Università
Ca'Foscari
Venezia

Master's Degree programme – Second Cycle
(*D.M. 270/2004*)
in Economia e gestione delle aziende –
curriculum International Management

Final Thesis

Ca' Foscari
Dorsoduro 3246
30123 Venezia

Customize to compete: when digital competences and design are the keys to success.

Ares Line business case

Supervisor
Ch. Prof. Stefano Micelli

Graduand
Veronica Daminato
Matriculation Number 855620

Academic Year
2015 / 2016

“It's kind of fun to do the impossible.”

Walt Disney

ABSTRACT

Today's saturated market has reached levels close to the so-called pure customization, where high-quality and excellent details are the most considered features to make each good different from the others. In this dissertation, the main topic is about the ability of a company to sustain the production of customized products through digital manufacturing production techniques without taking any loss in quality and efficiency. The opportunity supporting this new demand trend is the digitization of the manufacturing system which has reshaped the business strategy and the business model too, where design along with innovation became vital tools to stand out in the market. Aiming to maintain a strong position in the market, companies must be able to achieve agility in their processes, adaptability to the external dynamism and alignment to customers' demands and technological development. The exploitation of an open business model by which collaborating with an external ecosystem in order to gather information and integrate new competences is essential to enable growth. Despite some barriers, lot of companies have undertaken the path to business model innovation and digital integration, gaining the advantages and proving the effectiveness of these approach.

The experimentation of this approach has been joined by Ares Line Spa too, a leading company in the office and community chair sector that it is analysed as case study. To reach customers' satisfaction, Ares Line relies on its values which are quality in terms of prestigious design, sophisticated materials, excellent ergonomics and liveable environments. To achieve all these goals, the company combines a long culture of traditional craftsmanship with the latest technology, a symbiosis that allows growth based on the synchrony between experience and innovation.

Ares Line has developed a production strategy based on the optimization of production times by using digital technologies, gaining all the advantages as geometry freedom, quick time-to-customer responsiveness, eliminating any possible interpretation errors that can be corrected in real time in the digital file, hence reducing costs and improving quality, increasing the best fitting through a flexible production and gaining a premium from customers' satisfaction. In addition, Ares Line

keeps its skilled craftspeople who add the rare and unique artisan know-how regarding materials processing techniques, handmade finishing and high-quality customization of the product as an added value coming from the Made in Italy tradition.

The search for customization and innovation is observable in the internationalization strategy too, and it is expressed by the contract business through which Ares Line competes worldwide. The company is part of the Contract Design Network that aims to promote and improve the development of joint projects in order to create products and whole services by integrating different knowledge and resources and being able to meet more articulate demands.

Finally, the customer strategy is affected by digital customization as well: through customized presentations the company pushes towards a high interaction with the customers directly involving them and with prototyping they provide reliable tools for marketing activities by reducing the ambiguities due to a clear and realistic rendering for a transparent and direct communication, increasing the value of customer's experience.

Keywords: *digital manufacturing, customization, open business model, collaboration, innovation, additive manufacturing, craftsmanship, Made in Italy, digital technologies*

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INTRODUCTION

In today's society, the main pattern of citizen living has been reshaped and translated into a community of digital people. Advanced technology and digital innovation are the mega trends that affect the world in terms of relationships, business, communication and culture: the world has become a global network in which people live always connected with easy access to every kind of information, regardless where or what. Digital technologies are part of people's life as well as companies' business. Innovative techniques and digital tools let organizations to manage resources and processes in a better and profitable way, gathering more information enables them to make fruitful decision quickly and growth and development are more affordable thanks to the wide range of advantages the digital manufacturing brings. This connected society is more and more acquainted thanks to the digital devices and so, it has new and sophisticate expectations and needs that organizations of all kinds have the opportunity to satisfy by exploiting a new set of business model sustained by, again, digital technologies.

In the first chapter of this work, the new mind set of nowadays society is analysed considering especially the empowerment of consumers' role in defining business strategies. Consumers want to express themselves by the product or the service they buy, hence, something unique and personalized is what they look for. The fast pace improvement of technological innovation enables people to represent their identity by shaping and building goods upon their own personal tastes and preferences, highlighting the growing importance of product customization. The demand for customized products is directly linked with firms' way of doing business since it impacts on product development, product meaning and value, and above all on final satisfaction: the more a product fits the demand, the higher satisfaction is. Indeed, this in turn means that consumers are willing to pay a premium price as a guarantee of best matching with their preferences and a higher sense of accomplishment in order to communicate what their identity is. The extent to which a product is customized can vary and it can require different phases to be realized, but what is sure is that the approach to how manufacturing processes are carried out is totally reshaped as the entire business as a whole too. The adaptation of products and services to individual customers' requirements requires a high degree of

information and great level of flexibility as well, hence an innovation of the current business model to ensure the alignment with the market dynamism.

Consumers empowerment can have different shadows depending on how much they get close to products and to business processes: due to degree of collaboration and engagement in the organization, customers can be engaged in different roles.

Customers can be defined as ‘branders’ since they have the possibility of gather information about a company, but moreover, they can share this information with all the global digital network, affecting the reputation of a company and its business by generating new content and information around that specific brand. Collaboration with customers helps companies to gather information about them and to control and manage what it is said about it, partnering with the aim of gain loyalty and credibility. A step forward we faced the role of customers as ‘innovators’, where the engagement with the organization is deeper and usually at the design phase. By participating in the product designing a customer can fulfil his desires and expectations and a company has the opportunity to grasp new ideas and perspectives useful for its innovation, while matching the demand directly with any attempt to deduce customers’ needs. Hence, on the one hand satisfaction increases and on the other hand fresh innovation and profit will be gain. Furthermore, customers have the possibility to move forward along the product development cycle and get the role of ‘co-creators’: from a basic customization of current products up to co-design and create entirely new products using digital technologies. Collaborative creativity reflects the shift to a customer-centred approach where both the company and the customer are active parts in creating higher value that benefits customization and efficiency. Finally, the last paragraph of the chapter deals with the distinction that this market trend has brought: the difference between product variety and product customization. When a company seeks for variety, it means that the features of a good are multiple but they are set by default from the company. Instead, customization refers to the design of a particular attribute expressed by the customer that is involved in the process, and for this reason one or more operational processes are modified depending on the kind of customization required.

Wondering how companies can effectively provide for customized product without loss in efficiency, quality and cost, the second chapter solves this issue by

explaining all the advantages that digital manufacturing brings, improving the production process and ensuring a strong presence in the market. Due to the increase complexity of products' requirements and the higher demand for customization, additive manufacturing, robotics and material science become common in the most advanced industry to cope with the above changes. What matters the most is to offer the customer what he wants as quickly as possible, hence responsiveness and target activities are necessary to succeed and this is why production models should be built upon increasingly advanced and improved methods and techniques. In a broad sense it is about a growing dematerialization of production processes due to the possibility of encoding the knowledge applied in the production and to reproduce it in digital form, collecting all the advantage related. In the chapter the benefits of additive manufacturing are analysed under an economic point of view: free design and complex geometries can be realized as never before, customization can be pursued with no cost increasement since no moulding and tooling are required, the initial investment is reduced compare to traditional manufacturing and engineering changes and re-configuration are cheaper and easier to be done, to a faster product development phase correspond a quicker time to market, thanks to less steps to assemble a product and less error and uncertainty as consequence since by the digital visualization it is possible to modify each element in real time. This in turn means less waste and higher quality of the final product with the benefit of getting more revenues due to the premium price customers pay as reward for their satisfaction. Product development benefits a lot from the use of digital manufacturing techniques since we can talk about design-to-manufacturing where every aspect and feature of a product are described digitally and implemented without any restriction along the way, allowing for complexity experimentation with no costs. Moreover, products become smarter and added functionality are digitally integrated to realize the next level of innovative products.

The potential of these new technologies cannot stand alone, in fact in order to successfully exploit all the advantages they bring it is necessary to have a strong structure underneath all the processes. Though, the third chapter examines how the business model should be reshaped in line with the external dynamics and consistent to sustain the digital manufacturing approach. An open architecture should be developed within the organization where through digital interfaces and other tools all

the departments can share information and collaborate to improve process development, reducing errors and increase time. This concept of sharing information must be then externalized as well, in the sense that interaction and connection with other actors outside the company are essential to gain advantages from a new way of working based on cooperation and knowledge sharing. Hence, an open business model based on collaborative network is the solution for all the companies that aim to be competitive in the digital era, since it allows to access knowledge and resources, while sharing risk and competences as well. Dialogue and communication within and outside the firm is essential to gain advantage from the information about customers' preferences and from the confrontation of ideas as starting point for new forms of innovation. Indeed, a combination of competences and skills let a company innovate and reach higher quality results that are not affordable by the company alone, with access to fresh creativity and new assets through which it can be flexible and able to react in an agile way to every market push. Despite that, lot of companies still face some difficulties in the transition from the traditional business model to the open one. In the chapter it is explained why the current business model becomes unsustainable and which are the barriers, from cultural to organizational, to be overcame.

The fourth chapter brings the issue of digital manufacturing within the Italian industry perspective: this industry is historically rooted on a long manufacturing tradition that makes the Made in Italy be a synonym of excellence and quality all around the world. But even in this case, the traditional knowledge and craftsmanship, even though still successful today as in the past, must be adapt and innovate in order to remain competitive in the digital economy. Hence, Italian companies undertake the path to digitization of their traditional manufacturing system by following three fundamental principles: they have to produce variety and customization as the demand required to avoid to succumb to a dynamic market, in doing so they must be connected with their culture which is a unique point that put the Italian products ahead of the competitors since they convey meaning and values linked to history and that cannot be found anywhere else. Finally, they should be able to combine the traditional craftsmanship and its rare techniques that are renown globally with the latest technologies in order to efficiently enhance they production process accordingly to the challenges of the global market. However, Italian SMEs find some obstacles to shift to the open business model approach too. An examination of

barriers is done in this case as well, with a list of opportunities and incentives available to help them in the business model innovation. Turning to the end of the chapter, the maximum expression of customization is described in the contract business, a sector that provides a great chance for internationalization and business expansion. It requires different competences to be managed effectively and a business re-organization as explained in the chapter, but it is worthy since it is suitable to seek customization at a global level and as a consequence, obtaining profit and recognition from a larger scale.

Finally, the last chapter presents a business case study as proof of the ability of some Italian firms to get involved in the digital innovation and to successfully respond to customization demand by reshaping its business model. Ares Line Spa is the company considered, a leading firm in the office and community chairs sector, that is able to combine its high passion for the traditional Italian craftsmanship together with the innovation brought by digital manufacturing techniques. The analysis of its customization, production and internationalization strategies provides a real example of the effectiveness of digital manufacturing and it shows the concrete achievement of all the advantages described along this thesis. Moreover, the contract business developed by Ares Line, the Contract Design Network, is a clear evidence that an open business model and a collaborative approach are great solutions for business growth and innovation, and despite all the barriers that are still alive it demonstrates that they might be overcame with competitive and successful results.

CHAPTER 1

A NEW WAVE OF CONSUMPTION

Changes in demand

“Now everybody wants to have something different” Tom Ford (2007).

That is the most suitable explanation of what is going on in today’s society: first of all, we are digital and connected.

People have technology. They have the tools to move on and renovate the business, and they are already using them. This connected generation is behind the biggest business trades and the most talked-about cultural phenomena of the moment. This shifting within all consumers is changing the way business is done. Advances in technology are causing a shift in how the generation interacts with the world, changing the way it conceives it, resetting the demands and expectations it has of the businesses it deals with.

Since this generation has the possibility of gathering lots of information and has access to all the latest technologies, the main trend arising nowadays is about the great potential of high-tech facilities to produce custom-made and on-demand goods. This comes from a new mind-set embedded in the society that is saturated of standardized goods and, above all, is aware of the availability of different manufacturing processes usable in favour of a higher identity establishment. One of the reasons of this change over individualization and customized consumption is that today’s new technologies and internet more than ever allows people being quickly independent and better informed. Internet connects people from whole over the world inducing then the provision of different experiences and exchange of knowledge as never seen before. So then, users know exactly what they want, with who they should communicate immediately and how and where to find relevant contents to get it.

1. A new generation's mind-set

Consumption can be seen as a process people seek for, make a choice and purchase products and it is used to satisfy consumers' needs, such as their taste or vision. Therefore, consumption is a highly individual area, where questions of individuals´ preferences are raised. This means that our possessions sometimes are perceived as portions of ourselves, regardless if they are by choice or not. Due to the strong influence of our possessions for defining our identity, consumption turns to be organized around consumers rather than around producers. As a consequence, in this new wave of consumption, products have received a progressively crucial function in peoples' lives. Therefore, people is getting more and more engaged in asking for personal recognition which find its best manifestation in the digital world. In addition, considering this generation as an active one, not passive, it means that in order to reach its self-identity, people are also highly engaged in creating their own solutions.

Acquainted people become more selective and demanding, together with their increasing sensation to be unique and their-self every time, they also want to discover and experience new contents and usance. Wondering of new design as well as new impulses, wherefore make increasingly difficult to forecast buying behaviour and being ahead anytime in order to be able to respond appropriately.

So then, what should companies do when they realize that an entire generation's behaviour is absolutely evolving?

Entrepreneurs of every industry around the globe recognize that consumer expectations have been transformed by recent technological advancements. What is arise as a central focus of the company is the adaptation of the products to every single customer's requirements. A key practice is offering the ability to customize goods and services to consumers' liking before they purchase them. This in turns affects deeply how manufacturing will be carried out and revolutionize business as well.

Through the internet as well as at a personal contact level the customer can simply be engaged in specifying different features of the good take into account, for example colours and materials of the garments as well as measures and shapes. This service can be offered by different online marketplaces and configurators and physical

showrooms.

The digital experiences behind all this new concept of demand is supported by the continuous drop of costs of the interfaces used by firms to involved customers, thanks to the related diffusion and the increasing request for these platforms that make them getting cheaper.

The influence of digital technologies on customers' expectations and their ability to customize many aspects of their experience when shopping online these days, offers them the opportunity to buy something that express their own style and that they had a hand in creating, which is more pleasurable than purchasing a mass-produced good.

A buyer-centric approach will strike customization and in order to make a product much more individual a built-to-order strategy is necessary to be developed, as it will be discussed later on. In this system, an active participation of the customer as well as the interaction of pillar information between customer and manufacturer is essential for a business transaction. Thus, as stated some lines above, customization begins with customer and the product can only be manufactured after customers' order.

Depending on the degree to which a customer can interfere with the product development process, we can also face the possibility to have consumers closely intervene in the creative process of designers and creators.

Co-creation is a process allowed by advanced technologies, which enables the customer to create or build and promote an innovative service or product, thanks to some sophisticated, yet easy-to-use interfaces (or "configurators") from which consumers can co-create goods.

This make an outstanding point since in a society where identity and personalization are promoted by goods, it makes design to emerge as a sign of the good life and self-expression. The aspect and feel of objects and places is becoming increasingly important. Design is shifting paradigms and it is spurring established products and industries to be evaluated again. Design, along with innovation, has become a vital tool to stand out and to be ahead in an increasingly competitive market.

Indeed, it is truthful to state that customization provides companies with a competitive advantage, considering also the opportunity to conquer niche markets by offering a wide product variety for market of one and individual customers' requirements. Small

and medium-sized businesses are jumping on board as well. The willingness to take advantage of technological innovation and meet effectively a constantly changing consumer demand has reshaped their strategy in the industry, so it is expected to face even more SME getting in on the action.

The connected generation we are taking into account has embraced technology to build social and professional networks with a brave new structure. Because of this concept mainly deals with consumers, firms need to understand how to interact with these powerful new social entities if they want to grasp great business benefits, trying to identify who their customers are and which are their likes in order to trait them in the right manner and so to stay in the loop. Entrepreneurs have all the digital instruments at their disposal to anticipate how expectations will evolve just taking a deeper look at the social and cultural shifts under way in how people live, work and communicate. They are aware about all the tools needed to improve their view of how people's behaviours and values are changing in order to take advantages in shaping a forward-thinking strategy. The forecasting of this switching is the driver of the idea described as "flexible manufacturing" which will be the issue take into consideration in the later chapters.

2. Customers' empowerment: a new consumers' identity

Advances in technologies allow people to get informed and involved in business. The crucial point is the shift in the society through a higher self-awareness that goes together with the possibility of express themselves with products. What comes up is an empowerment of consumers enabling them to renew experiences and reimagine businesses and the processes within them.

Consumers now have the opportunity to communicate their identities and since they are the main source of consumption, what counts the most is the possibility for a firm to satisfy their expectations: build products and services able to communicate multiple society's identities.

As identity is the driving force in consumption lots of attention is then paid to the relation between people and products, focusing especially on how much empower customers received since they have the opportunity to get closer to products. That is,

the ability given to consumers to have a voice in business processes by taking the role of designer and represent their individuality by building aspects of it into products' design via customization.

a. Innovators and Branders

The empowerment cited above can be exploited upon different levels. "Digital technology has also built new or stronger business-to-consumer relationships through online"[1] channels, and due to this the first level of authority approved to customers is about how they can influence firms' businesses through the exchange of information and their connection in the digital world. Since they are active users of social media and they participate in digital communities, their empowerment upon information regarding firms and products can be attribute as user-generated content ability.

Digital consumers are not only shoppers, but instead they are digital content creators. "Digital consumers use technology to create content about products and brands"[2]. Thanks to all the different channels the Web offers, the power of customers is not just limited to their ability of gathering information, but moreover, it is even shown through the action of sharing the information they found with all the other users participating in the internet network. As a consequence, the empowered consumers will take part in the generation and distribution process of that information, allowing then the creation of shared online spaces in which user-generated contents upon brands and firms are produced.

The relation between the ubiquitous process of gathering information about products form manufacturer websites and reinforcing them with the knowledge spread in the network and the actions taken by firms above this issue makes clear that consumers become "branders" as well. Therefore, if a company wants to join the advantages provided by this category, it should pay attention to what is stated in the web and specially "manufacturers can partner with the consumer by providing in-depth product

[1] Fiore, A. M. (2008). *The digital consumer valuable partner for product development and production.* Clothing and Textiles Research Journal, 26(2), 177-190 p.177

[2] Fiore, A. M. (2008). *The digital consumer valuable partner for product development and production.* Clothing and Textiles Research Journal, 26(2), 177-190 p. 180

information, comparisons, search and navigation options, and promotions"[3] since the quality and richness of the information would be a point of uniqueness for a brand. "Whose purpose is aimed at informing customers about the quality of products, services, brands, or sellers prior to making a purchase and after it, allowing customers to share their experiences about it"[4]. This phenomenon of customer-generated communication affects the perspectives of marketers in a way they are required to develop new paths and skills in order to be align with this new role of consumers, they must find resources to manage information in interactive experience-sharing communities and tools to empower the brand's recognition itself. Hence, due to the constant information seeking by digital consumers, entrepreneurs that want to succeed in this new business world have to grasp the best of this new perspective since it will be "helpful in the areas of spreading reputation, customer support, discovery of users' hidden behaviour, understanding demands and trustable advertisement"[5]. Competitive advantages will be given directly by the demand side that is continuously increasing its relevance: a deep analysis of it should be developed and tools to understand it are needed. The most straight and easiest way to do it is by "partnering with the digital content creator. Customers' views of the product can be gleaned to create a better product, and loyalty to the brand can be fostered when partnering with the content creator"[6]. Surely, product development and design processes as well as the manufacturing production will benefit from it.

