customer. On one side the customer transfers the risk of underperforming onto the producer, who is in charge of monitoring the machinery to get the best performance possible. The approach can vary from a more standard reactive one to a more innovative proactive one. The latter can help the manufacturer into delivering always improved and attractive value proposition for the client. Another potentiality offered by remote monitoring is the possibility of getting full access to customer data regarding machines' performances. In this way the producer has the possibility not only to understand insights about customer's needs, but can also receive interesting feedback to be used for research and development. Operating like this creates a virtuous cycle in which companies see the continuous growth of their learning capability and knowledge creation. Once again Biesse S.P.A. is a leading company in the Italian machinery sector and has built a software called IoT – SOPHIA which offers maximum visibility of the specific performance of the machines.

- Product remote diagnosis: this can be considered as the following step of the previously described service. Monitoring in fact sometimes could not be satisfying enough. With the purpose of further increasing the quality of the service, remote diagnosis has been introduced. With remote diagnosis machinery producers are now able to understand why a failure happened and they can be more effective in a timely manner and efficient as regards physical inspection's cost avoiding.

- Remote troubleshooting: can be considered as the final stage of monitoring and diagnosis. Following a logical approach, once the problem on the machine has been identified, it is reasonable to think that the operator wants to resolve it in the best way. For this particular reason remote troubleshooting has been developed. More in detail an operator from the supplier's site can drive the technician on customer's site to address the failures of the machine and restore the working condition. This activity can be enhanced by technologies belonging to I4.0 world. SCM GROUP S.P.A. has developed Maestro Smartech, a solution that allows for an augmented reality connection between the customer's operator and the SCM Service. Through a pair of Smart Glasses and a specific management software, the SCM experts can diagnose and

solve problems in real time, using various transmission channels at the same time (voice, video, audio). Again, it is important so underline the novelty and advantage that can arise from carrying out these activities in remote mode.

- Technical assistance: this comprehends a set of services. The list can be wide and diversified but the general purpose is to stay as close as possible to the customer trying to intercept its needs. Among the different companies consulted these are the most relevant technical support operation provided (some of them, i.e. maintenance have already been deeply described in this report):

    - Installation and start-up for new machines.
    - Service hotline, to maintain direct contact with the customers for every inconvenience.
    - Inspection planned during period of slow production to be sure everything it's working at its best condition.
    - Maintenance.
    - Balancing. From Emag website: In recent years, requirements for machine tools have increased in order to achieve higher machining capacity and increase efficiency. With this increase, the requirements for spindles, tools and workpiece holders have also become more stringent. If unbalanced, the effects are detrimental, especially at increased speeds. This example shows the variety of operation that a machine needs to run smoothly and how important it is a long-lasting relationship between producer and customer.
    - Replacing modules
    - Standard monitoring, the supplier control that the machines of the customer respect the standard imposed by the law and when needed (i.e. after certain period a particular machine could be not safe anymore) alert them.

- 24/7 technical assistance: this offer comprehends the same services listed above but always made available to the customer to bring to the minimum the loss of productivity. This further distinction was created considering that the companies offering technical assistance 24/7 repeatedly refer to this proposal on their website. This can lead to think how important it is for them to offer such a service to

differentiate themselves from competitors. In this case the full availability could help the company to distinguish in the industry. Biesse S.P.A. offers 24/7 operations both on-site and on-line, with support provided to key customers by dedicated Biesse staff on site and at customer facilities.

- Financial services: when a company offers financial services, it means it is possible for the client to get access to more comfortable payment method than payment in a unique solution. High revenue machinery companies nowadays are used to offer a 0% interest rate on a monthly rate. This could represent an advantage for the buyer who does not want to spend a big amount of money in one initial solution. A more developed proposal is the one made by Biesse S.P.A., which revolves around the innovative Italian industrial politics called Transizione 4.0. for 2021. The company offers a minimum recover of 60% of the investment with tax credit to use within 3 years. Financial services offering can be wide and it emerged from the websites the possibility of providing tailored made agreements for each customer.

- Consultancy services (not related to producer's product enabled processes): some companies, especially the big ones and the ones that have been in the machinery sector for many years, have accumulated a well-structured level knowledge about industrial reality. With consultancy services the competent producer will help the customer in designing and implementing best practices in his company. The approach is holistic and evaluates not only the machinery present on the shop floor but all the interaction happening in the operation department.

- Second-hand products: Buying a new machine at a full price is not always the only option. ADIGE S.P.A for example sells used and refurbished machines. They sustain that with used and refurbished machines the client will gain productivity, quality and performance at an economical price. Their used systems are entirely refurbished, guaranteed and equipped with new, genuine spare parts.

- Relocation: this service regards logistic operation carried out when it is necessary to move machinery. The machines' producer can directly provide logistic operation or outsource it to a specific company such as SCHOLPP S.P.A., which has more than 50

years of experience in this field, is used to do. Moving, relocating, positioning and hauling heavy duty systems and industrial equipment requires a highly experienced, resourceful and skilled approach only achieved by professional companies.

- Leasing services: the financing leasing is a contract occurring between two parties, the lessee and lessor. The lessee is the user of the machine, while the lessor is the producer. The lessee can use the asset for a specific period, making periodic payment to the lessors. At the end of the period the lessee can decide to keep the industrial machine and take the ownership or give it back to the lessor. Usually, the leasing entails the payment of an initial fee. The advantage here for the acquirer is that he does not have to sustain a big initial investment, but if it considers the machine to be worthy it has the possibility to acquire full ownership in a second moment. Many commercial equipment leases also include service agreements or service add-ons, which offer peace of mind for business users and negate the need for in-house technicians.

- Rental services: the customer will not buy the asset but will pay a fee for a period (which could be more or less extended depending on the supplier). The customer will be able to use the machine for the whole duration of the agreement and then will return it to the producer.

- Product disposal: similarly to relocation, when a machine is not able anymore to work properly it must be removed and correctly transferred. This solution is necessary only when operation of repair or retrofit/upgrade would be useless. The disposal must respect the rules imposed to preserve the environment, so it is advantageous for the customer if this whole process is carried out by a more informed player such as the machinery provider.

4.4) Analysis of the sample

All the data gathered from the search engine AIDA have led to the possibility of describing the set of company taken into consideration. The detailed analysis is performed through some information that could be useful to comprehend how the sector in Italy is structured.

- Business: first step to illustrate is the activity in which the companies analysed are involved. As already mentioned in the paragraph 4.2, all the firms taken into consideration belongs to the category defined by the ATECO code 28.4. This code has been chosen because it has been deemed as the most suitable to identify the companies subject of this study. The nomenclature for this category states: manufacturing of machine tools for forming metals and of other machine tools. It is clear that the reference is the B2B world and that the products sold can be considered capital goods. The buyer will utilize the product, the machine for instance, in his internal operation to create, in turn, the outcome for the final client along the value chain. This distinction has been necessary because it justifies the need of personalization. The types of machines sold can be several, varying from being highly personalized (at the point of reaching the degree of being tailor made in accordance with the ETO fulfilment strategy) to having a lower level of customization. It is reasonable to suppose that the higher the complexity of the product and the higher the need of creating a personalized machine for the client. To conclude this topic, it has emerged that the general idea was for the single company to propose machines with both a low and high degree of personalization.

- Numerosity: the total amount of the companies presents in the category analysed on AIDA was of 2350. As said, this number is huge and it would have been extremely time consuming to go through the whole list. For this reason, it has been decided to consider the 100 firms with the highest revenue.

- Revenue: this was the fundamental parameter considered when sorting the companies. The assumption was that the higher the revenue the bigger the company. So, in the end, revenue was considered as the main indicator to assess the dimension of a firm.

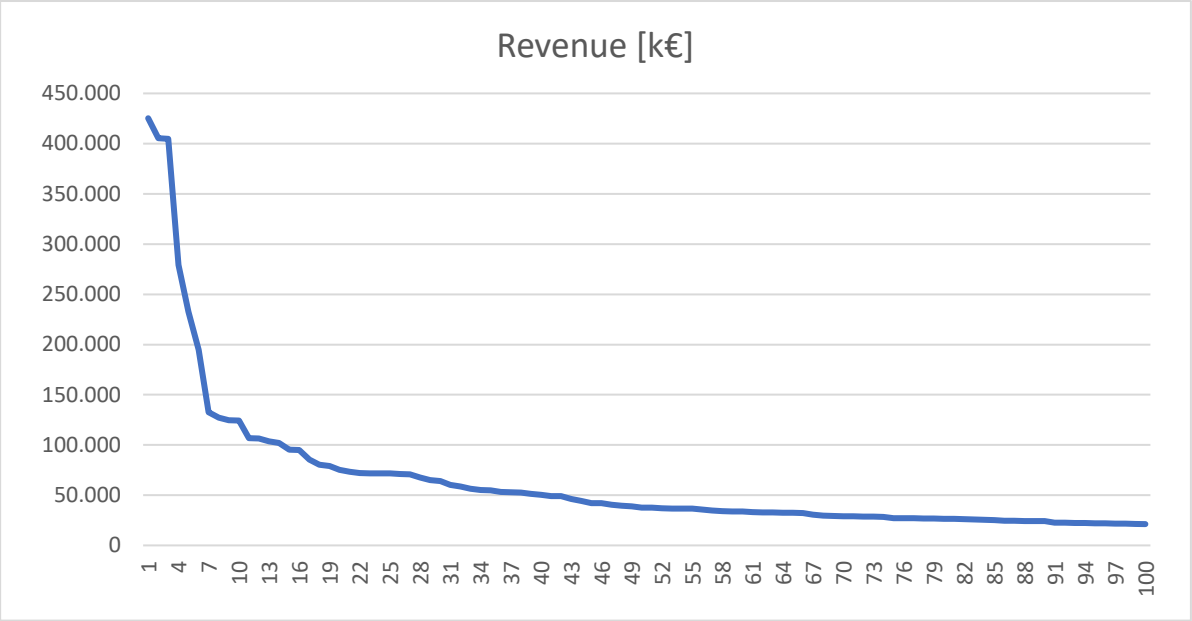

Fig. 4 Revenue graph

In the graph above it is possible to see the distribution of revenues for each company. The decreasing trend was obvious (the companies have been sorted according to a decreasing revenue value). Less obvious and interesting to be discovered was the huge step separating the biggest company from the vast majority. Looking at the data only the first three companies exceed the value of 400.000 k€. Then there is a big drop in revenue and the last company above the amount of 100.000 k€ is the 14th. This consideration will be used as a starting point for the critical discussion of the results. The tab with further data is presented below.

N. of companies	100
Average revenue [k€]	64.718
Highest [k€]	425.282
Lowest [k€]	21.208
Total sum [k€]	6.471.845

Tab. 8 Revenue analysis

- Profit: this data was provided by AIDA and combined with revenue could be useful to understand the margin of each company. The profitability has not been taken into consideration when sorting the company but could anyway provide an idea about the value creation in the industry.

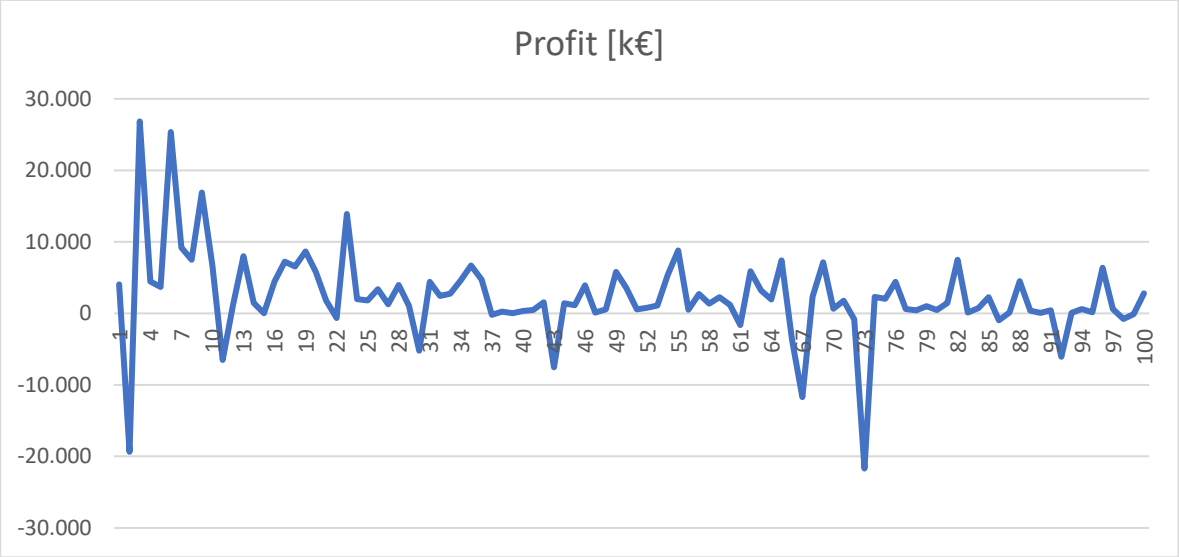

Fig. 5 Profit graph

Profitability offers a completely different approach. The shape of the graph is clearly different from the one illustrating the revenue and the trend is not uniform as seen in the previous case. The data say that out of the one hundred companies analysed, 85 of them have made a profit, while the remaining 15 have registered a loss in the year 2019. The following table lists the average profit, the highest and the lowest profit/loss obtained.

N. of companies	100
Average profit [k€]	2.294
Highest [k€]	26.838
Lowest [k€]	-21.690

Tab. 9 Profit analysis

It has been considered wise to introduce a further indicator to better characterize the sample. This proxy is the profit margin which is the simple ratio between the profit/loss and the revenue of each company. The value has been expressed in percentage and it basically shows how many cents of profit has been generated for each single euro of revenue.

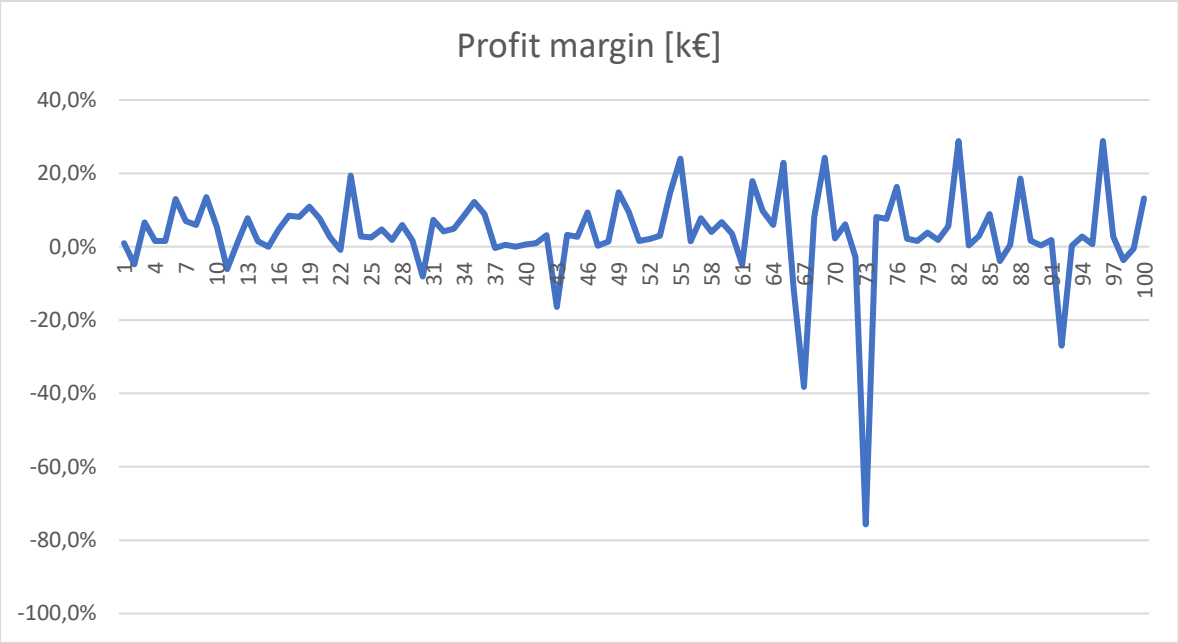

Fig. 6 Profit margin graph

Also in this occasion a synthetic table has been proposed.