A step further makes us facing the content created by users concretely evolved into raising products if a company gets into the idea of involving consumers as innovators. Following this approach defined as customers-as-innovators, companies provide customers with user-friendly tools based on new technologies, allowing them to design the various product components through systematic interaction with the company starting from the delineation of the most appropriate solution to the need, rather than be limited to the testing of the product when it has already been manufactured.

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[3] Fiore, A. M. (2008). *The digital consumer valuable partner for product development and production.* Clothing and Textiles Research Journal, 26(2), 177-190 p. 178

[4,5] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472 p. 5

[6] Fiore, A. M. (2008). *The digital consumer valuable partner for product development and production.* Clothing and Textiles Research Journal, 26(2), 177-190 p. 180

This means moving the communication interface between customers and companies at the preliminary design stage and allows the management of the supply creation process with greater speed and efficiency. The integration of customers into roles of innovation activities, foster a positive impact in the innovativeness offered by a company through its products and services helping it to be ahead when launching them in the market. In fact, “product development departments cannot keep pace with the need to understand and respond to customers’ changing needs on an individual level. Therefore, a successful solution for companies nowadays has become to stop trying to deduce customers’ desires (e.g. market research), since R&D has been a costly and inexact process, and instead give customers toolkits (e.g. modelling, prototyping) to design and develop their own products and services. In this way, companies may tighten the feedback loop between consumption and production cycles”.[7]

b. Co-creator and Co-designer

Digital consumers are not just content creators or providers of easily accessible knowledge to boost innovation. They are taking the stage as personalize product creators using digital technologies. This opportunity of co-creating the supply can be developed from a basic level of customizing actual products up to give an hand in the complete creation of products combinations, matching in all the ways their specific likes or wants.

Co-creation of the product means every action of "collective creativity" which provides a collaborative design between the company and consumers, defined as "co-creators".[8]

Customer participation in the co-production of goods and services and in the ideas co-creation reflects a strategic shift from a good-centred logic to a customer-centred one. This logic considers customers as proactive actors rather than passive

[7] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era.* Production Planning & Control, 22(5-6), 447-472 p. 4

[8] Siano, A., Golinelli, C. M., Della Volpe, M., Vollero, A., & Conte, F. (2014). *Oltre il manufacturing: l’impresa diventa content provider?* In Conference proceedings: XXVI Sinergie Conference, November p. 553

recipients, while entrepreneurs as co-facilitators of the value creation process rather than as standardized value producers, emphasizing customer integration as a prerequisite for enhancing customization and co-production.

"As cooperative processes involving customers and organisations interactions in all creative activities"[9], processes for co-creating goods are closely combined with the experiences they heighten and in this matter, value co-creation will be a competitive consequence of this collaboration with experienced and creative consumers. In point of fact, the level of customers' participation in new product development processes depends on their degree of knowledge and expertise in a given field. Moreover, in addition to their own skills and their knowledge domain, participation can also be differentiated by the timing in which the consumer takes part in the co-production process. Indeed, co-creation is understood as a two-dimensional structure in which the consumer can act either as a source of information, and as co-producer. In the first conception, consumers co-create in the front-end through idea generation and conceptualisation, providing knowledge input which are ideas and suggestions in the concept phase of the product development. While, in the second case, consumers participate in the back-end phase, where through assembly, co-design and testing processes are run for the concrete development of new products and services; releasing innovation and thus co-creating more value. In this matter, customers' collaboration can be shaped as co-design in the sense that a product's design is based on the digital selection the consumer does from a range of pre-set design configurations in order to customized the offerings' features. In this way, the interaction between the two parties "can support continuous - existing - product developments by allowing those customers that seek particular outcomes in their products"[10] to commit in the activities to co-design them: "generally with the aid of CAD technology and/or professional assistance, creates an individualized product

[9] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era.* Production Planning & Control, 22(5-6), 447-472 p. 2

[10] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era.* Production Planning & Control, 22(5-6), 447-472 p.4

design from a company's style, fabric, colour, surface design, and size alternatives"[11].

These changes underline a transformation in the role that the customer covers in way that it will be expanded. "Beyond their rising interest in personalization and customization, consumers are also increasingly apt to engage in the creation, or at least the conceptualization, of the products they buy. At base, this phenomenon represents a shift in identity from passive recipient to active participant"[12]. The outcome of this phenomenon is an higher co-created value as an advantage for both the organization and the partnered customers. Thus, the development and the exploitation of this interaction aim to set the stage for an expansion of the customers' role in order to achieve a greater value and its potential is then reflected in an upper level of value for goods and services. In that way, customers' utmost expectations are exceeded and a positive experience is set around a company's products and services.

The collaborative nature of this relationship between business and consumers involves the joint creation of benefits for both the parties. The opportunity for the company is that it can be involved in very profitable value creation processes: that is related to product customization thanks to which a company can get an increase aesthetic and functional fit of goods to consumer's preferences. As a result, more satisfied customers will be inclined toward an increment of their willingness to pay as they recognize that it comes from a correspondent increasement in value, resulting from the commitment of active consumers in the creation of solutions to their problems rather than passively choose a product from the shelf. But such array of benefits will be expanded later on.

[11] Fiore, A. M. (2008). *The digital consumer valuable partner for product development and production.* Clothing and Textiles Research Journal, 26(2), 177-190 p.183
[12] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 8

3. The new relation between production and consumption: variety vs custom-made

Many companies have focused for a long time on supply strategies based on product variety: this choice was justified by the expectation of increasing the value of the product perceived by the customer in order then to encourage him to finally purchase the good.

In a saturated market where acquainted consumers have, at their disposal, all the necessary information to make every purchasing decision in the most convenient way, what they expect to find in a firm offering is a focused and effective buying process through which they can purchase any product that meets their needs and their well-stated requirements. What often happens among those who decide to offer customers many product variations, is that, instead of being beneficial, it generates a negative effect in the mind of the consumer. This happens because the potential customer finds himself to sustain some selection costs of the product variant and that compromises the decision-making process that should be, on the contrary, much more simplified. Though, the customer has to learn what the company offers given the multitude of product features available, for what the variants differ from one another and finally he must figure out how these differences affect the use and the end-product performances. As a result, the reaction of customers may be to postpone the purchase or to look for another company in which the offer, although always well stocked, is more limited and so allowing them to reduce the costs of selection due to a too wide variety.

In an increasingly demanding and consciousness society, what triggers the purchase decision is not just the products variety, intended as a range of features and goods in which the customer chooses the option that best suits his needs; but rather it becomes increasingly important to offer the consumer the opportunity to express his preferences, and use them as a starting point for creating a product that is manufactured upon these likes. In other words, the supply of a customized product, rather than a range of variants to choose from, is set as a competitive strategy in today's business: understanding the difference between product variety and product customization is essential to remain at the forefront of a continuously changing market in order to cope with such a dynamic demand.

Unlike product variety, in which the features of the good, no matter how many they may be, are still set by default; customization refers to the specification of a particular attribute indicated by the customer that affects directly one or more operational activities that are then carried out with a custom-made process. Customization tasks can affect different stages of the production cycle: in a manufacturing firm, the consumer may specify his own preferences on, for example, the design rather than the manufacture, on the assembly or on the distribution phases. From this flows the categorization of four different types of personalization: pure customization, customized manufacture, customized assembly and customized distribution. The last step according to a descending order of the degree of customization leads to product variety.

The degrees of product customization aim not only to distinguish the made-to-measure industry from the variety one, but they also classify the customization concept itself. As already noted, in case of variety any stage between the design and the production of the product is run according to the procedures determined by the customer's direct requirements. This does not mean that the company provides a single standard product, but it means that the wide range of products among which the customer can choose is anyway previously fixed by the company. There are many situations in which companies pursue this strategy for the generality of their products, so offering multiple solutions but limiting the choice to the ones available, and then offering in the same time the possibility of placing more specific and customized orders but only for certain categories of services.

Depending on the orientation of the influence deriving from consumers' demands, customization can be categorized moving gradually away from the concept of variety. The closest phase to variety is when customer's specifications are mainly linked to the distribution phase of the product while the design and production stages remain strictly linked to the existing organization of the company. Running a customized distribution means offering the customer a catalogue configured specifically for him according to his preferences, by selecting among the whole range of products that the company already offers only those that turn out to be more coherent with his interest in terms of, for example, the range of prices and transport and delivery options that he highlights in the information related to his demand. The most frequent case in which customized distribution is taking place is given by the increasingly

common online purchasing: in a well-connected society that exploits the potential of e-commerce, personalization's influence is felt in particular on shipping channels where the selection of options as the billing address, the delivery, timing and means of transport are available to the user to allow him to set up on an individual basis the whole process.

To follow, there are those products built from a set of standard components where just the assembly of these takes place according to customized processes by which the consumer can configure his product with his own specific combination of those already predefined components. Moving forward a more detailed customization configuration comes up when customer's requests affect directly manufacturing activities. According to this approach, the consumer is provided with several degrees of freedom to modify a basic product offered by the company in relation to its specific needs. This is possible, however, when the extension of adaptation and reconfiguration of the product are previously defined, so that satisfying customer requirements does not imply any other design activity as the manufacturing changes are settled while remaining within certain ranges of variation. This is the case of many furniture companies, from the kitchen industry up to the interior design one in all its aspects, where products are increasingly tailored fitting the size of the room where they will be installed. The different sizes and shapes require the adjustment of the parameters used in production processes.

Thanks to technological upgrades and all the innovative solutions nowadays applied to manufacturing processes, this approach can be adopted with extreme agility and speed, thus obtaining excellent results in accord with the demands arising in the market. Greater success is ensured by the ability to respond effectively to market demands through the optimization of production processes in line with the trends related to customization and identification.

The peak of these benefits is achieved in the last step in which customization is classified: the more innovative one growing in the digital age. Today's society has reached levels close to the so-called pure customization, where the needs of each customer are taken into account throughout the product development process so that the result is totally obtained by customized, on-demand order. Therefore, with this kind of strategy a continuous cooperation between producer and consumer takes place in order to achieve the best solution for both the parties. To make it happens, all the stages of the process, from the concept up to the production and from the

assembly through the distribution, must be highly personalized. An example of this approach is given by the craft industry in which the attention for details and the ability to respond to every request in a unique and original way leads firms to be highly competitive in a market increasingly attentive to individuality and quality. Accordingly, it will be examined below a business case embedded in the Made in Italy, expression of craftsmanship and value and high technological capacity to better meet the demand.

To turn to the conclusion of this chapter, we can say that thanks to the classification of kinds of customization, the distinction between variety and customization can be highlighted: a concept that is gradually changing the way we produce, we do business, the interaction with the customer and increasing the dynamism of the global market. This concept is pivoted on the idea of customization as the involvement of consumer during the execution of one or more operational business activities in accordance with procedures ordered by specified requirements desired by the customer.

The distinction discussed above here gives rise immediately to the issue of how a company that wants to offer customized products can sustain specific and variable production techniques without taking any loss. The latest opportunity supporting this new demand path is the diffusion of the additive manufacturing processes and more in general the introduction of digital manufacturing systems which enable customers to co-design products that perfectly meet their needs. In fact, the ability of altering design parameters in order to personalized products is already allowed by the AM technology through the ubiquitous accessibility to 3D configurators which are so common and approachable in websites. In the next chapter, the processes and methods that are emerging in order to capture all the advantages of this new wave in demand will be discussed.

CHAPTER 2

DIGITIZATION OF THE MANUFACTURING PROCESS
Changes in the production

The high degree of access and use of technologies in the society has also expanded into deeper contexts beyond relationships between people. In particular, new technologies are also rooted in the processes that affect the true and proper production practices and their related businesses.

This is why today we are referring to the so-called digital fabrication as the broad trend towards the digitization of manufacturing that occurs through dialogue between computers and machines and better sharing of information between human entities and technologies. All of it is possible thanks to the spread of these technologies and the awareness gained from people about their great potential.

In today's economy what matters is the consumer and, in turn, what matters to the consumer is to get what he wants and needs. For this reason, companies are constantly looking for responsiveness, trying to find solutions favourable both for themselves and for the customers: this means that, in order to obtain lasting benefits, each company focuses on customer-based production models built upon increasingly advanced and improved methods and techniques.

Due to this mind-set, a new production structure flows out: the digital manufacturing. This phenomenon has already been started when the first technologies have been integrated within manufacturing processes as automated and computerized controls and through the sharing of information between entities. In a broader sense, it can be observed a growing dematerialization of production processes due to the possibility of encoding the knowledge applied in the production and to reproduce it in digital form. It is therefore a radical innovation within the organization that entails finding a new balance between material and immaterial, between atoms and bits, including local production and on-demand. It is also about redefining all the necessary competences and knowledge, new professionalism, a different logistic and organization of production activities.

In the wide concept of digital manufacturing we can better identify which one is the parent method of it: that is the method of production related to rapid prototyping. This industrial process has achieved great fame through the technological evolution of certain production techniques, among which we find also the one relevant for this dissertation: additive manufacturing. It is a production process in which 3D printers are used to shape the products before they are produced so as to allow individuals to design and produce on demand objects, exactly in the way they need them.

For this we can define rapid manufacturing as the starting point for a new industrial revolution, capable of democratizing the production of objects.

But even if it is not just about prototyping as it were since layered manufacturing techniques started to be used, rapid prototyping (RP) and additive manufacturing (AM) are used synonymously. But with special attention paid to the fact that the rapid prototyping field also includes other advanced production techniques not necessarily additive although, while the application of different 3D objects construction techniques used in production processes are mainly included in the additive manufacturing category.

In the AM processes the objects are generated for stratification and addition of material directly into a single piece. As will be seen, this involves radical novelties in terms of realizable geometry, material consumption, input type to be used, the cost of variants, the overall cost and logistics structure. In order to better understand the main advantages of these "technologies that become digitally empowered", we should firstly have an overview of the emerging fields "with potential for exponential growth including additive manufacturing, robotics, and materials science"[13].

a. Additive Manufacturing

Additive manufacturing is a production technique that, even using very different technologies between them, allows the creation of objects (components, semi-finished or finished products) by adding layers of material (from here comes the

[13] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p.15

name additive manufacturing). This is in contrast with what happens in many of the traditional production techniques in which processes are run by subtraction from the full (subtractive manufacturing) as it is production methods such as turning, milling, moulding etc.

Fragmentation of the markets, a more and more compressed products life cycle, increasingly high demands performance and sharp increase in customization, are some of the guidelines that push in the direction of customization, the paradigm by which it is theoretically possible to produce very small batches at low cost, while respecting stringent service target. AM fits perfectly because it includes all the applications of the latest technology, including modelling, prototyping, tool-making, and the production of end-use parts in volumes of one to thousands or more.

In many areas, these developments have undermined the traditional productive paradigm not necessarily competent to handle in effective and efficient way a scenario characterized by:

· Increased complexity: products must increasingly meet more stringent requirements, in terms of function, aesthetics or competitive prices but also, for example, recyclability or energetically efficient products. In this sense, the manufacture will stop being simply the production of goods and materials while shifting more towards a range of solutions in which the physical product will serve as an enabler of a wide range of intangible services;

· Increased customization: more and more often customers require customization of the product to meet their unique needs. In order to stay competitive in the market companies should expand their offer, trying to efficiently produce minor amounts of a greater number of articles. This is the well-known "long tail" by Chris Anderson [Chris Anderson, The Long Tail: Why the Future of Business is Selling Less of More, 2006], which already in 2006 had sensed this paradigm shift.

To operate in this constantly evolving environment, different tools are now required as it happened for Additive Manufacturing techniques which are economically viable for the production of small lots of small and complex objects.

KEY PRINCIPLES

AM technology was initially limited to the production of prototypes with the aim to obtain, during the product development process, the evident assessments in real and immediate time in order to be able to remedy promptly to any changes. This practice has become so common today in many industries and includes the production of parts and components but also of finished products.

Some key points differentiate AM technology from traditional methods:

- AM is a manufacturing versatile machine that allows to turn any 3D model directly from digital to physical through standard interfaces and applications. In this way, a series of on-demand products can be made quickly while keeping costs low.

- Customization and flexibility are guaranteed thanks to this method of production, impacting on benefits coming from the elimination of setup time and costs of the machineries, though increasing flexibility because production volume can be altered without penalty.

- AM provides higher levels of complexity without affecting on production costs, thus increasing the variety of products without having to undergo too many design constraints. In addition, product design can be easily customized as any kind of tools or molds are no longer required.

- Thanks to the opportunity offered by AM to produce directly integrated parts, thus reducing the number of steps involved in the production process, there is a reduction in assembly work since it is included in a single step without requiring too much manual intervention.

In terms of technological advantages, they derive mainly from the technological supports this method leverages on. It refers to the increasingly widespread 3D printers capable of receiving specific information from a computer to produce a piece without any adjustment to the working characteristics of the machine: the CAD file, thanks to its widespread compatibility, can be performed from any machine giving rise to production in different places and with different materials. Consequently, every

business can reap benefits from the absence of tools or molds, and in particular "setup and changeover costs are negligible as only a different CAD file needs to be uploaded into the machine when changing the product to be manufactured"[14]. With direct digital manufacturing, without the involvement of too many machines, the complexity of design can be increased and so fostering customization. That is possible without any negative impact on costs, as a more sophisticated production process based on AM does not imply an increase in production costs, unlike for conventional technologies where the unit cost normally increases accordingly with greater levels of design complexity. Surely, even because "AM enables the production of functionally integrated product designs in a one-step manufacturing process. Certain functions, such as moving parts or cooling systems, can be integrated directly into the produced parts without Involving additional manufacturing or assembly steps, further reducing manufacturing costs two to a decrease of production stages"[15].

So, in terms of improvements in the manufacturing process we can figure out that AM has several advantages since "the price of additive manufacturing is dropping, making AM increasingly competitive with conventional manufacturing due to differences in fixed vs. variable costs"[16].

b. Robotics

Industrial robots were initially used only for special tasks that required their utilization for the purpose of precision and high level of processes complexity. Furthermore, only large-scale industries could face the initial investment required for these technologies. Nowadays however, the situation is evolving in favour of these methods because, while labour costs continue to rise, a new generation of cheaper and highly competent robots enters the global market. Robotics impacts on

[14] Weller, C., Kleer, R., & Piller, F. T. (2015). *Economic implications of 3D printing: market structure models in light of additive manufacturing revisited*. International Journal of Production Economics, 164 p. 44

[15] Weller, C., Kleer, R., & Piller, F. T. (2015). *Economic implications of 3D printing: market structure models in light of additive manufacturing revisited*. International Journal of Production Economics, 164 p. 45

[16] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 16

production processes not only in terms of improved results, more accurate and sophisticated, but also on the workforce involved: human being cooperate with these technologies according to the spread of the so-called cobots, those robots that work directly with humans in the workplace.