N. of companies	100
Average profit margin [k€]	3,6%
Highest [k€]	28,8%
Lowest [k€]	-75,7%

Tab. 10 Profit margin analysis

- Geographic coverage: the analyses boundaries are limited to the Italian territory. Another information that has been founded on the research engine was the geographic location of the companies. Hereafter a table with the number of companies for region has been created in combination with a clear graphical representation.

Lombardia	40
Veneto	19
Emilia Romagna	15
Piemonte	14
Trentino Alto Adige	3
Marche	3
Toscana	2
Friuli Venezia Giulia	1
Umbria	1
Lazio	1
Campania	1
	100

Fig. 7 Geographic coverage

From the picture it is possible to obtain the confirmation about the fact that the majority of the companies is concentrated in the north of Italy with some region such as Lombardia, Veneto, Emilia Romagna and Piemonte leading in this chart.

5) DISCUSSION

5.1) Categorization of the services

The first step in the analysis of the services has been trying to group them into distinct categories. This has been done with the particular purpose of illustrating some similarities. At first the idea was to re-organize the services into clusters according to the product lifecycle. This proposal entailed the machine pre-setting, then the support in the operation department and last end of life of the machine. This classification, even if logically appropriate, has not been considered suitable. This is attributable to the fact that of the 23 services identified, 20 belonged to the operation department categories, while only 3 services lasted to be divided into the other categories. Seen that the categorization based on the different step of the product life was discarded, a new one has been proposed. It comprehends 5 categories in which services with similarities have been grouped. The clusters are:

- Installation
- Operational improvements
- Maintenance
- Logistics
- Financial options

It is appropriate to underline how the classification has some points in common with the previously proposed classification which was oriented on the product lifecycle.
The necessity to group the services in categories is going to be better understood in the following chapter when it will be discussed about the diffusion of the services. Only then it will be clear how some services can now be considered as standard and adopted by most of the companies while others are, at least at the moment, not at all spread among machinery providers.
The following image sum up the categorization.

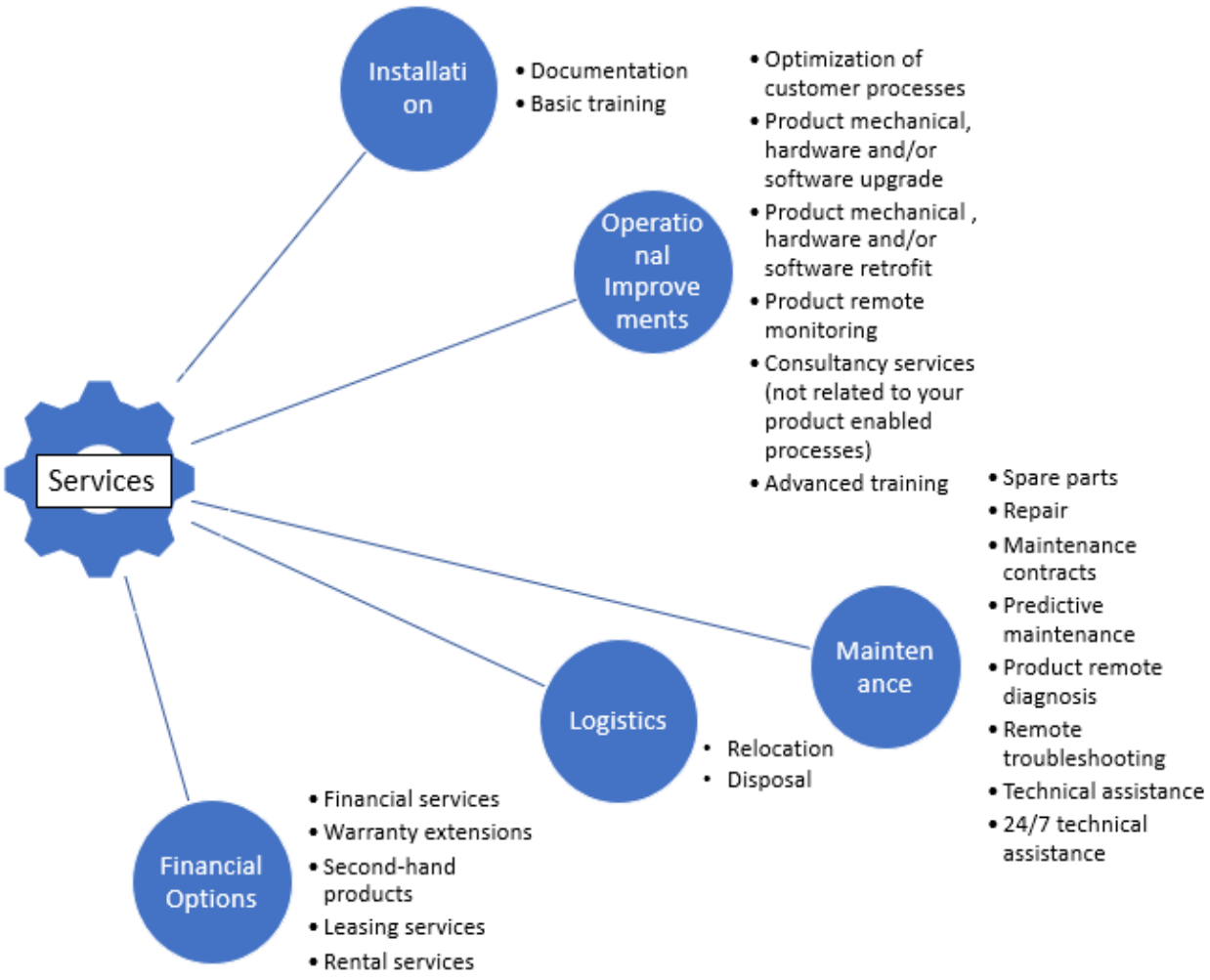

Fig. 8 Classification of services

5.2) Diffusion of services

Starting from the data showed in the findings, some analyses have been carried out to raise the attention on some topics. At the beginning of the report the preliminary job was to obtain an exhaustive list of the service portfolio offering of all the companies. Relying on a theoretical list and integrating it with information coming from the reality can be considered an intelligent method, but even before beginning to assemble the list it has been clear that the service diffusion might have been not homogeneous. The table below illustrate the percentage of diffusion of each single service. The percentage has easily been computed operating the ratio between the number of times the specific service has been proposed by the companies and the total amount of company analyzed in the sample. The services are sorted according to the order in which they have been studied following the literature framework.