“Though robots will not replace human labour in manufacturing in the immediate future, they are poised to take on an increasing share of the manufacturing floor. This is likely to reduce the number of low-wage, low-skill human manufacturing jobs while generating a relatively small number of specialized higher-wage jobs in programming and maintenance”[17].

c. Material science

As for any new technology, the more one is used, the more accessible it becomes. The same logic happens in the case of new materials that were previously inaccessible to all, and only to the most advanced manufacturers could afford them. But thanks to the development of production technologies and to a better use of energy systems, materials like carbon fiber are now produced at much lower prices. It leads to the production of dynamic materials not only able to adapt to the environment, but also to human needs. The first kind is useful in the field of adaptable architectures and the latter is related to a higher value in custom applications. "As these materials develop, we can expect to see more physical objects reacting dynamically to suit our needs across contexts", and "manufacturing improvements as lower costs and other barriers to access, we can expect to see such materials used in mainstream applications"[18] .

In a so heavily technological economy, progress in an industry leads to progress in another related one. So, as advances in the energy and in the materials science fields lead to a deployment and expansion of additive manufacturing, increasing the choice of printing materials, therefore the convergence of all these factors in these

[17] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 17
[18] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 18

new technologies will accelerate their progress and reduce barriers to entry in an advanced and customized manufacture.

2. Economic Advantages

Every company should develop some guidelines in order to help the management to understand if it might be beneficial for the organization to the use these technologies, not only considering their potential but also by assessing the technical and economic feasibility, and estimating the benefits compared to the current scenario.

Shown below an economic analysis is developed, with the aim of assessing the actual affordability of 3D printing applications and its main economic advantages. In this sense, we have already stated above that, thanks to the additive techniques, companies have the ability to design and produce products with advanced structures and geometries, so they can offer increased performances and functionalities, such as to guarantee the satisfaction of the needs previously considered beyond the potential of traditional technologies. Exceeding these limits and gaining benefits from the following advantages often turns into a lower cost of management of products during their production cycle.

From a general point of view in terms of economic advantages we can state that, “when the burden of production is transferred from the physical world to the digital world, engineers can design intricate, previously unproducible shapes. And manufacturers can produce stronger parts that require less assembly time, reducing the overall cost of production and increasing the value of the final product”[19].

[19] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p.17

More in details, the main advantages are:

→ *Free design and complexity: Customer co-design of products without incurring cost penalty in manufacturing*

Compared to conventional technologies, additive manufacturing abolishes almost completely the technical constraints of objects geometries.

At greater freedom in terms of realizable geometry, moreover, is associated with a lower number of parts to be assembled: this obviously determines not only a lower labor cost per unit, but also higher levels of technical capabilities differently from the case in which traditional techniques provide for the welding of most pieces: the welds are not only expensive but they also are points of fragility. Next to these potential benefits on a technical and functional level, a second set of considerations relates to the aesthetic of the objects produced with the techniques of additive manufacturing. Minor structural constraints on the designer's creativity, in fact lead to an expansion of design possibilities, looking for the most beautiful forms, original, distinctive, and so on, as circumstances which can be commercially exploited.

"The major driver for using RM is in design area since it offers the capacity of producing parts with unlimited geometry complexity"[20]. Conventional techniques of production are usually highly dependent to geometry complexity give that they are based on tooling. In this sense, design is 'frozen' in some constraints such as times and costs of producing new tooling for any change to part geometry. Therefore, in the traditional designing phase "manufacturing requirements and constraints are represented to designer so that he can design the required product in a way that it won't be hard to manufacture. But with the help of rapid manufacturing the only limitation is the designer's imagination and the design tools. So, Design-for-Manufacturing is shifted to Manufacturing-for-Design using RM"[21].

[20] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 40
[21] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 40

→ *No cost penalties in manufacturing for higher product variety: Part consolidation and molding elimination*

The most significant difference between the conventional techniques of production and additive manufacturing ones relies in the kind of machines used to carry out the manufacturing process. In fact, "with rapid prototyping techniques, objects are created from a three-dimensional computer aided design (CAD) model without the use of either moulding or tooling"[22]. As a consequence, the elimination of injection molding and of the other traditional methods has allowed, as already stated above, designers to free their design intent without being restricted in what they want to produce by the inherent restrictions enforced from a particular mould usually used univocally to produce a single item.

Moreover, additive manufacturing not only implicates the reduction of tooling and so enabling design and geometry complexity, but it also eliminates another restriction of conventional production which considers parts manufacturing. Less steps are required since there's no need to create new molds with different patterns and parts are produced directly. This is known as part consolidation and it "will also increase the opportunity of making more complex parts while reduction in assembly and sub assembly means less labor and less cycle time"[23]. To sum up, reduction and elimination of molding together with part consolidation reduce "assembly, tooling, inventory, waste and inspection costs with AM's high flexibility in geometric complexity design which defines the main advantages of direct part manufacturing"[24].

→ *Cost advantages*

Additive manufacturing is convenient in terms of cost under two different points of view. Firstly, thanks to the absence of moulding and tooling, it's needless to say that a huge cost is taken away since the creation of new tools, which is usually so expensive, is not required anymore: just a switch of the CAD file is necessary to start the production of a new item, lowering the expensive engineering changes regarding product design together with production tooling. Though, it benefits not only in terms

[22] Hague, R., Campbell, I., & Dickens, P. (2003). *Implications on design of rapid manufacturing.* Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science, 217(1), 25-30; p. 25

[23,24] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 36

of monetary costs but also for a decrease of time to market due to the fact that the product development process can be launched quickly without any long wait at the early stage.

Tightly linked to the first one, the second "thing to be mentioned is that the need for a huge initial investment most of the times prevents new products to enter the market. With the help of RM there is no need of consideration for tooling or moulds"[25]. In other words, the up-front investment is drastically reduced in the case of additive manufacturing and this makes the total cost even less compared to the traditional production. Even considering that "the material cost of printing a complex design is less than that of printing a solid block, since it requires less time and material"[26]. Hence, changes in productions and higher products variety can be achieved cheaply and rapidly.

Differently from traditional manufacturing, rapid manufacturing doesn't require production costs to be spread and absorbed over a huge volume. The time to volume then becomes an economic advantage thanks to rapid technology since this method of production is more effective when the batch size is small. "RM is well serving products of one or few but with high details and high profit per product unit. Using conventional methods for production in low volume will require a high cost of tooling, set up, etc."[27]. However, given that no molding is required when additive manufacturing is used, it will be more efficient to produce such end products.

→ *Acceleration and simplification of product innovation: Less time to market, end products are rapidly available*

The ubiquitous use of 3D printers is highly correlated with the use of CAD files and their combination brings out a lot of benefits. Due to their strong integration with the most technological and advanced production techniques, they have spurred productivity by enabling primarily a faster time to market while shortening the time required for product development processes: CAD files have improved manufacturing

[25] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 42
[26] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 17
[27] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 41

processes because they allow users to generate codes needed to drive the machine and the printer for the production of parts or of the entire product.

Moreover, beyond a strong shortening of the prototyping times (and therefore of the design time); these methodology enables the elimination of any uncertainty linked to any possible error in the interpretation of the project drawing. “From that point on, CAD systems have been developed allowing for part design and production simulation. Engineers have the ability to visualize both the part and the production process, to verify the quality of the product and then physically to perform the manufacturing process with minimum error probability”[28].

→ *Reduction of assembly work with one-step production of functional products*

The previous point is strictly related with a speed-up of the manufacturing process, from which the end products are created. In fact, in order to boost productivity, not only the steps required during the product development phase should be implemented by CAD files as we seen above, but even all the steps required to produce parts through 3D printers should be accelerate.

“RM will hide the constraints of Design for Assembly in the area at which it reduces the number of parts which are going to be assembles. In other words, it is able to manufacture sub-parts consolidated in only one part”[29].

“Moreover, lead times for the production of single batches of product variants can largely be reduced, while product variants can be produced in any sequence without additional changeover time or switching costs. Thus, AM potentially enables an efficient lot size of one”[30].

Factors as lead time, “quality and manufacturing cost of the final product are determined again in both the design and production phases. This demonstrates that

[28] Chryssolouris, G., Mavrikios, D., Papakostas, N., Mourtzis, D., Michalos, G., & Georgoulias, K. (2009). *Digital manufacturing: history, perspectives, and outlook*. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 223(5), 451-462; p.453

[29] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 41

[30] Weller, C., Kleer, R., & Piller, F. T. (2015). *Economic implications of 3D printing: market structure models in light of additive manufacturing revisited*. International Journal of Production Economics, 164 p. 45

there is a significant need for a bridge to be built between the production of development and the real production; digital manufacturing aims to play this part"[31].

→ *Less inventories are required thanks to make-to-order processes*

A first issue concerns the changes in inventory management and logistics activities. Starting from a CAD file, in fact, additive manufacturing allows to create unique parts or small series without the need to organize all the preliminarily complex devoted artefacts and tools such as molds, casts and so on. Hence, additive manufacturing will greatly decrease the need to hold stocks of spare parts given that they can be "printed" just in time. Consequently, stock optimization and complicate internal logistic activities are then reduced and the related time and cost to get them organized expire as well.
Secondly, since products are made only after ordered, there is any unsold finished items inventory, and the relative risk is then avoided.

→ *Local production and simplified distribution*

The possibility of reducing the inventories derives also from the opportunity to create components and parts in real time when it is necessary or in any case without having to wait for any shipment from third parties. The relatively low cost of the additive manufacturing machines and their setup, has led companies to rethink about the manufacturing locations.

First, the easy acquisition of additive manufacturing tools combined with the possibility to produce small batches, allows to bring production at the local level, at the point where a product is required or at least in close proximity.

In addition, rapid manufacturing provides for distributed manufacturing "so that parts may be made in or near the location where they are required, rather than being moulded at one production facility and shipped to the required destination. This

[31] Chryssolouris, G., Mavrikios, D., Papakostas, N., Mourtzis, D., Michalos, G., & Georgoulias, K. (2009). *Digital manufacturing: history, perspectives, and outlook*. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 223(5), 451-462; p.458

simplified distribution may be particularly useful for the provision of replacement parts etc. as it will also obviate the need to store spares"[32].

This simplified distribution results in even more advantages in terms of less haulage required and so "the packaging, transportation, and lead time will be decreased thanks to the decentralization of the production system"[33], and that will be translated to less costs and time efforts.

→ *Lowering waste*

Another economic advantage is about waste management. Indeed, the possibility of decreasing transportations for the distribution makes this method is environmentally friendly thanks to the less impact on natural resources and a lower incidence of fuel costs. Among the other benefits that digital manufacturing implies there is also one related to the reduction of waste because of the use of additive methods instead of subtractive ones. In traditional manufacturing, all the production specifications must aim to minimize the subtractive activities, according to the idea that the less material is removed, the less it costs. However, in the case of additive manufacturing, the logic of productive efficiency maximization results in a design that minimizes the use of material, according to the principle for which the less material is used, the less it costs.

Finally, another benefit in term of waste is about "better functionality of the products manufactured by RM: the advantage gained is defined as the term optimized product. An optimized product can be lower weight product or better featured product. Either way it will result in reduction of energy and natural resources consumption"[34].

→ *Premium price can be achieved through customization and improvement of products*

As we noticed some paragraph above, one of the great advantages of rapid manufacturing is that without any tools or molds involved in the production process, there's no need to mass produce parts over which amortize costs. As a

[32] Hopkinson, N., & Dicknes, P. (2003). *Analysis of rapid manufacturing—using layer manufacturing processes for production.* Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science,217(1), 31-39; p. 32

[33,34] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 42-43

consequence, the possibility to print directly few items leads to the potential for more custom-made products.

As already highlighted, design freedom is allowed by 3D printers and this, in turn, allows for higher customization and involvement of customers in the design process. One of the main advantages is that, since the demand for custom made product is every day more pressing, through AM technologies firms can meet easily any specific customers' demand, remaining competitive in the market and leveraging on this strength as a key factor if they want to profit from it.

"Lower cost combined with design freedom will benefit both manufacturer and customer which mean better customer satisfaction"[35]. Needless to say, then, that "product customization potentially yields an increase in customers' perceived product value and, thus, higher willingness to pay"[36].

In commercial fields such as furniture, lightning, office accessories, fashion and other consumer products, people are already familiar with some interfaces and web-enabled software that allow consumers to be included in the design process and to enable them to produce or modify some options to their components in order to end up with a customize product. Consequently, a positive correlation can be found in the degree of matching between the design freedom and the consumer's needs. The more a design fits the demand, the higher the premium price a consumer is willing to pay is.

In other words, the higher quality and uniqueness perceived, in addition to "the opportunity for consumers to design their own desired products or to buy custom and edited products, and designers to quickly step in the market after making their prototypes"[37], "will present tremendous profit-making opportunities for manufacturers who pursue rapid manufacturing as an alternative to conventional techniques"[38].

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[35] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 40

[36] Weller, C., Kleer, R., & Piller, F. T. (2015). *Economic implications of 3D printing: market structure models in light of additive manufacturing revisited*. International Journal of Production Economics, 164 p. 45

[37] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 36

[38] Hague, R., Campbell, I., & Dickens, P. (2003). *Implications on design of rapid manufacturing.* Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science, 217(1), 25-30; p. 27

a. Supply chain re-organization

The focus shifts from products to consumers, according to the customer-oriented perspective, and has led to a redefinition of the roles within the supply chain and a reduction of it following the benefits of digital manufacturing.

From a more technical point of view, the development of additive manufacturing could reduce the incentive to relocate production to low-wage countries: the labour factor affects less the total cost, the cost of raw materials is substantially identical and less environmental pollution problems associated with 3D printing reduces the importance of the advantages of countries with less stringent environmental regulations. In other words, it is expected to redefine the supply chain, from a global perspective towards regional connection between business relationships. “First, because manufacturing no longer needs to be centralized for high-volume production, low-cost sourcing of suppliers no longer makes economic sense. This will result in the localization of both production and sourcing”[39].

Traditional methods of production rely on different combinations of modular parts and raw materials are usually pre-assembled components that come from multiple suppliers which are highly integrated along the supply chain in order to ensure that every part is available accordingly to specific quantities, time and features. Differently, for what concerns 3D printing, raw materials are varieties of materials to be fused in order to print object. Hence, this method uses supplies readily-available to be purchased from a few number of vendors.

“RM usually eliminates some stages of assemblies”. As already stated, through part consolidation it is possible to create products as they are assembled, so in this way there is no need to spend time in producing sub-components and put them together. “This time which is spent for set-ups is not value adding time, so there will be less waste time”[40] and time reduction is just one of the advantages of AM in the supply chain.

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[39] Petrick, I. J., & Simpson, T. W. (2013). *3D printing disrupts manufacturing: how economies of one create new rules of competition*. Research-Technology Management, 56(6), 12-16; p. 4

[40, 41] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 48

Another non-value adding activity is about transportation. “Transportation of unfinished products between stages, can be eliminated or at least decreased by RM, because it requires less stages for manufacturing parts”[41]. In addition, thanks to the availability of 3D printers and AM technologies, the production can be now located closer to the consumer and in the market where it is required in order to decrease even more the need for transportation.

Furthermore, due to the continuously changing demand and the higher request for customization, any supply chain needs to leverage on reconfigurable system that can be quickly adapted to every situation. Rapid manufacturing can easily keep the delivery time short “because of the opportunity of distributed manufacturing which helps to shift the production closer to customer. But also in case of demand variation, which is normal in agile supply chain, this method helps to deliver the unpredicted orders thanks to its rapid techniques”[42].

In traditional value chain, any product after its production goes through a series of different parties that forerun the consumer. Lot of value and time are then stuck in intermediaries and all these steps create a sense of disconnection between the makers and the customers. In nowadays society where digital information and connected infrastructures continue to cut the distance between manufacturers and customers, the value of having available items in one location and the value assigned to direct interrelation, are going to slip the role of intermediaries whose sole value is to hold some inventories that are no more necessary due to the possibility of produce the right amount of goods required. “The most likely survivors will be those that create more value for consumers, perhaps by providing useful information, helping people make choices, or allowing buyers to experience products in new ways. For the same reasons, successful manufacturers will be those that can engage directly with consumers, narrow the gap between prototype and product, and move their business models from build-to-stock to build-to-order”[43]. In a build to stock model “intermediaries reduce speed to market and require capital to build up inventory; while in the case of built to order, they can also make it more difficult for

[42] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 49

[43] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 28

manufacturers can have easy access valuable consumer insights”[44]. This situation damages the position of manufacturers that heavily rely on large intermediaries, let smaller players to gain more visibility and market positions due their ability of being more responsive to any change in consumer needs since they count on a direct relationship with them.

With this new trend in the business, the role of customers is increasingly seen as part of the supply chain where his direct engagement plays a key role since through a constant communication it is possible to share reciprocal information and “even suggesting potential solutions and recommending specification upgrades, several of which were incorporated into the product”[45]. As consumer preferences shift toward personalization and customization a direct access to consumers is going to become a competitive key factor.

“In general, less waste, better flexibility, re-configurability, fast customization compatibility, reduction in stock level”[46], makes additive manufacturing significant to provide different advantages to the supply chain. In some industries, the customer is involved in the first phase of the production process in order to engage him in the design realization of some products following the so-called pull system path. “Pull system helps to produce exactly what is required in the required amount (lean) and if the market is volatile then the variety of products forces to have a flexible production system to act fast regarding order (agile)”[47].

3. Innovative product development

Regarding the development process of the product and its innovation, we can say that for years many designers have used digital manufacturing to create unusual shapes and structures, since this was allowed by the availability of advanced technologies. The product development process has benefited in many ways thanks to the introduction of additive manufacturing methods, relying on tools such as CAD

[44] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 31
[45] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 30
[46, 47] Aliakbari, M. (2012). *Additive manufacturing: State-of-the-art, capabilities, and sample applications with cost analysis*; p. 50

scripting and generative modeling methods. Product development has seen its implementation not only at the local level where the designers are allowed to modify and vary each single artifact according to the needs during the planning and design phases, but has also seen its improvement in the case of high-profile international projects that have been designed digitally.

Through the exploitation of digital manufacturing, several benefits can be achieved for the product development management:

"(a) shortened product development;

(b) early validation of manufacturing processes;

(c) faster production ramp-up;

(d) faster time to market;

(e) reduced manufacturing costs;

(f) improved product quality;

(g) enhanced product knowledge dissemination;

(h) reduction in errors;

(i) increase in flexibility."[48]

a. Higher complexity

A major advantage that comes from digital manufacturing is the ability of this technique to produce high quality material representations for complex designs.