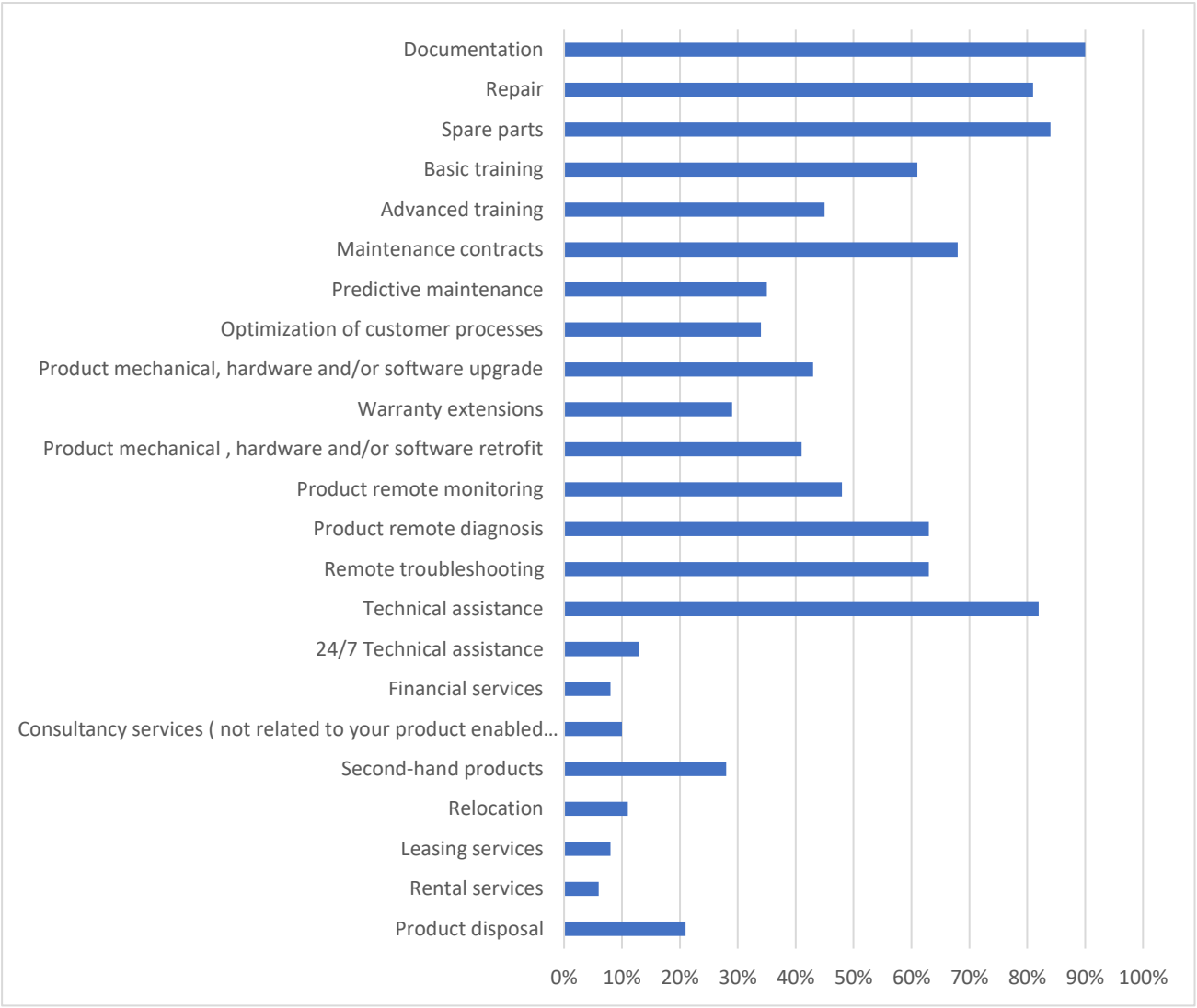

Fig. 9 Diffusion of services

Furthermore, the next table highlights the chart of the services offered with the relative percentage. The services have been sorted so that it is clear which are the most common and the ones not very spread. With the help of colours is possible to get the real diffusion of the service. More in detail:

- In green there are services which are proposed in more than 75% of the situation.
- In yellow it is possible to find the ones offered with a frequency between 25% and 75%.
- In red the services which can be considered as rare, with a percentage lower than 25%, have been highlighted.

Service	%
Documentation	90%
Spare parts	84%
Technical assistance	82%
Repair	81%
Maintenance contracts	68%
Remote troubleshooting	63%
Product remote diagnosis	63%
Basic training	61%
Product remote monitoring	48%
Advances training	45%
Product mechanical, hardware and/or software upgrade	43%
Product mechanical, hardware and/or software retrofit	41%
Predictive maintenance	35%
Optimization of customer processes	34%
Warranty extensions	29%
Second-hand products	28%
Product disposal	21%
24/7 technical assistance	13%
Relocation	11%
Consultancy services (not related to your product enabled processes)	10%
Leasing services	8%
Financial services	8%
Rental services	6%

Tab. 11 Services and their percentages

The highest positions of this chart are occupied by services that can be considered basic such as documentation, spare parts, technical assistance and repair. These services, if compared to the others in the list, entail a reduced level of complexity. The belief is that their percentages, which are still high, could have been closer to 100%. The data gathering phase has been processed with accuracy, nonetheless some limitations have raised by the fact of consulting only the websites of the companies. This is going to be discussed more in detail in the proper paragraph about limitations.

On the other side it appears that some services are embraced only by a small part of the machinery's sellers. The leading services in this category are rental, financial and leasing services. These services do not affect the functioning of the equipment but are addressed to the acquisition of it. On one hand the benefit coming from these services could be in terms of making the sale easier and so to ensure the revenue, on the other they could be a source of profit if the buyer will pay regularly interest on the finance plan.

It is possible to refer to the classification proposed in the paragraph 5.1 to understand which categories are more important for producers than others.

Installation	76%
Operational improvements	37%
Maintenance	61%
Logistics	16%
Financial options	16%

Tab. 12 Category's percentage

The evidence shows a clear difference between the different categories. It is possible to identify installation and maintenance as leaders among the others. The reason behind this result could be multiple. On one hand it can be hypothesizes that the most diffused services are the ones with a low degree of complexity. In this direction the possibility to provide the customer, for what it concerns installation, with documentation and basic training and to carry out some operation of maintenance, repair and spare parts substitution should not represent a problem for the machinery producer. But the correlation between simplicity and diffusion of a service is not enough to justify the data. A second fact that justifies the numbers obtained is the importance of the service. More in detail it is correct to affirm that the relevance of the services is not homogenous and some of them are necessary while others can be considered as enhancement and nice to have. The word necessary has been used to strongly underline the fact that those services must be present in one way or another. In absence of them the functioning of the machine would not be granted. There is a difference between services aiming at the optimization of the productivity and the ones without whom it wouldn't even be possible to start to produce the goods. Clear exponents of the necessary services are repair, maintenance and spare parts. The reason has its roots in the usury, which over time will damage the capital goods. After this consideration, a question could arise: why, given the necessity of these services, the percentage of proposal registered was not 100%? Why doesn't the totality of the companies offer these services to its customers? The answer relies in the fact that not all the companies are interested in offering the necessary service. The possible reason will be investigated in the following chapter but the fact that a company does not provide a necessary service does not mean that the customer's urgency will not be satisfied. The possible solution comprehends the involvement of a third-party company which might be specialized and available in service offering for the machinery sector.

The next category, the third in order of diffusion after installation and maintenance, is operational improvement. This category is composed by many services but the commonality among them relies in the objective. They are in fact services which are provided with the goal of trying to maximize productivity. They cannot be considered necessary because they are not involved in the functioning or not functioning of the equipment, but they can determine the success of a company. The well managed operational department works pursuing the maximum efficiency and effectiveness. In line with what has been just said it is clear the role of the operational improvement services. Once the machine is installed and can be considered as ready to work, the following step is the maximization of productivity. Along the value chain the machinery's producers want to be as close as possible to their customers, trying to intercept their needs as soon as they arise. It is safe to affirm that boosting the parameters above mentioned such as efficiency and effectiveness could lead the company to assume a competitive advantage in the industry. The merchant of industrial machine which can go further than the single sale of the product, providing in addiction useful services to push to the limit the performance is for sure appreciated by the market.

At last, it is possible to find the two category of less diffused services which are logistics and financial options. It has been considered appropriate to discuss them one by one since the only point in common is the extremely low percentage of 16% for both.
Logistics services are something which only rarely have been found on the website of the companies analysed. The supposition, once again, can be found in the customer's request. These services are probably not so appreciated to the customer's eyes which, in some cases, is probably able to accomplish them by himself.
The situation is different for what it concerns financial options. As already said these services are not directly related to the correct functioning of the machine but are more focused on the acquisition. It could be appreciated by the customer to choose among different payment solutions. More in detail it could also happen that a certain client might get access to a specific resource, a machine for instance, only if adopting rental or leasing services. In other situation second-hand products, at lower price, could result attractive for the buyer. As for logistic services, financial options come with two possibilities. The first entails a third-party contractor to cooperate with. Usually, it is a financial institution such as a bank and it is specialized in financial service providing. The second option does not need to rely on third player. It happens when the machinery provider is financially strong and can accept different payment option which could facilitate the customer.

To sum up the next graph shows synthetically the diffusion of services for each category based on the data provided in tab. 12.