As stated in the list above here, one benefit is the reduction of time require to produce and release the product in the market. That is essential since customization means more variety and a quickly response is important. Rapid manufacturing keeps

[48, 49] Chryssolouris, G., Mavrikios, D., Papakostas, N., Mourtzis, D., Michalos, G., & Georgoulias, K. (2009). *Digital manufacturing: history, perspectives, and outlook*. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 223(5), 451-462; p. 459

high level of customized parts and helps to better managing the delivery time in the same time.

In order to efficiently combine complex design together with faster time, improved quality and reduced costs, additive manufacturing techniques rely on different tools that open up the opportunity of product design optimization thanks to "the ability to describe every aspect of the design-to-manufacture process digitally – using tools that include digital design, CAD, office documents, PLM systems, analysis software, simulation, CAM software, and so on"[49]. The simulation activity has become one of the most competitive phase through which decision makers and designers can investigate the complexity and figure out the best way to do things, without any restriction in attempting and changing the project along the way. A deeper technique that can be used in manufacturing system is the virtual reality technology, an extension to simulation, that "has enabled engineers to become immersed in virtual models and to interact with them. Activities supported by VR involve factory layout, planning, operation training, testing, and process control and validation"[50].

b. Digital manufacturing facilitates customization

To reach customisation the customer specifies the product in such a way that the item produced meets his needs completely. This can only occur with low volume goods and when the wait for tooling to be manufactured is negated and the cost of such tooling removed given that it can't be amortised over a large number of units. Due to the fact that digital manufacturing doesn't rely on these machines, a radical restructuring of the manufacturing sector towards local production of small-scale and high-quality products arose. Customer expectations on quality increase and quality becomes a differentiating factor from competitors. Compared to the past, quality is not only a guarantee in the strict sense of being aligned to the requirements, but today means satisfying the needs expressed by customers. As a result, we can expect greater customization and therefore a greater variety to meet the needs of the consumer. This implies the possibility of producing highly detailed products with

[50] Chryssolouris, G., Mavrikios, D., Papakostas, N., Mourtzis, D., Michalos, G., & Georgoulias, K. (2009). *Digital manufacturing: history, perspectives, and outlook*. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 223(5), 451-462; p. 454

minimum defect margins thanks to computer control techniques and a wide possibility to create on-demand models.

Moreover, thanks to the widespread connection between people it is certainly true that companies have at their disposal lot of data about the tastes and the behaviour of their customers, and this advantage is coupled with the ability to interact directly with them through the Internet. That is the result for the enhancement of the potential of additive manufacturing in the transformation of the typical organizational processes in the light of the potential of the network and of 3D printing in terms of customization of products, based on the tastes, needs and the specific propensity of consumers to participate.

“The digitization of manufacturing, along with the exponential growth of subtractive and additive digital fabrication technologies and robotics, has made manufacturing more repeatable and portable”[51]. When a client has a demand of products in a small or medium quantity, companies can easily design the structure and figure out the materials, and thanks to network that facilitates the communication between the parties, essential information can be shared in time and transfer to the manufacturing point. “Increased digitization is likely to further lower the cost of customization, giving more advantage to distributed small-scale local manufacturing that captures consumer needs”[52].

c. From product to platform to service

Digitization of manufacturing processes relies on some software platforms that create a sort of bridge between the information insert by the consumers and how they are then translated in a properly language to enable the production. It is about platforms connected with app in which new instruction about the product are delivered in response to any shifting needs, allowing a greater and faster range of customization.

[51, 52] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 23

From product to platform: The concept of creating and projecting a product is changed. The design and the features are now set through a different path in order to allow a higher personalization from third parties that increase consequently the value of the basic product. The product becomes a platform, its shapes configuration takes place in that specific platform where different add-ons and options can be built accordingly to the individual needs. "What is new is the upsurge of products designed from the start as bases for third-party extensions from partners and others"[53]. Companies that extensively use this concept are including the idea of product as a platform within their business strategy to boost customization: "introduce a product platform, then invite multiple third parties to create modular add-ons that extend the value to the customer"[54].

From product to service: "Today, however, the expanding digital infrastructure—low cost computing and digital storage, ubiquitous connectivity, and a multiplying number of connected devices—has created many more opportunities to fundamentally rethink the product as a service"[55]. This shift affects not only the way products are conceived, but also how all the services related to a product are carried out thanks to the ubiquitous use of technology. Great opportunities are dictated from the latest trends in business such as the so-called sharing economy where, through the digital infrastructure, a company can change the nature of its business following the idea of commoditize sharing of underutilized goods and services; one more, the case of simple products transform into smart products as the Internet of Things takes place. "The pervasive expansion of sensors, connectivity, and electronics will extend the digital infrastructure to encompass previously tasks, processes, and machine operations"[56] and to reconfigure products in a way that allows collaborative consumption such as the case of direct remote control of digital items up to the integration of devices into our clothing and accessories so that the product as a service becomes wearable.

[53] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 12

[54, 55] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p.12

[56] Hagel III, J., Brown, J. S., Kulasooriya, D., Giffi, C., & Chen, M. (2015). *The future of Manufacturing-Making things in a changing world.* Deloitte University Press. p. 11

d. Higher value integration

Personalization and attention given to consumers' tastes and preferences are two key points through which is possible to increase the value of a product. Added value can be derived thanks to the opportunity of co-creating goods and services based on the interaction between customers and manufacturers, all the information gather from customers can then be translated into codes to be used during the development process in order to produce tailor made products. This in turn benefits both the company that will be able to earn premium profits and visibility and the customer whose satisfaction will be higher.

Thanks to the advances in information technologies that ease communication, as the case of Social Networks and the Internet in general, together with all the interfaces available to let the consumer interact in the e-marketplace with the products a company offered and the main features of the digital manufacturing we have already cited above, nowadays any forward-thinking firm can "integrate organisations' competencies and involve customers' individual preferences into network and community formations for the co-creation of the next level of value for products, services and experiences to be launched into the market"[57].

[57] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472 p. 1

CHAPTER 3

BUSINESS MODEL ORGANIZATION
Information and communication as new norms in business

An effective use of the new technologies has helped lots of companies embracing the digital world to scale up in their business sector, overcoming the ones that are still waiting for any change from the traditional business. One key factor to succeed is the ability of the incoming business era to shape new expectations thanks to the advancements in information and communication. This means that through digitally empowered communication systems, learning and data are on the way to become more and more transparent and personalize, providing for better awareness of the market demands. Hence, the consciousness of the abundance of all the useful information available should be use by companies in order to gain advantage in understanding what the needs are and turning this data into actions. The gap between gathering all the information and translating them in productive plans must be as short as possible in order to succeed before all the other players: real time information-driven decisions are the new pattern which is the basis for a useful decision-making process in business. The ability to communicate and interact with customers helps the company to find new opportunities in the market and to demonstrate it is able to coherently turn them into effective results and moreover, use them to innovate in an agile way. As digital contents become so common not only in communication through different interfaces but even in products since smart products and sensing goods are continuously improved, businesses should learn how to operate rapidly with all the data coming from customers and from connected products as well in order to clearly grasp the demand and consequently respond in the most proper way to then succeed. So, with the change in the nature of the way value creation comes, what is going to be relevant is collaboration, information, data and learning: all these aspects are the basis for powerful and competitive business models.

1. The integration between real and digital

In today's business scenario, a new approach within a firm organization is arising and that is related to the ability of a firm to integrate the real processes and activities with the digital projects and procedures that virtually plan and develop the organization's reality. This new model can be referred to the digital factory concept where a network of digital methods and tools are integrated in the company from the planning phase up to the production process and even applied to the control of the firm. These tools are for example simulation and 3D visualisation techniques used to optimized the production process and the operative planning and control as a whole, bringing benefits in terms of increasing innovation and flexibility, improving communication and facilitating catch costly mechanism in the upfront of the product lifecycle and manufacturing process as well as in the whole management. "Modelling and simulation techniques enable dynamic analysis to ensure that plant design problems and waste are discovered before the company ramps up for production. Further simulation technology ensures ahead of the start of production, that the factory will be able to meet the demands for efficient operations"[57].

One interesting case of plant and organization optimization is about the use of technologies to improve material flow and logistics: thanks to the development of wireless technologies, a firm can ease its logistic activity by using the radiofrequency identification which retrieves the items and their location in the stock by using bar codes or other identification tools. This helps to monitor every movement of the items and quickly gather information about them.

As far as we are talking about a digitally connected firm, this approach will improve the collaboration between all the levels of a company, especially between the production planning and the execution by improving in this way the process control and so delivering accurately customer orders all along the stages; reducing time and quality problems since any errors can be modified in real time. "The digital factory concept requires the integration of design, engineering, planning, simulation, communication and control tools on all planning and factory levels. […] Therefore an

[57] Kuehn, W. (2006). *Digital factory-integration of simulation enhancing the product and production process towards operative control and optimisation*. International Journal of Simulation, 7(7), 27-39 p.30

open architecture is an important feature of the digital factory concept. […] Open interfaces and interoperability are the key factors for implementing digital manufacturing concepts"[58]. In order to do that, an open architecture should be created relying on standard interfaces, easily accessible by all the personnel where information is shared and converted by 3D platforms, where the knowledge coming from different departments at different levels of the manufacturing process is well integrated in order to work efficiently and develop an effective cooperative engineering both within the company and with external entities as suppliers and clients.

2. Collective creativity: a new way of working

An efficient business model must be set so as to allow the company to carry out its activities in a competitive and targeted way depending on what are the trends in the market. Nowadays, given the widespread use of technology and the parallel use of the internet as an information hub, the business model should be structured taking into account the great impact that these digital technologies when integrated within the organization. The benefits of digital manufacturing, as seen previously, profit a company in its production process, but even before this stage the distinctive advantage due to the digitization of the company is determined by a new way of working based on people's connection with the company. Thanks to the interaction of web users in virtual communities usually grouped in industry categories, the company can capture all the demands of the moment and find new product development opportunities through the ideas shared in the portals to which it is registered or where there are discussions about it, increasing the spectrum of customers and powering up new initiatives based precisely on a process that has, as a starting point, collective creativity. Collective creativity provides access to a dimension in which customers' knowledge is widely shared among groups that share the same interest. The consequence of this way of doing work based on sharing and communication is that a more open business model is necessary to be sustained:

[58] Kuehn, W. (2006). *Digital factory-integration of simulation enhancing the product and production process towards operative control and optimisation*. International Journal of Simulation, 7(7), 27-39 p.35

creative work can occur by the direct interconnectivity between customers and manufacturers allows by the digital platforms spread all around the world through the network.

Ideas and information are the basis from which new products are conceived and innovation is boosted. “Dozens of disparate people, each with some useful knowledge about a given topic, pool their contributions in a single online source that is constantly edited, refined, and updated”[59] from which the company can grasp useful information and translating them into products’ improvement to carry out innovation quickly and, above all, coherently with what is expected by the market. In this way, a firm can successfully develop new ideas and meanwhile reducing the uncertainty thanks to the direct connection and communication with customers that helps to understand their needs and liking.

Digital tools and internet have a great impact on the collaborative innovation process since customer engagement is high and can be used to spur product innovation through a variety of mechanisms by which the customer and the designer can be virtually connected as it is allowed for example by real time imaging software. Value co-creation is enhanced together with speed and flexibility in releasing a high fitting product. “Collaborative networks represent a promising paradigm together with customer communities to emphasis on core competencies, personalisation and innovation, supported by collaborative mechanisms”[60] that help to succeed in the current economies of personalization since there are big differences from the traditional economies of scale upon which every company should be rearrange its own business model.

[59] Merges, R. P. (2009). *The Concept of Property in the Digital Era*. *Available at* http://scholarship.law.berkeley.edu/facpubs/1012/ p.1248

[60] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472 p.1

	Traditional economies of scale	Collaborative economies of customization
Business innovation perspective	Firm-centric	Customer-centric
Competitive source	Low cost production, high volume batches on which costs are spread	Flexibility, speed, customization
Business model	Efficiency, delocalization of production, value creation in R&D and after-sale services	Open business model, sharing and upgrading, manufacturing as a valuable activity
Role of costumer	Passive-customers voice to test products	Active-customers as partners to innovate
Interaction	One way dialogue from firms to customers on contingent basis	Two way continuous dialogue between firms and customers
Innovation	Based on individual knowledge, push strategy	Based on social and experiential knowledge, pull strategy
Design	Limited by production constraints (set-up machines), design for manufacturing	Free geometry and high customization (CAD file change), manufacturing for design

Table 1: Economies of scale compare to economies of customization.

(source: personal elaboration)

3. Open business model and collaborative organizations

In order to create value and spur innovation a firm should relies on a system able to be flexible and adaptable to external drivers, a prerequisite linked to a new business model approach typical of the so-called collaborative networked organizations. “Collaborative Networked Organisations (CNOs) show a high potential as drivers of value co-creation, allowing organisations access to new knowledge, sharing risk and resources, joining complementary skills and capacities, which allow them to focus on their core competencies. In addition, collaborative networks induce innovation, and thus co-create new sources of value by confrontation of ideas and practices, combination of resources and technologies, and creation of synergies”[61].

a. Dialogue and Communication

In order to sustain an open business model based on sharing, one fundamental change is required in the communication strategy that a firm pursues.

[61] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472 p.1

That means the marketing strategy should be redesign to enable a continuous dialogue with customers and with all the entities with who the firm has a business relation. Moreover, even the communication within the organization must be rethought to support knowledge sharing all along the company in order to act and work coherently to create value.

By creating digital environments designated to contain all the data and information achievable from the customer and reusable from the internal personnel, firms can improve its knowledge and quickly react to offer products and services in a successful way. The widespread deployment of the internet together with other digital tools let the company enhances the ability to gather information useful for the product innovation process and even to reach higher level of customization in tune with the current demand, as we will see later on in the case study presented.

Customers involvement in designing the product they desire is enabled by all the customized information they offer on the web and in the feedback obtain by a direct dialogue with them. This means that the way a firm communicate changes and becomes customized as well: the customization process begins with the planning and design of a proper solutions according to the demand which is then exhibited to the customer through a personalized way too; customization then continues all along the production process and ends up with a made to measure final product. The purpose of giving customized presentation to each customer is to provide them with personalized information specific for their own case and in turn, empower them to choose their preferred option in a more conscious way, ending up with better satisfaction and higher reward for the company.

b. Collaboration as fuel for innovation

All the data available can help a firm to develop and refine products according to customers' preferences and to change them as the demand evolves with market dynamics. Collaboration, as already stated, is a key factor in order to innovate properly and gain more advantage than competitors. "Collaboration mechanisms may also be classified in terms of their usefulness at different stages of the NPD process:

some mechanisms are more relevant at the front-end stages of the process (idea generation and concept development stages), while others are better applied to enhance the back-end stages of the process (product design and testing)"[62]. Every firm has to understand where the customer involvement should take place in terms of value that will be created, depending on its own knowledge and competences to develop innovative solutions. Customers can be asked to make a choice between different options available for the product, they can even be requested to make a trade-off among new items by relying on digital based implementation tools and analysis in order to test efficiently how a product will be welcome in the market. After that, thanks to digital technologies like rapid prototyping, virtual model and simulation, the product can be modify quickly and cheaply generating a new, more impactful version to be launched in the market.

Therefore, different organizational models can be practised nowadays according to multiple levels of customer integration in the firm's processes in order to create value. As in "Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era" Romero, D., & Molina, A. (2011), the following list of levels:

- "Product Finishing: This mode of value co-creation represents one of the first organisational intents to provide customers with an active role in the value creation process by allowing them to customise a set of pre-defined features in the appearance of a product design with their own personal taste (e.g. decoration);
- New Product Design and Development: As a final point, lead-users receive from organisations a position to intensively interact with the company during new product development period (design and testing) and benefit significantly by obtaining a solution to their needs, and at the same time help organisations with their innovation process. Both, organisations and customers can get a head on what is coming and together co-create the next generation of products and services be release into the market;

[62] Sawhney, M., Verona, G., & Prandelli, E. (2005). *Collaborating to create: The Internet as a platform for customer engagement in product innovation.* Journal of interactive marketing, 19(4), 4-17 p.4

- Existing Product Adaptation: successful organisations today are those capable to quickly adapt different versions of their products and services according to instant consumer feedback with a real agile product adaptation model competent to support short product release cycles based-on frequent feedback;
- Open Community Ideation: An open community of ideation is built upon users in a collaborative endeavour with organisations, and the second ones should be responsible for capturing the largest number of contributions (ideas) from their engineers and customers for the design and development of a high valuable offer;
- Personalised Experience Value and Knowledge Co-Creation: The personalised experience of a value co-creation process is about high-quality interactions with individual customers with the aim of engaging consumers and organisations in an on-going dialogue about the pros and cons of tailoring a product or a service. […] The basis of value therefore shifts from physical products/services (outputs) to a total co-creation experience, which includes the whole product/service lifecycle from its co-design to its delivery".

Each method of value creation requires different capabilities in companies and each firm should choose how to configure its own business model accordingly but taking into consideration the resources it can leverage on and the different benefits provided by each model.

c. How to succeed in the made-to-measure market

The fast-pace rhythm of today's market requires each business to have a flexible organization in which every activity can be quickly adapt to the environment and moreover, the business model should be configured in order to enhance properly a firm's competences to respond efficiently to short-term opportunities and customers' needs. The open business model is the best solution in nowadays market to create value by integrating a firm's core competences with customers' knowledge and individual preferences.

The competitive strategy to sustain a business is related to "the manner in which a network of organisation intents to gain competitive advantage by involving their customers and business allies in a jointly value creation process"[63]. This strategy focuses on the opportunity to spur value and innovation by offering what the demand asked, which is a high degree of personalization of goods and services in order to reach customers' expectation and offering them a high-quality experience that it will be translated in great satisfaction and so in better willingness to pay. As a consequence, the profit a company can gain from this way of working can be reach only if there is a proper business model as a basis to sustain the entire mechanism: a set of organizational arrangements and technological assets together with the knowledge and skills deliver all along the firm are necessary to set-up a collaborative network based on communication, cooperation and digital advances in order to achieve what the strategy aims to. The relationship between production and consumption changes along with the more importance acquired by the symbolic aspects of a product than the functional one: the production can't ignore the demands of consumer demand, and the consumer is willing to recognize an added value for a product closer to its expectation. This will be translated into the ability of companies to listen to and interact with consumers as a starting point to satisfy the increasingly demanding market niches.

So, this will end up in a shift to open business models that are structured to support collaboration and agility by digital platforms and strategic information conversion into value.

4. Business model innovation: a debate on opportunities and barriers

Several studies and discussions are ongoing about the real possibility of developing the open business model. Although the economy is increasingly based on the technologies and digital relations, yet there are several barriers to all companies to seize the opportunities these technologies offer. Starting with a brief analysis of

[63] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472 p.11

the major points that hold up the traditional business model, it will be then discussed the unsustainability of these because of the changes due to the digital age and how the open business model is the best solution. I will then analyse obstacles that are still faced in innovating the business model both in a global overview and then with specific reference to the Italian SMEs.

a. Traditional business model key points

Old traditional business models rely on a hierarchy structure that sustains efficiency and productivity maximization, but avoiding the business's ability to be agile and innovate at the same time.

Companies of this kind look for innovations in their own labs by searching for the best and skilled employees. The main issue was to profit from the single activities of the firm by being ahead of competitors thanks to the ability of developing and commercializing firstly innovative ideas to the market. After a waiting period for products to patiently emerge in the market, the company could earn the money and all the profits would then be reinvested in intensive R&D activities in order to make new discoveries. "While companies may have extensive investments and processes for exploring new ideas and technologies, they often have little if any ability to innovate the business models through which these inputs will pass. This matters - the same idea or technology taken to market through two different business models will yield two different economic outcomes"[64].

Typically, the vast majority of these firms focus their business model on competitive criteria based on price providing a base for high volume and low cost production, focusing on the scope of their current activities that should be efficient and sustainable.

[64] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 43(2), 354-363, p.354

b. The current business model becomes unsustainable

The problem nowadays is that traditional business models cannot create as much value as it was usually expected by companies some years ago for different reasons:

- Innovation intended in the traditional way becomes unaffordable due to increasing customization and individual demands. “The costs of creating, developing, and then shipping these novel products have risen tremendously”[65] and this in turns means that there are long term cycles in the design activities and more development time required before the launch of a solution on the market. As a consequence, some inefficiencies associated with the lack of synchronism between the phases of conception and evaluation arise and they limit the ability of gather the great value by instead grasp just a portion of it.
- The digital era has a huge impact on how people work, live and interact and it especially eases the mobility of knowledge and skilled workers. Hence, companies can’t rely anymore on a close business model since they become unable to control information, ideas and smart people. This means that a new business model should be built on the concept that knowledge and creativity reside outside the company boundaries because bright individuals do not get much satisfaction and attention from old incumbent companies rather than the open ones. That is a consequence of a shift in people minds as “employees at the fast-moving companies that lead in the application of digital technologies tend to want different rewards from their jobs than those at analog ones. The differences have less to do with money than with culture, and extend from attitudes toward innovation to the quality and flexibility of the work environment to what sorts of devices employees can use to do their work”[66]. So, in order to retain talent within the company a business model innovation is necessary where innovation comes from internal strength as well

[65] Chesbrough, H. (2007). *Business model innovation: it's not just about technology anymore*. Strategy & leadership, 35(6), 12-17, p. 12

[66] Jackson, J., Grange, O., & Millan, K. (2012). *Accenture Outlook: From Analog to Digital - How to Transform the Business Model.* No.2, issue of Outlook by Accenture. Available online https://www.scribd.com/document/103457740/Accenture-Outlook-From-Analog-to-Digital-How-to-Transform-the-Business-Model

as external pushes. “Resources are the main source of the competitive advantage and all actors of the network have different (in quality and quantity) resources”[67].

- Competition is changed. Market pressure addresses directly the system upon which the business model is structured. The big difference from the old business model is that prices reduction of products and services is not the main source of advantage anymore. Competition on prices is an option that customers do not value to much, in fact nowadays the demand moves toward a higher request of customization and uniqueness of products that consumers are willing to pay more as a guarantee of a better quality and fitting. Hence, in order to provide ad hoc products, the business model must ensure flexibility and availability of the right resources: focusing only on the firm activities is not efficient anymore, since it is hard for the company to cover all the requests by relying only on its own assets. As a result, companies are seeking for new business models considering that “the competitive advantage depends on the all actors of the network and it is not a mere output of the firm activities: it is the outcome of a social and collective process”[68].

To achieve advantages and new opportunities and to defend the market position in a rapid and volatile arena, firms need to develop coherent business models to be agile, adaptive and aligned. Afterwards, “Companies commercialize new ideas and technologies through their business models”[69].

c. Opportunities: the open business model

The open business model is a solution for the digital age. Based on a flat structure and on dynamic thinking to approach businesses, it relies on a network

[67]Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs*. Sinergie Italian Journal of Management, p. 393

[68] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs*. Sinergie Italian Journal of Management, p. 393

[69] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 43(2), 354-363, p. 354

through which reaching as many actors as possible in order to gather collective knowledge and information and spur innovation. An open business model should convey agility, adaptability and alignment to the firm's core business: respectively, being agile allows companies to deliver their products and services faster and with higher quality by a flexible operating model that helps to keep costs low with less waste. Hence, efficiency and effectiveness are the result of principles aiming to productivity and innovation; adaptation to a challenging landscape is essential to survive and react effectively. In doing so, a company should consider that partners and collaborators are useful helper and look up to other industries provides critical and clever links in an ecosystem that becomes strategical to compete. Finally, due to the higher expectations of customers belonging to a more acquainted society, a company has to be aligned to match the demand with suitable solutions. It provides benefits for both the parties and it also increases the efficiency of the whole creative design process, through the possibility of obtaining direct feedback from customers and end-users who will participate directly in the development of solutions to the proposed demand.

"In the context in which knowledge and competencies become the real source of the competitive advantage, the interaction between many players is more and more critical for firms in developing dynamic and successful strategies"[70]. By open the spectre of the business model it is possible for company to cope with the issue of lack of resources, whether they are intended as skilled people or as tangible assets, since outside the organization a firm can find what is needed to carry out its processes in a better way, to successfully develop activities that it might even never done before or just to grasp what will be useful to pursue new opportunities. Moreover, the openness of the model let the firm speed up innovation and time to market by reducing costs and sharing risk, so getting more innovative and sophisticate ideas in a more affordable way.

"The connected nature of digital technologies enables the usage of techniques such as open innovation, co-creation and crowd-sourcing. They can be useful for generating ideas towards innovative solutions, accelerating product development and

[70] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs.* Sinergie Italian Journal of Management.

addressing the rapidly changing market conditions"[71]. However, the power of these technologies cannot stand alone but it must be supported by a solid vision in order to benefit from all the advantages they bring and control them effectively: "technology by itself has no single objective value. The economic value of a technology remains latent until it is commercialized in some way via a business model"[72]. Different from firm to firm, but essential in all the cases, the business model can impact on diverse stages of firms' processes, in one or more activities and with higher or lower degree of maturity. For example, in the B2B case the openness to digital innovation focuses more on product development, manufacturing and operational activities; while in B2C it is more about product innovation, marketing and customer services. "Though, a potential new technology may have no obvious business model, and in such cases technology managers must expand their perspectives to find an appropriate business model in order to be able to capture value from that technology"[73].

Following this path, a firm can properly exploit the potential of digital technologies and turn its manufacturing system into a highly innovative, fast-growing and dynamic one, enabling the company to adjust its capabilities coherently to market requirements and to be ready to get access to the global scenario. "Product development experiences a significant increase of innovative power through open innovation and collaboration within integrated competence networks. In the manufacturing area, digital tools help companies to increase the productivity and agility of their factories to new levels"[74].

[71] Ebner, G., & Bechtold, J. (2012). "*Are Manufacturing Companies Ready to Go Digital?*". Capgemini Consulting White Paper. Available online https://www.capgemini-consulting.com/are-manufacturing-companies-ready-to-go-digital

[72] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 4*3*(2), 354-363.

[73] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers.* Long range planning, 43(2), 354-363, p. 355

[74] Ebner, G., & Bechtold, J. (2012). "*Are Manufacturing Companies Ready to Go Digital?".* Capgemini Consulting White Paper. Available online https://www.capgemini-consulting.com/are-manufacturing-companies-ready-to-go-digital p. 3

d. Barriers: organizational and cultural constraints

When new technologies within a company and in the external network drive the innovation process, a firm has the right orientation to take the step to an open business approach. The breakthrough happens when collaboration with other actors takes place in order to bring new perspectives and resources into the company to thrive in the market. Although this process seems to be just favourable for a company, there are lot of barriers that slow down the shift to a more openness.

Many companies do not pay attention to this issue since they think it is not their case given that their business model is a great one. Then, they do not experiment any new business model until the external pressure and the changes of market conditions come in and impact directly on them. The problem is that it is often too late and their traditional business model becomes obsolete and make them missing lot of opportunities. “A company has at least as much value to gain from developing an innovative new business model as from developing an innovative new technology. […] Companies need to develop the capability to innovate their business models, as well as their ideas and technologies”[75].

- One obstacle is the inability of firms to understand how collaboration and technologies can be profitable for their business and how to implement these new trends within their organization. Even if there are technologies that can assist the production process as well as other activities of a firm, the management is unaware of them or unconvinced of the benefits they bring since he doesn’t know where to use them and to which extent: external resources and technologies should be adopted differently on each department depending on the needs but the leaders must be able to identify how to integrate them in the best way, otherwise they lack any way to increase the quality and the productivity.

  Moreover, there is usually a “conflict between the business model already established for the existing technology, and that which may be required to exploit the emerging. Typically, the gross margins for the emerging one are

[75] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 43(2), 354-363, p. 356

initially far below those of the established technology"[76] so then it is easier for a firm to persist on the current business model since it is already tested and operational; hence, since resources and capitals are allocated to the most profitable purposes, it means that a firm keep on favour the current and established business model while the experimentation of the new one will lack of resources and will not be implemented.

To sum up, for these two reasons the barrier that arises is that companies are not able to see clear way to profit from this new concept of doing business.

- Another barrier comes from the so called 'dominant logic' by which a firm defines which kinds of information coming from the external economy are important and it then use them as a benchmark when looking for other information. But this logic is built upon the success of the current business model that influences all the information gathered since the only one that are relevant are those that fit with its logic, avoiding all the information that conflicts with it. The same logic is used "with regard to business model experimentation - following it too slavishly can lead firms to risk missing potentially valuable uses of their technology when they do not fit obviously with their current business model"[77]. By keeping the traditional asset configuration and discarding what is new and untapped, a company is able to prevent any threat of the current value of the company.
- "Changing historically grown operating models or even entire business models means a substantial intervention in terms of organizational structures and business rules, which could cause resistance from major stakeholders"[78]: here the difficulty is about the transformation of the current mindset of managers and how to accept a shift in the organizational culture towards all the areas of the manufacturing system. "A real problem with relying upon the CEO to lead change is that they likely rose to their position via the current business model, which is now deeply familiar - even comforting - while potential alternative

[76] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 43(2), 354-363, p. 358

[77] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 43(2), 354-363, p. 359

[78] Ebner, G., & Bechtold, J. (2012). "*Are Manufacturing Companies Ready to Go Digital?".* Capgemini Consulting White Paper. Available online https://www.capgemini-consulting.com/are-manufacturing-companies-ready-to-go-digital, p. 11

models will be unfamiliar and may even seem threatening. Thus - although in the best position to lead it - the CEO may actually act in ways that retard the experimentation process"[79].

- During the innovation of the business model, the current one must continue to be efficient and effective until the new one will be ready. "Indeed, this is part of the organizational problem, as the search for a new business model often requires an extended period of co-existence between the current and new models. Knowing when to shift resources from the former to the latter is a delicate balancing act, and rife with possible career consequences for the managers involved"[80]. Again, the management plays a key role since leadership skills are required in order to maintain control over all the team and to ensure the ability to allocate resources in the right manner to let every model to perform well. The main obstacle is that what often happens is a lack of coordination and of a clear strategy through which the business model has to be developed. Hence, disconnected and unplanned activities takes place, damaging both the current and the new processes.

In summary, all these barriers can be and should be overcome to benefit from an open business model, but considering that the innovation of this approach is not something quick that can be integrate within already established and fixed manufacturing procedures, but instead a long commitment and several efforts are necessary to change people, processes and the culture from the top level toward the organization. However, lot of manufacturing companies still rely on a wait-and-watch approach since they are not confident and neither convinced of the value the open business model brings.

[79] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers*. Long range planning, 43(2), 354-363, p. 361

[80] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers.* Long range planning, 43(2), 354-363, p. 361

CHAPTER 4

THE ITALIAN PERSPECTIVE
Artisan 2.0

Italy is a country that has always received great attention from the world market thanks to the renowned quality of the made in Italy product. The success that the Italian market has achieved has been possible thanks to two factors that distinguish the social and trade Italian culture, that is a strong entrepreneurial vocation of the population combined with a strong international business propensity of entrepreneurs who are aware of the powerful impact the exports have on growth. Internationalization is seen today as a major competitive factor and small and medium-sized enterprises, which make up the Italian industrial pattern, can embrace the benefits that the opportunities of internationalization lead thanks to the contribution offered by new information and communication technologies, addressing effectively the challenges that in the past only large enterprises could afford, thanks to the innovative potential in the manufacturing sector too, as the leading Italian industry sector.

The companies belonging the made in Italy prove to be interested in the digital manufacturing as it allows them to obtain higher and quick productivity, while keeping costs low and reducing time thanks to the use of new technologies in many stages of the production cycle. In addition, this can be translated into the ability to offer customized products according to customer requirements, which is essential for companies that want to respond quickly to the current market demand to succeed and stand out for the greater added value that they can transmit.

As mentioned in " Make in Italy. Il 1° rapporto sull'impatto delle tecnologie digitali nel sistema manifatturiero italiano " developed by Fondazione Nord Est and Prometeia: the digital manufacturing can encourage innovation and the promotion of human capital by developing technologically advanced profiles, introducing innovative elements in traditional companies, strengthening the competitive capacity of the entrepreneurial system. The change of the society profile and the consequent

dynamism of the market demand have imposed a new production paradigm that uses a business model based on digital innovation and knowledge sharing. As a result, the evolution of the companies is linked to the availability within them of the most advanced technological systems to count on along with the availability of highly qualified personnel not only with regards to the capability of using these new technologies, but also in terms of knowledge of traditional savoir-faire, rare and distinctive of the Italian production.

This strong industrial change deals with the transformation of the symbolic figure of the craftsmanship and manufacturing culture, soul of the Made in Italy, which is the artisan who, aware of the changes that are taking place, puts as basis of its production system the information sharing and the use of technology, hence being then defined as a digital artisan. The passion for a job well done that distinguishes the craftsman is the quality upon which a competitive advantage can be built. The contact with the product and the production with the craftsmanship world ensured the competitiveness of the made in Italy worldwide, businesses have been able to move into a technologically advanced scenario by adding the tacit knowledge and deep know-how of materials and of the production techniques to assert the quality of Italian products. Moreover, the digital craftsman has an important role in the innovation process as, in fact, for example in the design field where he is specialized in the conversion of a model into three-dimensional prototypes for the production of the object, interpreting and modifying the designs with the aim of improving and perfect them.

The entrepreneur as a digital craftsman has the task of preparing its company in a way it can embrace innovation and digital technology and also he must continually train his employees so that all the staff, at any level of the organization, can develop and acquire the same skills and knowledge adequate to meet the increasingly sophisticated and rapidly changing needs in the broader context of the global market.

1. The traditional savoir-faire in the digital era

The revolution induced by these new technologies has not only transformed the communication field, but it also is transforming the manufacturing field and for this reason we can talk about new manufacturing. This innovative vision in the way of doing business, particularly in managing the manufacturing industry, stems from the fact that firms cannot only adapt to change, but they must know how to interpret it and how to manage it to allow each business to grow and to seize the new opportunities presented by the local market and the global one, as the context in which the new manufacturing enterprises can have great success.

In fact, there are many companies competing in a different, new and clever way than in the past, relying on those aspects that characterize the field of the Italian production: the strategic use of an artisan savoir-faire to which the benefits coming from the quality technological and from the uniqueness of the cultural depth are added, as we only are able to infuse and that the world recognizes as a plus. The abilities of Italian companies always face strong pushes towards design, transforming usual products into objects able to strike and arouse the interest of the consumer. A high taste for design that results in new meanings of the same object in parallel with added functionalities. The desire of companies to make products that allow consumers to differentiate itself through the object's design has led Italians entrepreneurs to produce goods which through the aesthetics can also improve the quality of people experience and the individual satisfaction too. Therefore, the entrepreneur has developed his role consistently to the trend that the society has dictated, and businesses have been adapted accordingly in order to compete with the international competition and defeat it with a quality as typical signature of our country.

Hence, companies produce in a new way and the specialization of quality manufacturing, cultural and digital too, is the new way to conceive firms whose profile is evolving along three different strategies related to the elements that characterize the cultural craftsmanship that are going to increase its attractiveness to the consumer, especially at international level.

a. Produce variety and customization

The first competitive strategy is related to the increase in demand for customized products advancing in the market: the company must be able to produce highly customized goods and services. The Italian manufacturing produces a variety of sophisticated products to answer a demand that tends to ask for an increasingly individual identity in the products customers buy, engaging even niche and heterogeneous markets. The effort to offer products that fit the specific needs of each client has led companies to push up to the development of tailored products and projects. To skillfully cross the needs of a sophisticated demand with an offer able to satisfy it, companies have developed production and communication strategies adapted to the new constraints imposed by the market, by responding with more lean and agile business models, aiming to facilitate the decision making and planning processes in order to manage customization without increasing production costs and making it more flexible.

In order to compete properly in the new economies of variety, the roles within the organization change, as the company itself changes, toward more lean systems. The new manufacture provides for a direct contact between design and production phases, so that the conversion from conception to practical creation would be simple and quick and above all correct and of high quality. For this reason, the value generated by the company is distributed in a different way rather than the past, since the distinction between the design phase and that production one is no longer clear.

From the integration of computers and new manufacturing tools, as a guarantee for the efficient realization of several unique products, comes the competitive advantage of companies: technology and know-how are essential ingredients to ensure a production that bet on variety and customization. The virtuous relationship between the know-how accumulated in this country and the opportunities offered by new technologies is fully manifested in the traditional fields of tech, design and luxury. In these sectors, the combination between the experience of the individual worker and the contribution of technology ensures a continuous improvement of products and organizational processes, substantially contributing to the competitiveness of firms. (Nord Est 2015; Micelli, Oliva)

Right now it is important to produce alternatives to the offering model owned by large companies which are already advanced and well established in the business, both for the good of the market and for the healthy and effective development of enterprises. This is what the companies involved in the Italian design system are recommended to, which are working by following the distinction and not the habit, to be pursued through collaborations and personal experience. Italian companies enable the opportunity to realize such as in the furnishing field made-to-measure furniture and accessories, starting from a customization suggested by the company itself starting from a basic model and changing the customizable features, up to a progressive on-demand customization in which the company listens to and interprets the requirements of the customer in order to provide suggestions and solutions to satisfy him, through its expertise and services.

b. Connection with the country of origin culture

The use of technology is definitely an essential element in order to ensure a sustainable presence of the Italian manufacturing in the market. But there are many companies aware of the advantages that digital technologies involve and especially there are so many companies that are equipped with these digital means. For this reason, relying only on the technology cannot ensure long-term success because of the spread that these technologies have even among competitors. So, in order to differentiate firms need to add an element that is unique and not easily accessible by everyone: the link with the culture of origin. The connection with the country of origin is a value that expresses complex meanings and the authenticity that belong to traditional Italian knowledge and still attracts the world's customers.