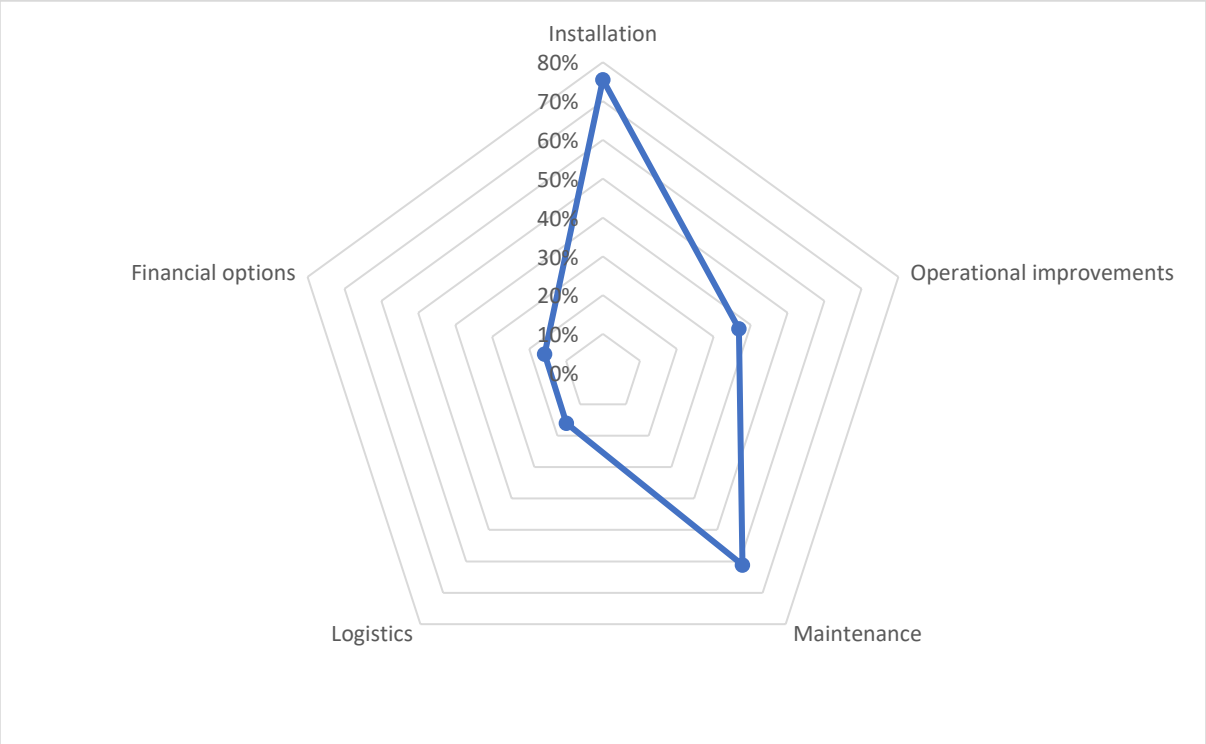

Fig. 10 Radar chart of categories

5.3) Industry 4.0 and servitization

The function of this chapter is to underline the relevancy of some Industry 4.0 tools as enablers for the enhanced provision of some services. The scope of this report, as mentioned in the introduction, is not to review the novelty and the related potentiality of I4.0 in general. Instead, it has been decided to concentrate only on those tools which brings improvement to the way services are developed in the machinery industry.

At first it is necessary to make a distinction between the role of Industry 4.0 in the company analysed. In some cases, the most advanced tools enable the service which without them it would not be possible to be delivered. In a second situation the technology serves “only” to improve the quality of the service, making it for example more accurate, faster or more cost-efficient. In the section about findings some preliminary insight about the application of new technologies to services have been highlighted. An overview, referring also to the websites of particularly deserving companies, has been performed.

When talking about industry 4.0, the thoughts immediately turn to smart factories. Conceptually all the advanced manifestations of IT (information technology) and OT (operative technology) are implementable since the 4.0 factory is a natively connected ecosystem as well as a huge data producer on whose enhancement companies base their success. In 2021, as markets dictate mass customization which brings to the arising need of a higher degree of personalization, business models are constantly evolving. In this context, relying on data to maximize production efficiency is no longer a peculiarity of a few enlightened companies, but a sort of necessity for all. The advent of the Internet of Things and 4.0 models has brought some novelty in the way of carrying out businesses. Today, thanks to the convergence between IT and OT systems, the industrial shopfloor has become a connected ecosystem of machinery, sensors, actuators and devices whose data flows into analysis platforms, such as the clouds, that transform them into information capable of directing decision-making processes.

Among the cases of data enhancement, remote support has a huge impact on the efficiency of the entire production ecosystem. The concept of remote monitoring is simple to understand and derives from the synergy between the sensors of the Industrial Internet of Things (IIoT) and the Artificial Intelligence algorithms: the formers are responsible for generating and transmitting data on the real operating conditions of industrial machinery, while the AI and Machine Learning algorithms proceed to enhance them in order to make the process more efficient. In this way, the company or an external provider can analyze the shopfloor data, transform it into useful information, act accordingly and obtain results such as the reduction of costs and maintenance times, the reduction of downtime and the efficiency of the whole process.

It has been considered interesting to explore more deeply the services of predictive maintenance and process optimization. Remote support in combination with data enhancement, enable the so-called predictive approach. The problem that is necessary to solve is the machine’s breakdown. When a failure occurs, the factors that most affect downtime are problem identification and procurement of components, which are not always available. Predictive maintenance makes it possible to understand, from excessive overheating, vibration or a set of out-of-scale parameters, a potential cause of failure well before the stop occurs, immediately identifying the component subject to wear and facilitating its restocking. What just stated should be enough to get the relevancy of predictive maintenance in the industry. To better understand the speed at which the service is

developing it is sufficient to look at the study by Fortune Business Insight. The compound annual growth rate of predictive maintenance solutions is 29,8% through 2026 when it will be worth more than $ 18 billion.

Predictive maintenance is only one of the services which benefits of the introduction of I4.0 technologies. Another interested application already cited is the use of augmented reality systems to create a collaborative connection between specialists of a certain process or machinery and those who actually work in the field. It is possible to distinguish different scenarios starting from training and arriving to quality control. Finally, another very interesting aspect of remote support is the optimization of the entire production process. Remote monitoring is not limited, in fact, to individual machines but can concern the entire work cycle, which is evaluated in terms of efficiency. The novelty stays in the possibility of monitoring in real time and, in the event of potential inefficiencies, optimizing through dedicated interventions.

The most relevant possibilities have just been reviewed and is safe to say that some companies have been implementing them in their activities. On the other side there are firms which have not embraced at best the new technologies yet. The potentialities are huge and the successful cases shows that the investment in I4.0 technology is profitable otherwise these innovative services would not have developed in the market. For this particular reason, the future will see an increasing technology adoption with the goal of succeeding in competition also thanks to the enlargement of service-based business model.

5.4) Servitization is more marked in bigger companies

Looking at the table presented in the findings at chapter 5 it is clear at a glance that the first companies, the ones with a higher revenue, are more concerned about servitization. More in detail the number of services offered by them is higher, on average, than the ones with lower sales. The following graph has the aim to highlight this concept. It shows the number of services offered by each single company belonging to the sample. The companies, from one to one hundred, are represented on the x-axis. On the y-axis it is possible to find instead the number of services offered with an upper bound of twenty-three.