The ability to convey meanings and values is a winning factor that benefits the Italian companies given the evolution the demand and consumption have gone through: a growing share of demand is aimed towards goods now able to enclose stories and values, which are not simply the expression of efficiency, but also the result of a research project linked to a particular company's history or territory. The value of these products comes from the ability to incorporate within an artifact, values and meanings that the client recognizes as relevant and unique (Il Manifesto del Nuovo Manifatturiero).

Hence, through social innovation emerges a new concept of value pursued by the people, a human value of great recognition as an Italian factor: a value expressed in the strength of style, in the ties with culture, in the authenticity. Italy, being a highly country involved in this dimension, can take advantage of its skills and its human and cultural sensitivity to emerge in an economic model that focuses on these values. Deeply knowing and emphasizing the local talent and the Italian being enables companies to become more attractive and reliable, more distinctive in offering an alternative to the traditional business realities that often do not emphasize their identity. For this reason, Italy should learn to transmit, to ensure and strengthen the uniqueness of its products, enhancing the specificity of its competences and standing out in the customization market avoiding the anonymity.

Consequently, human resources and human capital play a key role as they hold unique and valuable knowledge that comes from the experience gained and the continuous contact with the traditional knowledge. Hence companies are looking for trained and competent personnel through which ensure the possibility of expressing values and the traditional knowledge, and for this reason it makes difficult to replace them given that the learning process requires long time.

In a world in which technologies, languages and models are becoming more universal, what acquires great significance is local diversity linked to the uniqueness of a particular social and cultural context. The Made in Italy, renowned for its authentic values, can harness the interest of consumers in getting authentic experiences and products related to the long cultural tradition that, in turn, allows Italian companies to position themselves among the competition with a competitive advantage that cannot be equaled.

c. Combination between analogue and digital

The change is taking place in the global world leads companies to challenge social and technological changes that inevitably affect the current situation. Italy must be able to understand and interpret this evolution if it wants to avoid succumbing to the dynamism that surrounds it. The solution is to shape the company's vision in a

system that addresses current issues such as sharing, uniqueness and promptness: in fact, these are the values to which the economy and social generations are moving, also changing so the market demand and the purchasing process to which companies are related.

The new scenario is shaped on integrated real and virtual contexts that influence the society and the current entrepreneurial activity and Italian companies must be integrated in this context to help the Italian way of life to emerge in the global markets that it still is so much appreciate. In this case, to enhance the Italian worthiness companies must be able to value time in relation to the promptness, as it is another Italian indispensable factor to let the company to be at the right time, in the right way to improve its responsiveness to opportunities. But it is necessary that companies are appropriately equipped to act in this vision and digital technologies become a useful solution to this end.

The peculiarities of the Italian nation must be safeguarded and promoted as a way to get a prestigious value, but protecting and not contaminating these values does not mean that Italy should be closed to the world. Indeed, Italian companies must build on the distinctive and unique traits of their country a growth path which addresses the challenges of the global market through the right means that will make possible to see their talents recognized in the market. So leveraging on the positive prejudice surrounding the made in Italy, which is a strong value but not enough to sustain the business competitively, Italian companies must also follow the pace of progress and incorporate it to their advantage.

The spread of digital production technologies, robotics and other rapid design means is further transforming the relationship between production and consumption. Consumers can collaborate in the transformation of their ideas into CAD design drawings through which then finally seeing their products truly made. All this has led to a new configuration of the production reality that faces a strong combination between analog and digital thanks to the lower cost of technologies: this allowed not only an improvement of production facilities and production equipment, but also allowed to increase the levels of innovation of traditional products functionalities, increasing the value they generate in the market. In fact, through the digital penetration lot of opportunities to contaminate objects and make them more

intelligent, interactive and engaging take place, thanks to an overlap between digital technology and analog products typical of the tradition that allowed the Italian companies to revitalize their activities already considered as mature. The dissemination of these technologies has emphasized the need for new skills to manage new production models based on a combination of traditional knowledge, the analogue one and modern skills, the digital, since an effective design like the Italian one has to be combined to a proper production process to obtain a successful product in the international market.

Several considerations and skills are required to integrate the digital within the company. The first step involves the evaluation of the business environment, that is the scenario in which the company operates. Thanks to this phase, the company can identify the main areas that makes sense to consider or to exclude for the application of the digital technologies. This step helps the company to assess whether or not digital applications are useful, avoiding to underestimate or overestimate their potential in terms of complexity of the products, their size, their production process, to the materials used and the level of customization required. Subsequently it would be possible to identify the subset of machines and technologies to be used in order to guarantee the fulfilment of the technician requirements the company has. Therefore, a list of preferably useable technologies, 3D printers, materials and equipment will be done, able to support the company in the identification of those feasible to produce coherently to the business needs and at what cost.

With the benefits arising from the encounter between the technologies and the results obtainable in the market, many companies typical of the leading Made in Italy sectors wanted to invest resources and knowledge in innovative projects with the aim of offering technologically and functional advanced products incorporating in the same time design and aesthetic beauty.

2. How Italian brands emphasize their identity

The ability to produce customization while maintaining a deep bond with the culture, a careful and responsible mix of analog products and digital reality are the

changes that contribute to the definition of new competitive strategies striving for the growth and international visibility. Given these changes in consumption, methods of production and ways of communicating are transforming. Companies engaged in interpreting these new markets, are called to a different involvement of its employees and to a different way of promoting the quality of what they offer to the market. Traditional advertising is not enough. The companies are open to dialogue with the society, they convey their way of working, testified through their daily practices, they adherence to the values that their products aim to express (Il Manifesto del Nuovo Manifatturiero).

The potential demand for Italian quality leads to a complete integration between function and form, between manufacturing and digital services, pursuing efficiency, innovation and customization, a paradigm in which companies create value by welding together research, design and customers care around the business enhancement and promotion strategies that are always different. There are various decisive elements to enhance the Italian identity and decisive factors to give visibility to the authenticity of Italian brands, as listed below.

Openness to progress

Companies must know how to work traditionally repeating antique gestures as forms of knowledge but even cultivate the practice and the skills that boost innovation. For this, the skill and ability of doing are important but also the ability to modernize this knowledge through the motivation towards the openness and the push to the progress. Companies must be able to respond with intelligence to the strategic use of new technologies, integrating them with the craft skills in order to be recognized as leaders in the industry.

Mastery

Recognizing the centrality of excellence as a strategic tool to compete in the market is crucial. The craftsman is the representative figure of mastery in the care of detail and in the deep quality as values that characterize the new business models.

The wonder

In a society permeated by the involvement, from the demand of experience that elicits emotional interest becomes essential the ability to offer surprise and involvement by products made with deep craftsmanship techniques and technological expertise in order to reach the high creativity levels that tell the quality of a company.

Promptness

The slowest time of craft work is a source of satisfaction resulting from technical and personal skills, but the extended time of this talent must be reconciled with the promptness favoured by production technologies to respond effectively in a changing and complex environment. The manual skill together with the creative power of the machines guarantee a level of expertise and competitiveness helpful to deal with any request of the market.

Expansion and recognition

Knowing how to expand a firm's excellence globally and to conquer credibility and leadership in the world market are the tasks of the new entrepreneurs of the digital age. Companies must be equipped adequately to face a global challenge through to participation in international dynamics and thanks to the extensive use of new technologies in order to enhance the Italian craftsman of the future.

All the companies that activate more strongly all the Italian factor are the one that use and exploit the talents and their relationship with the country of origin, supporting growth through the attention to quality, to the values of tradition, to cooperation and personal growth.

3. Business model limitations and chances within the Italian scope

Several innovations impact on the business model of Italian manufacturing firm as well. Despite that, especially for small and medium enterprises, it is difficult to totally

trust in these new trends given that a great transformation is required and maybe it is seen as something affordable only by multinational companies. Avoiding this shift to the open business model means missing the opportunity to overcome limitations of resources and the size and power asymmetry that is usually a deal of SMEs. Hence, "external partnerships give SMEs the flexibility to open up to new frontiers (market/technological/ relational) and face the fast-changing environment as well as to bridge their own resources gaps"[81]. The external interaction is sometimes the only way to sustain SMEs' position in the market by allowing them to disclose their real potential and even more to upgrade it to higher level, ensuring their manufacturing competitiveness.

The Italian industry has been always characterized by a strong linkage pattern based on industrial districts where knowledge spillover and interaction among actors were the basis of every process. Nowadays, the situation can be seen as an evolution of that structure were knowledge and relations are boosted and speeded up by the application of the digital techniques and tools "to stimulate the participation and the engagement of the entire firm network from the generation of the idea to its selection and launch"[82]: all the tools and resources needed to implement production and all the other activities are evolved and aligned with the transformation that took place in the market and so, the traditional relationships and social ties to which SMEs were used are now upgraded to an advanced level appropriate to keep the pace of the digital economy. A broad application of this new approach can help to stay competitive and to cope with the dynamism of the external business, but to integrate this tools a firm must "require the development of new business models able to ensure the technological, strategic and relational alignment of the partners. This is a precondition to enhance collaboration between actors and to create a synergistic value"[83]: as in the past, through the collaboration all the actors can transfer knowledge, resources and skills but in a more efficient and quicker manner in order to develop an organizational learning in which different competences, belonging to

[81] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs.* Sinergie Italian Journal of Management, p.384
[82] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs.* Sinergie Italian Journal of Management, p.384.
[83] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs.* Sinergie Italian Journal of Management, p.384.

other firms of the network, are integrated together to enable value co-creation and higher innovation.

“The business model concept can be defined according to an economic, operational and/or strategic level. From the economic standpoint, the business model focuses on specific variables, such as, revenue sources, pricing methodologies, cost structures, etc.[84]“, so the opportunity for SMEs is that, as already stated, openness and digital innovation can reduce costs by lowering waste and decrease risk since they can be shared, while grasping new opportunities and broadening the range of activities the frim can undertake and so increasing revenues. In an operational context, the business organization is about the internal processes and techniques shape to create value. Flexibility and efficiency are the benefits that digital integration brings and collaboration can improve the skills and roles of business actors. “All actors are resources integrators. They integrate their own resources with ones made available from the community in different ways and intensity depending on the typology of role, skills, and of relationship they engaged. Specifically, they integrate human - knowledge, skills, time, effort - as well as non-human resources relating to the platform technical infrastructure to create new and sustainable solutions”[85]. Finally, from the strategic point of view the business model is about the definition of a firm’s market position and the path to growth opportunities and to global competitive advantage and its sustainability. Internationalization is a critical issue for SMEs as they not always have all the resources necessary to face global pressure, so then the collaboration with other “small-size, craftsmanship and high specialised Italian firms who are very sensitive to environmental, sustainability and made in Italy issues”[86] plays a vital role: the network business allows them to get access to higher value when they “get in touch with other companies and partners. Such type of value leads to - or is a precondition for- economic and financial value. Moreover, value is related

[84] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs.* Sinergie Italian Journal of Management, p. 385
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to knowledge as it concerns with tackling new technological and market frontiers and coping with the challenge of competitiveness"[87].

a. Barriers

The digital revolution changes the nature of innovation. Traditional innovation standards, as for instance the number of patents, may only grasp a portion of what is really happening. Today, innovation is manifested in new and innovative business models through which coordinate and gather both new financial and human resources, since "for European companies is vital to integrate technology and added value into their products to enable even new processes and new services" (Fuggetta, A., 2015. Agenda digitale). Despite that, even in the Italian industry many companies are still sceptical with regard to business model innovation and digitization.

- The first major obstacle is related to the cultural sphere that permeates Italian companies. Due to a lack of understanding of the market, Italian manufacturing companies often succumb to new trends that alter and modify the economic balance. "This needs first of all a new awareness of how the market is evolving. And the need is to understand how individual companies and supply chains of companies (think of districts) can benefit from the digitization of its products, processes and services also using their unique experiences" (Madini, E., 2014. Agenda digitale). The cultural leap required for companies is to overcome the idea that this subject is only a temporary event, but instead this is the upper hand in a new business environment: investments in digital innovation have already been made by several small and medium enterprises, 3D printers, robotics and all other technological tools allow them to do better what they did before, but these devices are not enough if they are not supported by a business model that allows to entirely exploit the opportunity of doing something more, to understand how to achieve greater results beyond what it is already reached. Unfortunately, artisans and entrepreneurs are still wary today and is often difficult they have the ability to innovate, an obstacle that can be solved with the help of the network.

[87] Caridà, A., Colurcio, M., & Melia, M. (2016). *Designing a collaborative business model for SMEs.* Sinergie Italian Journal of Management, p. 391

- Another obstacle is at the organizational level and it concerns the vision of managers and the corporate culture they enhance. A new business model consistent with the external dynamics involves changing the working environment “by redesigning the layout of work spaces, adopting new technologies in support of a more effective communication and collaboration and aligning organizational policies coherently with the new requirements about business and work-life balance of people” (Weisz, B., 2016. Agenda digitale). Often, however, these initiatives are blocked by the resistance of management who is afraid of losing control and do not know how to integrate new strategies. This barrier cannot be overcome unless a change in the mentality and in the current models of leadership occurs, and managers are the first who must open their vision to “put into practice and transfer to their people the new principles and organizational models favouring the deep cultural change necessary” (Weisz, B., 2016. Agenda digitale) to fully exploit the advantages offered by new technologies.
- One consequence that the flexibility and dynamism of new business models has led is the integration of different activities and between functions of different departments, such as for the project activity and product development, the prototyping stage that thanks to simulation technology and rapid prototyping is conducted in conjunction with production lines. This leads to an integration of knowledge and expertise ranging between different fields, with the result that the people working in the departments are involved in the production phase, other in the control and those with technological and development skills. So, a new business organization is essential to research and coordinate new skills and know-how and to respond to the consequent training needs.

  The problem that arises is that many Italian companies do not provide for any update and training plan, consequently, the level of employees’ preparation, at the moment, is considered very low (Weisz, B., 2016. Agenda digitale). The productivity and competitiveness of companies is not given only by innovation of the machinery but also by the presence of specialized people and experts, who are critical to ensure the proper operation and for the customization of products.

- Finally, the last barrier concerns bureaucracy, in fact, the current regulatory system consists of an excess of rules and regulations that make digital processes difficult to be implemented.

b. Stimulus and strengths

- ❖ a higher digitally awareness of younger generations, both in the social world and in the entrepreneurial one, and the presence of young talents also expressed with the start-up phenomenon;
- ❖ the propensity of consumers to the digital and the Italian enthusiasm for mobile, the widespread dissemination of a mobile network and an ever more demanding audience;
- ❖ Italy's and made in Italy international attractiveness.

Hence:

- ❖ we need to change the approach towards modern and open to progress mind-set and policies, with clear objectives that aim to maintain competitiveness in the market, with a governance consistent with the strategies to be pursued;
- ❖ the problem of culture and skills, at all levels, needs to be addressed with a quick and effective strategy, considering all the incentives, events and projects offered by the institutions, and not only them, with the aim to inform and facilitate the path to innovation;
- ❖ “enhancement of the Italian cultural and social dynamism, enthusiasm and initiative especially of the younger generations and the presence of excellence can be crucial points if firms get the ability to enter the network, involving actors at all levels in the decision-making and implementation processes” (Iacono, N., 2015. Agenda digitale).

c. The opening move

Despite all the barriers still rooted in the corporate culture and the poor digital awareness and familiarity of some companies, fortunately, the number of SMEs who

can look beyond their fears and that have integrated digital innovation within their business is growing, by proving to be able to manage the transition to new business models thanks to strong leadership and targeted strategies. Digital innovation is critical when it comes to addressing manufacturers' key business drivers to create value. One of the companies that embraced this new approach is presented in the following chapter: that is Ares Line, an Italian company that from this evolution has been able to reap all the benefits addressing the growth of its business and the confirmation of its competitiveness.

4. The contract business: where customization takes place

The contract business channel, meant as large supplies and as commissioned projects, it is becoming increasingly important and requires companies to provide products, services and design assistance, pondering all the process on the basis of customer needs. An approach that requires an investment of resources aimed and dedicated to the development of internationalization strategies in foreign markets. Italian companies are aware of this trend and in sectors such as furniture, lighting and communal areas the contract is becoming a practice that is highly regarded. The Italian production is a world leader in the furniture industry when qualities, professionalism and willingness to collaborative work are required, for this fact, the Italian companies are placed on the high-end market. In particular, it will be analysed a company operating in the furniture system that is one of the most interesting areas of the Italian manufacturing field, as Italy is recognized around the world for a very high taste for products design and for a great ability to realize them.

To clarify what is meant by contract business we can relate to the concept of turnkey projects involving the supply, by direct commission or through a tender, of products designed ad hoc and customized according to their destination and to the customer's requirements. The contract channel includes projects relating to the achievements in public spaces, hotels, retail places, office and business areas, the shipping industry and residential buildings.

The process by which the contract develops is not general and applicable to all the companies, but rather it follows different paths depending on the type of project, the

partners involved and the technical and timing specifications and of course on the requests of each client that will radically change from project to project. The project management first implies to understand customer needs and develop the related project through a continuous dialogue with him and with the designer, setting the economic requirements, the services and the management and operational strategy needed to achieve a high-quality project.

A contract project is characterized by different phases. The first begins with the request from the customer, represented by an architect, the owner of a property, or from participation in a tender. Subsequently the first contact with the client aims to draw up a document on the internal organization and product specifications for future development, basic elements for the definition of the design phase. When defining the design phase research and development, the technical department and the designer are involved. In this phase, the specifications are defined in detail, to define the critical points of the product and of the realization process, so it is here that the entire project takes place and consequently this is the moment when value is created. The success of the project depends on the time and the professionalism dedicated to the design phase. After presenting the idea of the project and obtaining the approval it is possible to continue with the offer and the negotiation in order to complete the contract. From the design stage the process goes to the prototyping phase and the definition of the BOM to rough out a more detailed view of the design since the success of the project depends on the quality of the work for the specifications selection and on the level of competence applied in the design phase.

a. A chance for internationalization

Considering market saturation in the retail sector, and the competition of low cost companies in some foreign markets, many Italian furniture companies came to consider the contract a potential, if not the only, possibility to grow. Contracting implies abandoning the traditional role of producer, to become a provider of elaborate services in a market (Lojacono, Catalani, Bruno; Il Contract: Un Modello di Internazionalizzazione per l'Arredamento).

The companies of the furniture system have focused investments for years in the retail channel which is now stationary and requires high costs to cover many geographical areas. For this reason, the contract represents a great opportunity for business diversification since in the present scenario there is a continuous decline in the retail channel and traditional markets are now saturated and therefore no longer a source of new profits and new opportunities for growth, especially in certain areas of the made in Italy such as furnishing.

Conquering new markets through contract allows to invest resources effectively, precisely for a project that the company has acquired and therefore it will certainly have a final profit, without having to incur costs for long times addressing the generality and with no security of having concrete results as it happens in the case of retail. In addition, there are several ways through which realize the contract, one of them is through collaboration with other companies that, as will be seen below, brings many benefits and makes it more accessible to enter new markets.

From the managerial point of view, the contract is primarily a complex service. Not only covers the sale of products in the catalog or the simple personalization of some features of standard products, but companies operating in this business must be managed and organized so as to provide design, production, final installation of furniture and furnishing solutions, accessories, household appliances and consumer electronics, upholstery and much more depending on the sector in which they operate. The offer is highly personalized and in order to respond adequately, a company must have highly qualified and organizational skills and a solid and well-structured management to be able to have the right approach in providing a suitable service to furnish functional spaces. This vision requires a different mind-set from the one Italian companies have had for a long time, therefore it poses some challenges to be overcame: to undertake the contract and integrate it in the business, a company need to reformulate the traditional concept of business, so moving from an entrepreneurial mindset founded on the creation, production and supply of products of the catalog, to a more open and dynamic one with which evaluate and reconfigure the organizational structure, the corporate and product communication, the necessary skills and the change of roles, the integration and collaboration strategies with stakeholders, with the aim to satisfy the demands with high-level performances. Given the high customization of each project, a company must be flexible and

adaptable in the production process, knowing how to integrate it with other processes and product categories in order to provide a more complete service, a flexibility that is also reflected in the managerial procedures to control each phase at an economic level and to ensure the on-time delivery of the project.

This internationalization method can be applied to any company, not just large ones but also small and medium-sized manufacturing companies that seek to develop and grow through the opportunities offered by the world market. But to take advantage of these benefits through the contract, each company must firstly overcome the cultural and organizational change phase as a basis to build a business model that supports this strategy in tune with the customization and development dynamics of the current market. As regards in particular to small and medium-sized enterprises this means organizing in a corporate network to combine forces in strong and insightful collaborations to obtain impactful results: in fact, the contract system often involves the need to satisfy requests covering very different products and sectors and that go beyond the competences of a single firm, so being in the market as a group means to increase their chances to win entire projects thanks to the integration of different and wide skills with which to develop an Italian branded product judged as the best for quality, innovation and style .

b. Different contract approaches

Companies operating in the contract business can be divided into several macro categories depending on the type of service they offer and the more or less extensive role they undertake. The classification is general and not binding, so some companies may organize their business in a way they belong to one, two or more categories, according to the ability of responding to different services.

- One area that is mostly linked to the contract in which companies of the furniture system operate, provides for the complete outfitting of the interiors, leaving out the part of the yard, they can provide planning, budgeting, the order control and other complex operations that define the tasks of the interior contractor in realizing turnkey services. The Italian leader companies able to

assume this function are the same leading companies in the retail and that have a contract division to better manage processes as in the case of companies such as Poltrona Frau and Cassina where the contract division is separated under the name of PFGroupcontract.
Companies that play this role can work differently if they are included in the Fit Out, FF & E (Furniture, Fixtures & Equipment) or OS & E (Operating Supplies & Equipment).

Fit Out identifies the category of interior design finishes and, specifically, the flooring and coatings with permanent linkage to the building. The materials can vary from wood, marble, ceramic, glass, wallpaper, painting etc., while fixed furnishings are cupboards, wardrobes, kitchens, doors, panelling etc. In order to produce Fit Out projects companies need to have a contract division able to follow a turnkey project, this means they are not only able to realize tailor-made furniture, but they are also able to carry out construction work for the installation of floors and coatings. Sometimes it happens that if the fit out contractor is an interior designer, it proposes to set up a temporary joint venture with a construction company, in order to provide an adequate service, each one for its own specificity.

FF & E (Furniture, Fixtures & Equipment) indicates furnishings, furniture and various tools that do not have a permanent connection to the structure. Usually items that fall into this category are upholstered furniture, decorative lighting, technical and decorative curtains etc. In the case of contract customers often require custom furnishings and components for which the company must realize prototypes in order to evaluate the ergonomics and finishes. This area is the one in which Italian furniture manufacturers operate more frequently.

OS & E (Operating Supplies & Equipment) is about the provision of equipment closely related to the specific activities of the client and to its organization and in fact are usually products that are customized with the logo of the brand to which they are intended.

- The producer of **commissioned order** and the one who sells products of the catalog. Selling commissioned products enables companies to increase the

saturation level of their production capacity or to increase the enhancement of its business opportunities. In this approach, it becomes crucial the relationship with the customer to understand exactly what he requires and to fully satisfy the demands and so it is necessary that companies are extremely flexible and versatile. Some of these companies also operate as suppliers of catalog products by allowing their customization. The customization may be to adjust the product to technical specifications, the realization of fabrics textures or colors chosen by the customer, customized colors or finishes, or special dimensions. Often companies operating in the contract market as suppliers of products of the catalog are companies that belong to the world of design and who have built a strong market position thanks to the presence in their offer of iconic or particularly known products.

- Finally, one case of contract that is more and more increasing especially among smaller companies is the one where firms join a **contract group**. Creativity is fundamental in business in order to spur innovation and, although the technologies are of great help to the company's progress, along with the technological development people still remain a key point and they still need to collaborate with other people to work better. To meet the challenges of the market, companies need new knowledge that can be found by forming partnerships with other organizations to work in a network in which integrate different skills of other professionals and to ensure continued innovation driven by technology too. A contract group is useful for several reasons. The partnership brings benefits to companies both in production and in contract marketing, with the possibility to commit more financial resources to seek customers and to improve the position among sophisticated projects, rather than waiting to demands related just to the core business of a firm that imposes a downsizing. The company must provide a product and an extraordinary service, both in the B2B (business to business), and in the B2C (business to consumer). In this new approach, brands promote collaborations and strategies able to allow a certain operational flexibility and the ability to act across several sectors to build new growth opportunities. To do this, companies need new knowledge obtained by working together and by sharing production skills through collaboration with partners with different skills from those within each one of them.

c. Business re-organization

The contract function should be adequately supported within the company with the means suited to achieve optimal management of this business branch. Within the organization, the personnel assigned to the contract department must be able to work with all levels of the organization for the exchange of information and at the same time must be able to integrate in the designing also the information flows coming from external dialogues. If the target market then includes the foreign as well as the national one, then the professionals working for the contract must ensure its management and its support under an international profile.

As regards the internal structure of the company there is no any common rule on how it should be structured, the organization varies according to the number of business with which the company operates, the levels of customization and the resulting complexity, the role it plays in the contract design and the skills required in handling it. The greater the organizational sophistication, the greater the need for the company to be equipped with an internal contract division. In the case that a company points to the mere personalization of products in the catalog there is no need to create a separate division used for the contract since it is mainly about commercial choices that are already taken into account in business processes. Instead, the implementation of larger size orders and articulated projects implies a different operational structure, budget and more specific organizational models and related to the sole contract activity. Companies that provide custom-made products are generally well-organized producers with a high level of specialization that are chosen by customers and designers because they know the quality standards with which these companies operate and they appreciate the certainty given by their organizational flexibility. In this case a dedicated department is created and it can be autonomous or integrated into the sales function depending on the economic dimension developed by the contract business and the geographic breadth considered. The activities carried out in this division are in support of the development and coordination of all the steps involved in the realization of contract projects, while allowing the rest of the organization to carry out the tasks relating to the other business activities, without bump into one another.

In a business where companies produce according to customer tastes and specifications, the corporate communication changes too. To maintain consistency and brand personality, communication is translated to the spatial dimension. Through space and furnishings, the company communicates his way of being, through the stylistic and formal choices, the design and the materials represent a communication project that shows the core values and the real corporate. The brand identity is not only an immaterial dimension made up of values, of the vision of the surrounding world, the mission and how it is exploited through aesthetics; but it is even translated into a physical, emotional and three-dimensional image able to communicate with the public and through concrete manifestations that interface directly with the consumer.

Every company that presents itself to the customer or that it is chosen by them to realize products and contract projects, first of all it looks to clarify immediately what its value is and it does so using paper tools, multimedia ones or through specific events. In this way customers know with who they collaborate and they choose the company based on trust and professionalism that it conveys.

Starting from the papers they mainly consist of a company profile, catalogs, brochure, advertising and press kits. A company profile should summarize the company's philosophy clearly specifying the areas of production related to the know-how and managerial and technical capabilities supported by a documented list with pictures of the work carried out, where to stress if they are part of a group of companies describing the references and collaborations with designers and architects, and providing all the information related to operating and production sites. The catalog graphic design must allow to have a concise and comprehensive presentation tool that reflects the company's image. For product-related aspects it is suggested to refer to certifications and include clear data sheets and specifications on finishes. Another important factor to consider is the language to be used, Italian and English are a must together with the other most spoken languages, but a company could use all the languages needed to communicate and collaborate with people depending on target markets and the strategic areas in which it operates.

Thanks to the diffusion of technologies, the multimedia component has assumed an important role in communication. The web site is, in fact, a device that, if skillfully made, can become a good showcase for the company and also a great business

tool. Many business sites, in fact, make it possible to clearly view the products and also to download both technical drawings and three-dimensional too in order to provide users with a convenient tool for the creation of 3D rendering for project presentations. It also becomes advantageous to create personalized catalogs and files relating to every single project that the company develops to increase the quality of communication with the customer. Ultimately, realizing photo shoots of projects it is something that definitely pays off in terms of quality and credibility of communication, in fact, the references are very important in the contract market.

Finally, companies can rely on specific communication places like fairs and events. At a local level or across national borders depending on the internationalization strategies of companies and the resources available. In these cases, communication is directed and each brand can easily convey its message and enhance its identity.

d. Brand identity

To maintain the brand identity in the world of contract, companies must firstly communicate and offer customers the value of the Italian lifestyle, of quality in shape, materials, and the set of details that create an authentic Italian taste environment. It must also take appropriate skills and pay attention to the materials, sustainability and innovation: the excellence of Italian craftsmanship comes from the fine workmanship of the finest materials such as wood, marble and ceramics, but to which are added higher innovative and advanced materials that meet modern needs and which involve the ability of companies to develop a production that has to be continually reinvented to improve the quality of supply. The products with the best quality, lighter and more durable are those competitive in the contract business, and safeguard the made in Italy and pursue continuous innovation it is crucial to be the first in Italy and abroad.

The contract is a growing market and therefore represents a new opportunity for most of the companies. Some companies have already successfully undertaken this path, while other companies have not been able to operate effectively since this activity requires a profoundly different mindset approach from those that most Italian companies are accustomed to. Companies are not selling in a store with a sell-list and a well-defined product, but they provide a sophisticated, personalized and

complete service in a market where the choice falls on those companies that know how to present themselves properly and know how to preserve their contacts and relationships in an engaging way: the skill lies in the ability to don't undermine or distort the value of the brand, but to make it even greater. To this aim, the determining factor is the communication, in fact, the brand must continually emphasize and explain its logic to the personnel and to the customer as well.

All the public spaces up to private environments have seen an increase in their communicational value and in their ability to represent a meaning and precise values. So, the creative and production processes, through which these environments are realized, are changed: the design must be preceded by a strategic analysis in order to detect the expressive potential that the products and spaces have in their three-dimensional level. The company must be able to shape the identity required by the customer through the design of space. The contract has this purpose which is entirely consistent with the trend in demand that requires more personalization in order to identify itself in products, and this is why this market has more and more success and positive validation.

[i] Fondazione Nord Est, (2015). "*Sintesi Nord Est 2015"*; Stefano Micelli, Silvia Oliva (a cura di)
[ii] Confidustria Veneto, (2015). "*Il Manifesto del Nuovo Manifatturiero"*
[iii] Lojacono, G., Catalani, A., Bruno, A. (2012). *Il Contract: Un Modello di Internazionalizzazione per l'Arredamento.* Economia & management
[iv] Fondazione Nord Est e Prometeia, (2015). "*Make in Italy II 1° rapporto sull'impatto delle tecnologie digitali nel sistema manifatturiero italiano"*

CHAPTER 5

ARESLINE Spa
Case study

- Company profile

Ares Line is a leading company in the world of office and community chairs thanks to the ability to create functional and design products in full compliance with customer requirements. A winning strategy based on continuous research, ergonomic shapes, cutting-edge design and advanced technology solutions to improve the use of space and create comfortable environments.

The excellence of this company comes from the great attention given, since the foundation year in 1987, to the quality that the passion for the Italian traditional craftsmanship enhances, and to innovative researches through a strong industrial set up as the basis to design and build products by always aiming at both the maximum comfort and functionality. The high quality of products and processes with which Ares Line works is confirmed by the numerous certifications with which the company increases its value and the value of its products: the company assumes commitments and ethical responsibilities through specific codes, which ensures great loyalty to suppliers and customers in order to develop the best mutual trust. In addition, the organizational model ensures that verification and control procedures on each business dynamics are constantly carried out to always guarantee the maximum fairness and transparency. The safety culture is widespread among the organization through an ongoing staff-training for a maximum prevention of company risks. As for the environmental sphere, the company ensures the total respect of the environment through the development of an eco-sustainable and efficient production, with emphasis on energy saving and on the use of environmentally friendly materials.

The excellence of the products and processes through which Ares Line holds its successful position in the market stems from the efficiency of the underlying

organizational structure, designed to reduce waste and increase the competitive capacity through the use of new business models based on lean thinking and on production processes optimization strategies thanks to the new frontiers of technology and manufacturing flexibility. Ares Line productive agility allows the company to meet the increasingly demanding requests of customers and designers through the development of on demand solutions, where each product and every space are studied with great competence and professionalism in order to provide the customer a solution designed to find the best fitting with its individual needs.

With the aim to offer the customer more and more unique products consistent with the objective of offering innovation and excellence, Ares Line collaborates with other leading companies belonging to the made in Italy culture and with research institutions in order to obtain advanced results and to develop shared and more targeted knowledge. An example is the strategic partnership with Pininfarina that from 2001 sees this two companies of high design and successful products for both the quality, functionality and comfort collaborating together, thanks to which they obtained several prizes and awards. In addition, according to Ares Line way of thinking, growth opportunities stem from the comparison of ideas in terms of new products, new projects and new solutions. For this reason, the company works closely with architects and designers facing any project requirement with the result of a winning integration of creativity and ideas within the company. Not surprisingly, among the partners of Ares Line we find the prestigious Quinze & Milan brand of which Ares Line is the exclusive agent for Italy. Quinze & Milan is a factory of ideas, projects, a leading-edge platform for collaborations with designers and groups of experts. A collaboration focused on custom furniture in a sort of think tank and idea factory aiming to create and build unique shapes, custom upholstery, co-designed products. Among other projects, Ares Line has always pursued the acoustic comfort in conference rooms, auditoriums, lecture halls and multipurpose spaces, through the design and production of specific armchairs and chairs to which the value given by Fonology line products is added: thanks to Fonology the noise level of each environment is corrected and improved. The acoustic comfort comes from the study of the position and of the type of materials on different walls of an environment and on the various furnishing elements. Fonology allows the creation of solutions with

highly functional components without any loss in customization and with the strong aesthetic appeal of Italian style.

Finally, in 2011 Ares Line participated in a strategic partnership with other companies in order to enter the world market and offer more sophisticated projects and solutions: the Contract Design Network. To achieve highly customized projects designed on specific customer requirements, Ares Line created a network with other high-end brands to develop contract projects based on experience and great innovative strength and coordination skills. Contract Design Network is a network of leading companies in their sector, in addition to Ares Line are part of the group:

- Castaldi Lighting, important company in the lighting world, specialized in the production of equipment for external and internal systems is known in the market for the quality and reliability of its products.
- Decima Italia is characterized by the design and implementation of the best stagecraft, technological and furnishings solutions for the theater with high competence and specialization in mechanical stage and in the acoustic-decorative furniture in all kinds of show.
- Gruppo Edilsoffitti, is able to offer a turnkey service with the highest quality in the field of interior finishes in both civil and naval sectors.
- Patentverwag Italia, achieved great success in the production of lockers for changing rooms and prefabricated walls together with the division of telescopic platforms, even completely motorized.
- Radio Marconi, is a pioneer in design and implementation of multimedia and interactive communication systems. Its greatest ability is to integrate in large scale systems audio, video and text with extreme versatility, offering the user a simple and captivating interactive enjoyment.
- WRK has as main activity the production, development and installation of bleachers for universities, theaters, cinemas and other places with patented systems which are fully removable and reconstructible in other environments with clear saving of costs.

In additions to producing furniture, Ares Line works in close collaboration with designers, architects and specialized manufacturers that make use of their proprietary equipment when producing products and designs to complement their own research and provide the perfect environment, the best ergonomics of shapes

and the latest design. The result is a quality product that has the added advantage of flexibility, particularly important when serving clients with special requirements.

The international competition implies great efforts to remain competitive in the market. The Contract Design Network allows to create an aggregated network with other companies able to share risks and investment and multiply trade opportunities: in this way, even the small business can operate as a larger and qualified organization, while maintaining its strong image and position in the market. Ares Line has indeed a strong vocation for internationalization from which it derives many benefits and business opportunities as well as new ideas and teachings. The company has an extensive and well-established presence in the world markets, with a globally active sales network that enables a fast, efficient and prompt service to ensure the highest professionalism. The main showrooms are located as well as in Italy (Carrè and Milan) also in Paris, São Paulo and Toronto, but the projects that Ares Line has realized are more wide-ranging: US, France, Morocco, Luxembourg, Brazil, United Arab Emirates, Lebanon, Chile, UK and so on.

In the realization of its products, which are either entire projects or individual chairs for educational, operational and executive purposes, for conference halls and theaters and multi-purpose rooms, the top priority is customer care and his wellness. In offering its services, Ares Line aims to achieve the best customer satisfaction. For each custom product matches a tailor-made service: this is a fundamental issue for the customization of any product, given the fact that in order to meet clients' requirements the service offered to the individual must be a correct translation of the information exchanged between the company and the customer as the key for a successful custom item. Thanks to the flexible organization that allows Ares Line to overcome its own limits through the use of digital technologies linked to the knowledge and traditional skills. The use of digital methods is useful for seating customisation since it allows to produce parts that are designed according to body shape in order to influence the comfort of the user and this technique also reduces wastes in time and materials together with the reduction of the number of manual operations necessary and though the number of errors. Using advanced engineering techniques and 3D CAD file the seat can be produced directly by using appropriate RM equipment. These techniques can lead to improvement in customisation of products that are truly individual in both aesthetics or design without any loss in

manufacturing speed, since a great degree of automation of these machines will speed up and refine the production process of customized seats.

1. Business model and internationalization

The organization of the company is set in tune with the objectives that the management pursues. The high quality and design combined with functionality and efficiency are the distinguishing features of the company that has a great history made of experience and growth as the basis of the outstanding success that it enjoys in the market.

The company's strength is the ability to combine the great benefits of using the most advanced technologies along with the uniqueness of craftsmanship to offer customers sophisticated products and solutions of high quality, being able to take advantage of the flexibility of digital manufacturing during the production phase for on-demand products and enriched them with precious details of the ancient tradition that distinguishes the high prestige of the made in Italy craftsmanship.