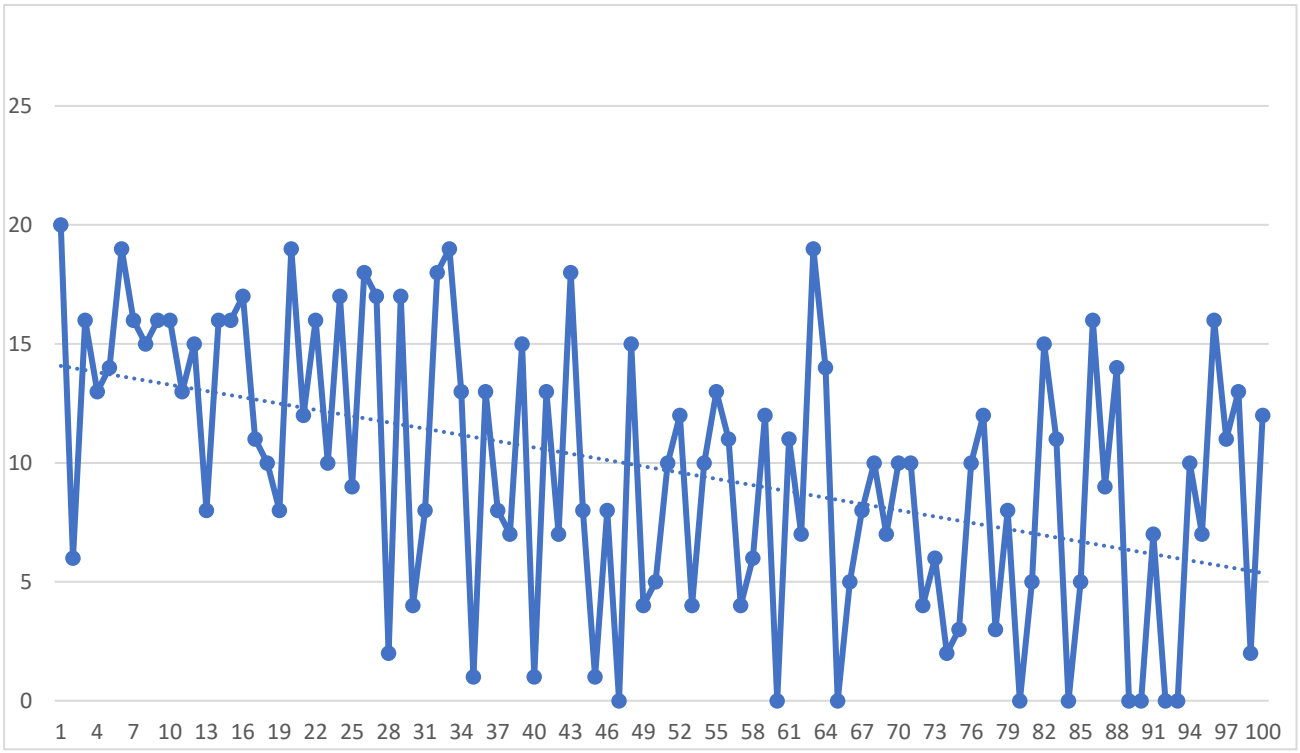

Fig. 11 Number of services for each company

The graph is not homogeneous as there are many ups and downs. Nonetheless, the trend line has been drawn and it clearly suggests a decreasing trend. This simple analysis shows that the companies with a higher revenue are able to propose a wider catalogue of services. This concept has been investigated also in the literature and the results emerged are interesting. F. Adrodegari, A. Bacchetti, N. Saccani, A. Arnaiz and T. Meiren suggest that the correlation is not between the revenue and the number of services provided. Their study called “The transition towards service-oriented business models: A European survey on capital goods manufacturers” affirms that the focus is instead on the installed base of goods. The installed base can be described as the quantity of machinery sold, actually in use, that continue to be serviced by the producer. The service provider can benefit from a big installed base because if a critical mass is reached, then it is economically advantageous for the producer to offer more services. If the critical mass, which can vary in each situation, is not reached it can happen that the introduction of some services is not justified by a profit. The theoretical concepts that can be referred to are economies of scale and economies of scope. It is known that usually larger company have lower costs due to a higher level of production. In the machinery sector being a company and consequently being able to reach the critical mass for the installed base means to divide the costs sustained to provide a service, onto a large quantity of unity. To sum up the correlation between the installed base, which leads to a high revenue and the number of services provided is verified by the data found.

A more qualitative consideration can be made and has always to do with the dimension of the business of the company. The bigger company can generally rely on an elevate capital. As stated by Adrodegari: “companies must have enough capital or obtain funding from partners to sustain the new service offering”. This concept applies not only to the quantity (number of services offered) but also to the quality and level of advancement of the service. In this way the most successful firms are also those company exploiting cutting edge technologies to serve the clients at best.

Another analysis has been done on the findings. The hypothesis that wants to be verified is about the fact that if the number of companies analysed reduces, the percentage of each service offered increases. To do this the original sample of one hundred companies has been at first reduced to seventy-five, then to fifty and finally only the first twenty-five companies have been studied. The graph below illustrates the results.

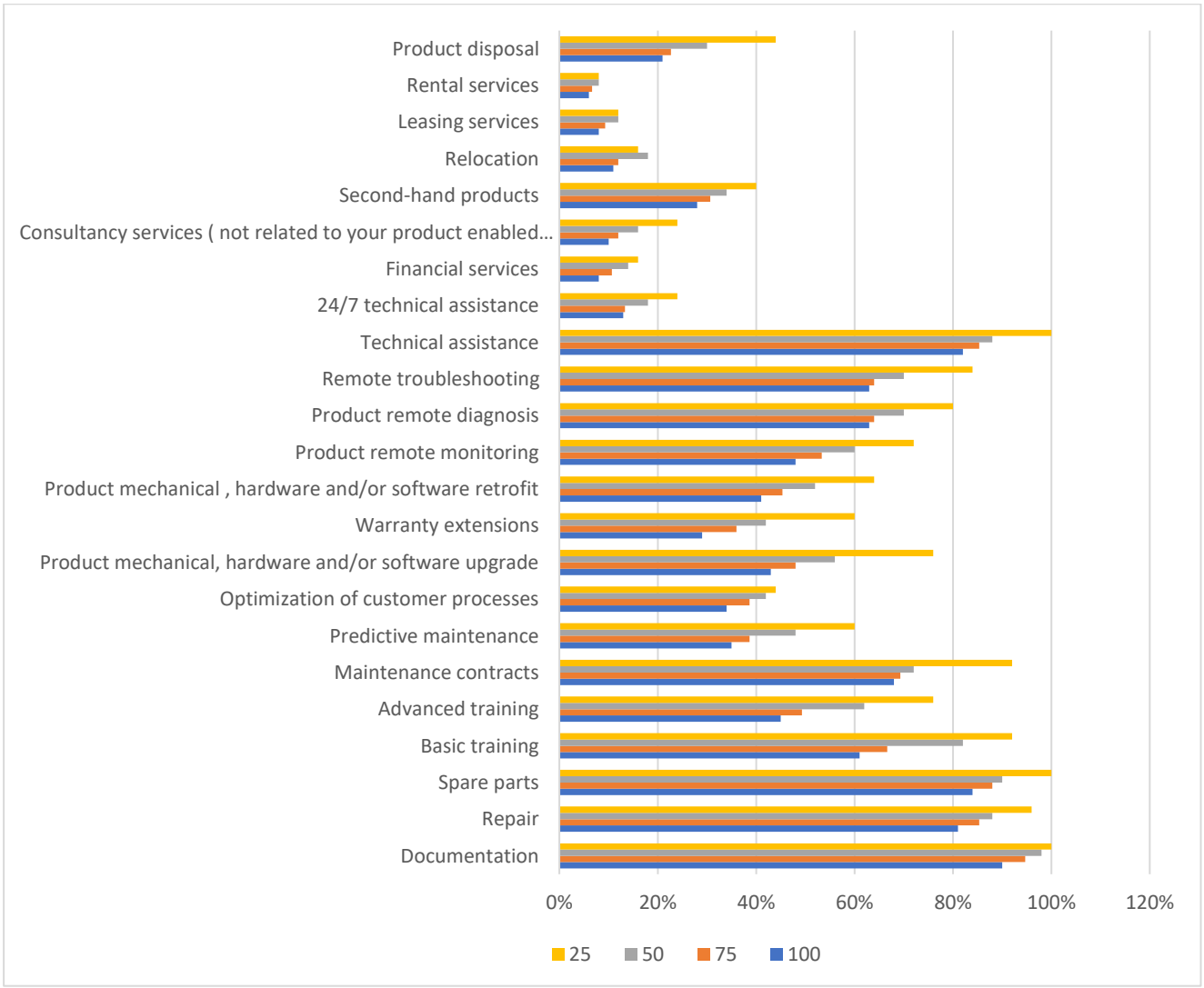

Fig. 12 Different sample size and services offered percentages

The blue line stands for the whole sample, so the percentage are the same indicated in table 11.
The orange, grey and yellow line refers instead to the smaller samples as described before.
It emerges that for all the services, except for relocation, the percentage increases when the size of the sample decreases. This represent another proof of the fact that, for what it concerns the Italian machinery industry, the leading role on the servitization path is covered by the bigger company. They embrace service-oriented business model more than their smaller competitor. These ones show some effort interest for what it concerns the development of a wide and high-quality offer, but they still have big space for improvement.
Finally, it is also possible to note that some basic services such as documentation, spare parts and technical assistance reach the value of 100% when the sample is limited to the first twenty-five companies.

5.5) The advantages of servitization

It is necessary to answer to the questions: what are the advantages of servitization emerged from the investigation? Why do company seem eager to explore a new business model more service oriented? Does the theory analysed in the literature review match with reality in Italy? The objective is now to confront the output of the empirical research with the theoretical knowledge proposed by literature and showed in the chapter 2.
First thing to be said is that the sale of the product, the machine for instance, is still a fundamental and predominant share of the company's business. Nonetheless it is clear the effort put in place by the firm to go further. A further investigation about the reason to undertake this path has been performed.
The discussion is going to be based on the information gathered from secondary sources such as report of consulting company and integrated with websites. BCG in his report "Creating Value for Machinery Companies Through Services" provides an interesting starting point. The study is conducted on companies operating in the machinery industry in general, but nonetheless it can provide some interesting insights. More in detail the advantages of servitization are:

- Greater predictability.
  The supply of a service offers to the machinery's producer an interesting shift in revenue stream. The business is no more only based on the one-off sale of the product.

When the customer subscribes the service, the provider will receive periodically payment. In this way the producer will receive a fixed payment as established by the contract. Predictability has particularly relevancy during the planning phase.

- Greater resilience.

  The success of a company operating in the machinery industry is influenced by the economic conditions that globally affects its business. After this premise it is logic to suppose that if the surrounding conditions are not favourable the business of the machine's seller will be negatively affected. Since the history shows that the economic cycles repeat themselves through the years, the perspective of facing some economically declining period must be seriously considered. In this context resilience, the ability to return quickly to a previous good condition after problems, is fundamental. The example of the still in act global crisis due to COVID-19 is perfect to describe the worst scenario. The economy has heavily dropped and for this reason the sale of products such as industrial machines has been slowed. It is possible to imagine that in this situation only few clients would be eager to buy new equipment. This tendency could have impact not only on the machinery producer but also on the whole value chain. The firms successful in servitization can rely on a certain source of income which periodically can support the development of their business.

- Opportunities for profitability.

  Broadening the offering and providing always more complete services represent a clear opportunity for companies to expand their business. From the sources analysed it has not been possible to get the exact number for all companies about the relevance of services. Fortunately, one of the few companies analysed which was traded on stock, provided the investor relation with data on past performances and future development. The company cited is Biesse S.P.A and it affirms that services consist of 16% of the total revenue but the plan is to increase it until 20% in the next years.

- Nurture the relationship with customer.

  Servitization offers the possibility to enhance the relationship client-producer. Ideally the seller will be placed side by side in every step of the customer production process. This will enable a close cooperation between the two parties with the opportunity of achieving advantages for both. The machine's producer will understand the needs of

the clients and keep them in mind as a starting point for its offer. The development of advanced service, for example remote monitoring, is perfect to gather data from shopfloor to extract information useful to resolve problems and improve performances. Another aspect necessary to underline is the benefit of an increased loyalty between supplier and buyer. This can represent a winning factor for what it concerns customer retention.

- Scalability

  Once the decision of developing a service has been taken, it possible to replicate the same services in other contexts. The companies which have chosen to embrace some of the technologies belonging to the I4.0 paradigm can now exploit them to serve more than one customer. A suitable example is represented by the adoption of remote troubleshooting. Once the service is established, it is possible to spread its benefit on a wider customer base. The concept of scalability, the capacity to cope with an increasing overload, is relevant because it offers important opportunities for growth at a limited effort.

5.6) Limitations and further research

Coming to the conclusion of the investigation, it has been considered appropriate to list all the limitations this report can present. The most relevant one relies in the fact that all the data used are extracted from the websites of companies. This operation has been particularly laborious and time consuming but still presents some limit. For instance, a hurdle that has been encountered is the fact that not all the information have been easy to find. Some companies list all the services they provide in their catalogue, but then if wanting to deepen the proposal it necessary to be a real company and establish a contact with them. This limitation only marginally influenced the final outcome because as said the additional information would have been nice to understand to get a full picture but for sure are not to be considered fundamental to the development of the study. One possible way to get access to more precise information about service offering is to contact each single company directly, but even in this case a transparent information sharing would not be assured.

Another delightful information it would have been interesting to get access to, is the degree of personalization of each single companies. As mentioned in the introduction the sector under investigation, the Italian industrial machinery, presents different level of personalization. The maximum of customization is reached when, according to the engineer

to order approach, the customer is involved at the beginning of the process in the design phase. All the companies studied offered a catalogue of products and services which are not personalized but then there was also the possibility to request customised solution. To conclude it can be said that the degree of personalization offered is various between the companies in the sector and can fluctuate reaching in some case the ETO fulfilment strategy. Once again to discover this data it would have been necessary to contact each single company. An interesting idea for further development could be to map the exact level of customization offered by the companies. For the type of research performed in this report, relying only on secondary sources this has not been possible. The research question that could guide a further and future research is about how servitization applies when the level of personalization is maximum and to understand if the customization of the product also requires a customization of the connected services.

The idea of servitization is by now completely defused among the companies considered. By the way there are still many chances for improvement. The fact that all the companies embrace the service offering means that they get some benefit from it. The direction for the future is that companies expand their list of services. More in detail we have seen that the most successful companies are the ones with a broader service proposal and they could lead the way, being an example to follow for smaller companies.

A particular service which was present in the literature but that has not found feedback in the practice is pay per use. The following definition, that has been taken as a reference, is provided by European Commission in 2016. Pay-per-use includes any type of payment structure in which the customers have unlimited access to resources but only pay for what they actually use, or for the result linked to their use. This indicates a transition from selling products to selling services. As said pay per use is not defused among the companies analysed, if not for what it concerns the cloud services. In the future it is possible to imagine that the pay per use model will gain a more relevant role in service delivery. The main advantage is the possibility for the producer to share the product among many users and doing so to maximize its usage. On the other side the customer is going to use and to pay only when they really utilize the machine, avoiding any waste of time or inefficiencies. It would be interesting to investigate how the concept of pay per use applies in a sector where the level of personalization is high, to understand if it is still advantageous for both parties.

Enlarging the list of services delivery is not the only way to pursue success following servitization. It is also possible to research the continuous improvement of already established services. In doing this it has been showed by the research how the technology could help the development of always more attractive proposal. Services and products are nowadays to be

considered as complementary and the technological innovation represent one of the tools to be used to pursue the maximization of value creation.

ANNEX

The table presented hereafter it has been used to run the analysis and it comprehensive of the full list of companies analysed with their business names, revenues, profits and websites.

#	Business name	Revenue 2019 [k EUR]	Profit 2019 [k EUR]	Website
1.	BIESSE S.P.A.	425.282	4.063	https://www.biesse.com/it/materiali-tecnologici/
2.	BERCO S.P.A.	405.297	-19.343	www.berco.com
3.	SCM GROUP S.P.A.	404.861	26.838	http://www.scmgroup.com
4.	BRETON S.P.A.	279.249	4.457	https://www.breton.it/it
5.	COMAU S.P.A.	232.529	3.677	https://www.comau.com/en
6.	ADIGE S.P.A.	194.756	25.363	https://www.blmgroup.com/it
7.	C.M.S. COSTRUZIONI MACCHINE SPECIALI S.P.A. IN SIGLA C.M.S. S.P.A	132.610	9.222	https://www.cms-srl.org/
8.	BUCCI AUTOMATIONS S.P.A.	127.207	7.515	www.iemca.com
9.	COMAS - COSTRUZIONI MACCHINE SPECIALI - S.P.A.	124.639	16.894	http://www.comasitaly.com/en
10.	FICEP S.P.A.	124.161	6.646	https://www.ficepgroup.com/
11.	PAMA S.P.A.	106.698	-6.489	https://www.pama.it/service/

12.	FPT INDUSTRIE S.P.A.	106.408	1.078	https://www.fptindustrie.com/services/service/11/
13.	IMAL S.R.L.	103.437	8.001	www.imalpal.com
14.	MACHINING CENTERS MANUFACTURING S.P.A. OPPURE MCM S.P.A.	101.929	1.473	https://www.mcmspa.it/
15.	GILDEMEISTER ITALIANA S.R.L.	95.282	14	https://it.dmgmori.com/
16.	SCHNELL S.P.A.	94.996	4.440	https://www.schnell.it/it/
17.	IDRA S.R.L.	93.141	7.245	https://www.idragroup.com/index.php/it/
18.	EMMEGI S.P.A.	85.486	6.547	https://www.tekna.it/it/home
19.	PAL S.R.L.	80.471	8.647	https://www.imalpal.com/en/
20.	BLM S.P.A.	79.202	5.796	https://www.blmgroup.com/it/
21.	PEDRINI S.P.A.	75.190	1.821	https://www.pedrini-italia.it/it
22.	M.E.P. - MACCHINE ELETTRONICHE PIEGATRICI - S.P.A.	73.464	-648	https://www.mepgroup.com/en/service
23.	PERKIN ELMER ITALIA S.P.A.	72.192	13.914	http://www.perkinelmer.com
24.	AMADA ITALIA S.R.L.	72.145	1.995	https://www.amada.eu/it-it/
25.	OFFICINE E. BIGLIA & C. S.P.A.	71.756	1.820	www.bigliaspa.it

26.	ITALPRESSE INDUSTRIE SPA	71.631	3.368	https://www.italpressegauss.com/it-it
27.	EMAG MILANO S.R.L.	71.212	1.256	http://www.emag.com
28.	FREUD PRODUZIONI INDUSTRIALI S.P.A.	70.658	3.983	https://www.freud.it/global/en/
29.	PIETRO CARNAGHI - S.P.A.	65.138	1.056	https://www.pietrocarnaghi.com/it/index.html
30.	IMT S.P.A.	63.963	-5.211	https://imtspa.com/
31.	MAIR RESEARCH S.P.A.	60.198	4.417	https://www.mair-research.com/en/
32.	GRAZIANO TORTONA S.R.L.	58.540	2.433	https://de.dmgmori.com/service-und-training/my-dmg-mori
33.	ADIGE-SYS S.P.A.	56.388	2.762	https://www.blmgroup.com/it/
34.	F.O.M. INDUSTRIE - S.R.L.	55.184	4.655	http://www.fomindustrie.com/en
35.	SACMA LIMBIATE S.P.A.	54.857	6.689	https://www.sacmagroup.it/
36.	GNUTTI TRANSFER S.P.A.	53.181	4.732	gnutti.com
37.	SISMA S.P.A.	52.813	-183	www.sisma.com
38.	FINN-POWER ITALIA S.R.L.	52.535	268	http://finnpower.co.uk/
39.	INNSE-BERARDI S.P.A.	51.307	16	https://en.machinetools.camozzi.com/

40.	MINO S.P.A.	50.312	320	http://www.mino.it/
41.	BDF INDUSTRIES S.P.A.	49.074	463	https://www.bdfindustriesgroup.com/
42.	GMM S.P.A.	48.963	1.547	http://www.gmm.it/
43.	CERATIZIT COMO S.P.A.	48.130	-7.552	https://www.ceratizit.com/
44.	FEDERAL-MOGUL IGNITION S.R.L.	46.066	1.417	https://www.drivparts.com/
45.	PROMAU S.R.L.	44.159	1.127	www.davi.com
46.	CUTLITE PENTA S.R.L.	42.126	3.922	www.cutlitepenta.com
47.	COSTA LEVIGATRICI S.P.A.	41.997	101	http://www.costalev.com/
48.	INNSE-BERARDI S.P.A.	40.631	558	https://en.machinetools.camozzi.com/
49.	PARPAS S.P.A.	39.454	5.791	http://www.gruppoparpas.com/
50.	GASPARINI S.P.A.	38.981	3.539	https://www.gasparini-spa.com/ita/contatti/assistenza-post-vendita.html
51.	VIGEL S.P.A.	37.726	583	https://www.vigel.com/
52.	COMETAL ENGINEERING S.P.A.	37.512	785	https://www.cometaleng.eu/en/
53.	O.M.V. OFFICINE MECCANICHE VENETE S.P.A.	37.018	1.081	http://www.gruppoparpas.com/
54.	BTB TRANSFER SPA	36.818	5.430	http://btb.it/it

55.	MECCANICA NOVA S.P.A.	36.787	8.796	https://www.meccanicanova.com/
56.	CESARE GALDABINI S.P.A.	36.727	536	https://www.galdabini.it/
57.	MECOF S.R.L.	35.781	2.692	https://www.emco-mecof.it/
58.	STANLEY TOOLS S.R.L.	34.834	1.349	
59.	F.I.M.E.R. SPA	34.025	2.260	https://www.fimer.com/
60.	ARROWELD ITALIA - SOCIETA' CONSORTILE A RESPONSABILITA' LIMITATA	33.824	1.192	http://www.certicontrol.it/
61.	DALLAN S.P.A.	33.735	-1.612	https://www.dallan.com/en/
62.	AUTOBLOK S.P.A.	32.864	5.875	https://www.smwautoblok.com/it/it/
63.	BGS S.R.L.	32.715	3.195	https://www.blmgroup.com/it/
64.	TIESSE ROBOT S.P.A.	32.624	1.936	www.tiesserobot.com
65.	TREEMME (MACCHINE, MINUTERIE, MONILI) SPA UNIPERSONALE	32.387	7.414	www.tremme.com
66.	FIDIA - S.P.A.	32.200	-3.776	http://www.fidia.it/
67.	IMT INTERMATO S.P.A.	30.627	-11.697	https://www2.imtintermato.com/
68.	COLOSIO S.R.L.	30.380	2.370	http://www.colosiopresse.it/servizi.html#magnet

69.	VALEX S.P.A.	29.677	7.127	https://www.valex.it/it
70.	NOVASTILMEC S.P.A..	28.961	647	https://www.novastilmec.com/
71.	BTB TRANSFER SPA	28.903	1.773	www.btb.it
72.	TACCHI GIACOMO E FIGLI S.P.A.	28.795	-824	www.tacchi.it
73.	EINHELL ITALIA S.R.L.	28.457	-21.690	http://www.einhell.it
74.	MANDELLI SISTEMI S.P.A.	28.306	2.313	www.mandelli.com
75.	TRAFIMET S.P.A.	27.153	2.058	http://www.trafimet.com/it/?noredirect=it_IT
76.	ROBOR SRL	27.070	4.418	www.robor.it
77.	STORTI S.P.A.	27.001	591	https://www.storti.it/
78.	BONETTO SRL	26.892	419	http://www.bonetto-group.com/
79.	KERAGLASS INDUSTRIES S.R.L.	26.880	1.021	https://www.keraglass.com/it/home
80.	FACCIN S.P.A.	26.644	483	
81.	ARIES S.R.L.	26.418	1.460	https://ariestiberina.it/
82.	SORBINI S.R.L.	26.330	7.507	https://www.ceflafinishing.com/it/
83.	MEP S.P.A.	26.080	97	http://www.mepsaws.it/?lang=it
84.	SIMEC S.P.A.	25.667	746	https://www.simec.it/index.php
85.	TREVISAN MACCHINE UTENSILI S.P.A.	25.470	2.241	www.trevisanmachinetools.com

86.	C.M.S. COSTRUZIONE MACCHINE SPECIALI S.P.A.	25.298	-968	https://www.cms-srl.org/
87.	SOITAAB IMPIANTI S.R.L.	24.484	98	http://www.soitaab.com/
88.	VEZZANI SPA	24.232	4.507	https://www.vezzani.biz/
89.	SAMPUTENSILI MACHINE TOOLS S.R.L.	24.172	395	http://www.samputensili.com/it
90.	BAVELLONI S.P.A.	24.093	72	https://www.bavelloni.com/it/
91.	MC SRL	22.722	413	www.mccomponents.it
92.	GALBIATI GROUP SRL	22.513	-6.069	www.galbiatigroup.it/
93.	MILLUTENSIL S.R.L.	22.346	49	www.millutensil.com
94.	BRE. MA. BRENNA MACCHINE S.R.L.	22.276	628	http://www.brennasrl.it/
95.	PEZZOLATO - OFFICINE COSTRUZIONI MECCANICHE S.P.A.	22.132	143	https://www.pezzolato.it/
96.	COMAS S.P.A.	22.113	6.372	http://www.comas.com/
97.	NORGREN S.R.L.	21.812	611	https://www.norgren.com/it/it
98.	C.B. FERRARI S.R.L.	21.679	-800	http://www.cbferrari.com/it/
99.	RIELLO SISTEMI S.P.A.	21.429	-117	https://www.riellosistemi.it/it/

100.	EUROMAC S.P.A.	21.316	2.783	https://www.euromac.com/

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