A good organizational structure is essential to efficiently carry out every firm’s activity, as it should be the basis of all the processes that arise and take shape within the business. The internal organization needs to be well balanced and align with the external needs, in order to enable the company to quickly react to orders coming from the sales department. A lean structure that must be oriented towards the same goals and that relies on a common knowledge widespread along all the business departments so as to work with great efficiency and consistency in order to obtain a flexible and rapid production. For this reason, Ares Line has developed a web site designed as a hub where both the internal staff and some external users, who are working with the company, may have access to always be in direct contact with all the information and the updates regarding the company's business. It concerns with offering a dynamic approach to the information and to the specifications of the projects and to all the underway or completed achievements, in which real time updates can be shared addressing the totality of the personnel without additional costs. Through different levels of password, it gives access to a platform where both the internal commercial department and the external customers or designers can be

informed about the on-demand solutions that are realized and though draw from the same background and production philosophy that gets together the company's know-how, thus allowing to place all the users on the same level of knowledge and raising their awareness about how they should coherently operate.

To support the company's growth, the management leverages on the continued involvement of the internal staff as well as of the external customer. Ongoing training and upgrading of all the people allows them to gain an equal knowledge, at the same quantity and quality to be able then to easily convey the message of the company: the ability to spread its own know-how means to enhance the core competences of the organization, making everyone acquiring all the skills and abilities by describing itself concretely through case history as a strength to be recognized in the market and to be chosen for the background and the experience upon which the company can boast.

Ares Line can count on a team of professionals in different fields of specialization among architects, designers and engineers who maintain the company's high profile as they are well-trained and capable of responding to the articulated demands of clients. Due to the open business model of this firm, these individuals, besides already having a high qualification and professionalism, are inserted into the company through an internal training that allows them to fully understand what are the points on which the corporate culture it is founded by ensuring that collaboration is simplified and in turn it results in the development of a high quality project even faster.

Precisely thanks to the skills of the staff there is a high utilization of the technologies and last generation digital systems, as regards for both the production and the communication with customers. The first aspect relates to the use of machineries such as the 3D printer, robots, lasers and other means helpful to run quality control tests. The company is equipped with an in-house 3D printer and other purchased digital equipment in addition to those built and manufactured directly from them. Through these technologies Ares Line has been able to keep in-house the entire research and product development process, being able then to produce small batches of products or components directly according to what is known as make-to-order process. In this way, innovation is a continuous flow and it is closely in touch

with the internal professionals who collaborate to realize each product especially with the sales department so as to speed up the time-to-the market response when from the order received the printing phase is carried out almost in real-time thanks to the space proximity of competent persons by which these phases are developed. The proximity in question allows the organization to be more agile and flexible so that the exchange of information between departments is continuous and without any intermediate step needed for the interpretation of the project's specifications because the order moves between highly trained people, so then reducing time and errors during the development and increasing the final output.

Instead, in the case in which larger scale productions are required, the company relies on external service providers for the 3D embodiments and similar realizations as it is advantageous to let these third parties produce what could not be realized in-house. Trying to produce everything in-house would be a loss in quality and an increment in costs because holding all the technologies required to work all the raw materials and the relative expertise to do that, would imply large financial investments and long-time gaps than the option of relying on external professionals. Their higher skills due to the specialization in specific sectors allow Ares Line to get in turn better quality products in shorter time, thus being able to concentrate on all the other aspects related to its core activities. All the professionals that make up the supply chain of Ares Line are strictly selected and they must follow the standards defined by the Ares Line itself so as not to deviate from the established mission. External providers are not fixed or binding, indeed the company continues to monitor the market in order to identify the best companies to work with in order to always get the best and to be always open to any novelty and innovation to improve and implement its own experience. The entire supply chain is made up of high-quality suppliers and exclusively Italian manufacturers that, for almost all the cases, are close to the company in order to improve the interaction between the parties during the collaboration, to reduce delivery times and to facilitate intermediate steps without waste of costs and information. To an increase in quality it also corresponds an higher probability of success due to another strategy put in place by Ares Line aiming to have a good control over their supply chain and reputation. Though, Ares Line ensures the good work of its suppliers thanks to a kind of mutual support based on access to credit: the company is evaluated with a rating of 1 thus having good

visibility for banks, while the small businesses that belong to the chain are often hardly considered by bank credit. But precisely because of their small-scale dimension, these SME are critical for Ares Line's strategy since they are small but very qualified companies and seriously managed, linked to the traditional knowledge and open to innovation at the same time that allows them to increase the degree of reliability and trust. For all these aspects, hence, Ares Line tends to vouch for them, as it knows the way they operate and relies on them too, making sure that their rating may be included in Ares Line's one and thus allowing the access to bank loans: this is a way to further develop the capabilities of these small businesses that they can match then their knowledge with the tools needed to put it into practice. That is a supply chain strategy that benefits both Ares Line that operates with complete and efficient companies, and these small businesses that can ease the growth of their business.

The communication and collaboration typical of an open business model occur not only at the supply chain level and with external professionals and designers, but also with the customer according to various media. The company aims to highlight its exposure through the participation in category portals and online platforms in which, without charges, it can increase its brand visibility among the competitors and also its site visibility among search engines because through these external web pages it can boost the visits flow to the company's page, and then improve its position in the ranking of the search results page. The interested customers will easily find the company as it appears in the major reference platforms of its market sector and it can be contacted for information about products or specific requirements as provided by the tools on the corporate website.

A great example of collaboration and involvement with the client is given by the online configurator, a well-used tool now diffused in particular among the furniture and interior design companies. In this case two different objectives can be achieved: the first concerns the possibility of including the customer in the choices regarding the realization of its own product, while the second, as the continuation of the previous one, focuses on the production of the project created by the consumer. The first case will be discussed later, while now the key point is about the development strategy that allows the company to improve the production quality and to make it more streamlined in terms of time. Not by chance in fact, IT professionals who work

within Ares Line are planning a more advanced version of the configuration software that is based on the concept of directly connect consumers to the production process. Once the customer creates its own project through the choices available online, often combining different components, the project is sent directly to the production department without having to go through intermediate stages for the interpretation of the project. This is possible because the customer is not only asked to choose the products, but he can directly build his final project in a simple way guided by the software, thus resulting in a BOM where the necessary components are already selected and set and correlated one to each other. For example, in the simple case in which a row of chairs should be create where the chairs are aligned side by side, the user has not only to choose the model of chair he prefers and then indicates separately in the order all the measures, since this then would require the interpretation of the order to identify what are the necessary components to be produced, such as the number of right or left armrests, the ending one and those to be eliminated in case only one armrest shared between two seats. The idea is to virtually create the right positioning of the components so as to send a complete order in which each individual element is already specified and does not require any review before the production process. Taking up the case of the row of seats, this means that the customer via the configurator directly creates the row and then he sends the project in which the number of armrests is already defined and the necessary components whether right, left, ending or shared, they are already selected and displayed in the virtual model. The production is facilitated and speeded up, avoiding possible errors of components' choice and reducing the development time of the entire process. Less intermediate steps and less waste emphasize a lean production in full compliance with the requirements desired by the customer who will benefit from a product that fits perfectly his choice, directly from the digital to the material.

Another beneficial aspect supporting the partnership and a business model that aims to improve the competitiveness through sharing, concerns the co-marketing strategy that Ares Line has undertaken with another well-known company: Pininfarina.

Figure 1: XTEN Pininfarina design chair

(source: http://www.aresline.com/it_IT/prodotti/direzionali/1/xten-r)

The strategic partnership with the latter which is a high quality and technologically advanced company has as objective the development of products and know-how through constant cooperation, where innovation can be implemented and improved through researches and efforts sharing to reach excellent results. So, improvement and expansion are the two cornerstones of this strategy based on co-design of increasingly sophisticated goods in which the knowledge and competences of one company will integrate those of the other one, and moreover the co-production process is run by sharing the different technologies that each company holds to produce the best components it can in the field it specializes, thus improving the final result of the product given the high quality and professionalism that are involved and combined together to achieve the most advanced product levels. Great innovation and ergonomics are the results that arise from the integration of two leading companies in their field, Ares Line provides the raw material on the coating upholstery and the most advanced materials for the seats, Pininfarina joins all together with the production of the plastic structure according to the designed geometries regardless of their complexity.

Figure2: Premiere chair Pininfarina design

(source: Ares Line showroom)

All these activities are coupled with studies and researches not only in respect of the most efficient and advanced procedures for the production, but with great respect of design quality and functionality too, intended as support to the user's welfare. The visibility that companies acquire in the market is then amplified by the double advantage due primarily to the already established and well-known position that each brand holds individually, which is of course increased by the marketing strategy jointly developed and simultaneously associated on the behalf of both the companies.

Finally, needless to say that the benefits of the collaboration are going to help Ares Line internationalization strategy too. Working with the foreign market is fundamental both at the income level to support the business of the company and even in terms of quality in order to keep pace with market developments. Ares Line is the symbol of the culture and of the manufacturing tradition of the region where it is located, and it is aware that the excellence of the Made in Italy is a valuable resource for the recognition in the world market and as competitive factor and better prestige than many other competitors. Respecting and enhancing their origins and the knowledge rooted in local traditions, the company does not intend to close itself from the

external environment but on the contrary it seeks to integrate its ancient knowledge with the one which the modern era brings, looking for the best ways to combine different knowledge and re-elaborating them in higher skills. That's why in fact Ares Line in addition to its in-house R&D activities has decided to collaborate with the MIT in Boston in order to gather the advanced technology and the latest innovations to enhance its openness to the world and to progress.

Moreover, to better support its presence worldwide, as the numerous projects confirm, Ares Line has an internal division dedicated to the contract business so that it can respond to more elaborate on-demand requests starting from something totally new to get more profits and differentiate their skills. Within the company there are offices in charge for both the Italian contract sector and for the foreign one, in this case customization permeates almost all the demand features as it is about to create orders that are not only customized through the choice among a variety of already available options, but entire rooms, auditoriums, theatres and public spaces are set up and designed from the scratch. The company seeks to meet customers' demands by directing its needs around the business background, modelling solutions based on their own skills and engineering. For this reason, in all the projects they develop there is always a reference to the history of the company through its products, messages and quality are both conveyed through the use of its resources in tune with what the consumer asks. Through the network of companies involved in the Contract Design Network the expansion to new markets is more affordable as the strength and the capital to invest on are being shared and promote all the participants.

The company's international presence is symbolized by some showrooms and by on site intermediaries, in addition to the production facilities located in Canada and Brazil to serve their local markets and to ensure a rapid time-to-market according to the Italian production methods, reflecting the same standards to guarantee the highest quality. As for the Italian market, the strategy toward these markets always starts from the needs of consumers, so not from the product but from an analysis of the demand upon which the product is then adapted and customized. The customized demands are different especially for the non-European market and mainly concern different measures and structural adjustments related to broader standards; also, the requests about coatings and the materials used are different and this requires great flexibility in the production. For this purpose, the company makes

several market research before entering new markets in order to be prepared when facing the requests coming in, proving to be interested and already aware of the traits that characterize foreign preferences. From that point then all the needs of each customer with whom they come into contact are individually taken into consideration. This, however, requires a good corporate structure since the company work a lot towards the service that surrounds a high-quality product: information, close contact, on-site staff and constant presence to convey the corporate message and to promote the brand are the key elements for succeed abroad, but at the same time they also require expensive investments in order to support the resident managers in charge of exploring the market in which they are going to operate and to enhance relationships with customers to offer a complete service around the proposed project and the sale of products, in addition a good internal organization is necessary since the manager area has to manage effectively more markets and countries simultaneously. Thanks to the companies network this is facilitated since it is profitable and beneficial for every company involved to share the expenses and charges imposed by this internationalization strategy, but also sharing the resulting benefits given by an increased global visibility.

a. Contract Design Network

Ares Line figures in the global market through a strategic alliance with other companies to deal with the challenges and obstacles posed by the world economic scenario relying on feasible resources. Great innovative strength and coordination skills are the cornerstones upon which the entire network revolves with the aim of getting an extended and dynamic collaboration, flexible and excellent. Contract Design Network, that is the name of the enterprise network that brings together seven different companies belonging to different sectors but which are integrated to promote and improve the development of joint projects in order to create products and whole services to totally meet the needs of each client. From lighting to the interior supplies, multimedia and special furnishings for contract and public entertainment areas, these are the fields of expertise of the companies involved in order to ensure the best possible service by integrating different knowledge and being able to meet more articulate demands, “exceeding in this way customers'

greatest expectations with an entire experience around their favourite products and services"[88], undertaking projects that exceed the core business of any company without then limiting growth opportunities.

Ares Line has thus strengthened its position through a strategy that involves aspects of product differentiation in fact, in addition to office seating, it develops a comprehensive plan for the community in general with greater interest in the satisfaction of customers who contact the company to obtain the solution on-demand, for which Ares Line uses high industrial technology combined with industrial finishes of its ancient tradition, all in a logic of a business combination that allows to implement its visibility and effectiveness of its internationalization strategy.

Contract Design Network group companies that work together and combine their researches to offer unique solutions for an ideal environment, the best ergonomic shapes and cutting-edge design. As stated on Ares Line's web site, where a separate linked section is committed to the contract division, the crucial points of this strategy are the following:

COMBINED SUCCESS (SYNERGY)

The business strategy that Ares Line has for the contract department is coherent with the open business model adopted all along the company: that is the one belonging to the so called collaborative networked organizations, and as well expressed by that name it is not so difficult to understand why that business model perfectly fits the company's strategy. "Collaborative Networked Organisations (CNOs) show a high potential as drivers of value co-creation and co-innovation. Both look at the network structures as a source of jointly value creation and open-innovation through access to new skills, knowledge, markets and technologies by sharing risk and integrating complementary competencies"[89].

Working in the business network means to act as a team where every single firm is involved and contributes with its strong own skills coming from the long experience that each one has in addition to its own applications and technologies then combine

[88] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472

[89] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472

with the ones owned by the others and therefore co-create value in a collaborative endeavour.

Moreover, the CDN as a strategic network will also help the company to boost innovation since the cooperation let every firm focus on core competencies, personalisation and through collaborative mechanisms "co-create new sources of value by confrontation of ideas and practices, combination of resources and technologies, and creation of synergies"[90].

Through these synergies Ares Line reaches its goals in the market and succeeds in its field widely taking advantage of the CDN since, as affirm in the web page, "We speak one language, we work together, we aspire to our best to provide the best service to our Clients".

COMPETITIVENESS

Needless to say, that higher competitiveness can be achieved by networking since it is possible to get shared management that is essential in order to enter new and bigger markets. Spread risks among multiple players together with the benefit of getting access to more resources are balanced in the network in order to ensure great opportunities to spur innovation and become proactive in a dynamic market such as the global one.

"Organisations nowadays must continually disintegrate and reintegrate themselves in order to quickly and continually assess their value-chain capabilities for a fast response to the rapidly evolving industry dynamics and customers' preferences"[91]. In order to do that, collaborative networks are the best form of business model given that they can provide the agility to redesign quickly when necessary the on-going path to consequently let every organization be flexible to rearrange its structural, technological, financial and human assets "on-demand" in order to ensure a quick response to the customer and by assuring a tailor-made approach and high quality standards, with the best value for money.

[90] Romero, D., & Molina, A. (2011*). Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era.* Production Planning & Control, 22(5-6), 447-472

[91] Romero, D., & Molina, A. (2011). *Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era*. Production Planning & Control, 22(5-6), 447-472

MADE IN ITALY

The contract networking gather together the best Italian companies leader in their own fields and what all these firms have in common is they hold the Italian style and traditions since they are all aware about its prestige and how it symbolizes the high quality renowned all around the world. By leveraging on rapid configuration and shared resources they can integrate intellectual and technical leaderships belonging to the excellence of these companies in their fields in order to provide the best Italian tailor-made goods and therefore, they can gain competitive advantage and trustfulness from the exploitation of the made in Italy manufacturing esteem.

The main idea is that of a joint participation leading to more advantages in terms of the ability to obtain more numerous contracts with the ability to roam between even more complex tasks, with less costs resulting from sharing and thus more opportunities to strategically gain new markets with greater ability to invest in human resources and initiatives, because from the comparison of ideas the growth is strengthened.

2. Customization and customer-oriented strategy

The strategy pursued by Ares Line is definitely customer oriented. Whether it's end users, designers or architects the treatment does not change, their satisfaction comes first, and projects are realized with an extreme professionalism and competence to always strive for excellence, with all the interest towards the purchaser and its needs to improve his well-being.

Solutions on-demand are the products Ares Line aims to offer the customer: a continuous search of always giving the best solutions in terms of specificity and relevance to the needs expressed by customers. The aim to satisfy the individual requirements and customizations desired by customers is achieved through two different strategies:

- the first, the simplest, provides for the customization of products already available in the company's catalogue as a continuous offering for those

customers who have no particular creative needs and so they can find what best suits their needs by the pre-set selection options suggested by the company. In this case we talk about the customization of series and of series derivatives where a high involvement of the consumer is not expected because the products are already present in the firm's offer and by being continuous products a medium/high investment would be required for customizations. Seating customization regards variants of fabrics and leathers with which the chair will be upholstered, the type of armrests and different settings depending on the use, the addition of the headrest or the folding table and so on. All the features are described in detail in the product catalogues in the web site related to each chair depending on the category of interest, in the same way the available customizable features are listed in attachment to each product. The customer then faces an individual choice between products that are born to be customized, hence already set to allow the consumer to create his own product quickly while always getting the highest quality from the company.

- More interesting is the case where the products are totally made to measure. Starting from a client's request, the so-called on-demand products are then realized, where, taking into account the technology and resources that the company has, a new product fitting the characteristics expressed by the customer is created. The internal technical team of Ares Line has the task of realizing a project, the design and the prototype as soon as possible to reduce the response time to the customer in proposing him the final solution which, after being ascertained, goes to production. At this stage the major competitive differences of Ares Line already begin to take shape: a customer-oriented and flexible organization able to quickly satisfy him with excellent results, where customer engagement becomes a strong point upon which all the departments must working on to fully understand the requirements and to develop them in a consistent and efficient way. New technologies play an important part in exalting the role of the customer in the development of on-demand projects, whether it is about individual seats or larger and complete projects, whether they are realized individually by the Ares Line or by the

Contract Design Network, however, the digital and new technologies increase the involvement of the individual in the creation and in the communication phases, and they promote a lean production making the entire business more flexible as we will see below.

All the strategies implemented by the company in the various fields of activity including the production, the management and internationalization are developed according to the first mission that Ares Line pursues and stands at the head of all the other above-mentioned strategies, which thus they all aim to reach the most important objective: customer satisfaction. All the actions must aim as the ultimate goal to satisfy the customer, without which there would be no chance of success or even survival of the company. This satisfaction is only obtained through a continuous search of excellence taking into account that from the quality of any action depends the quality of the final product. To satisfy the customer does not only count the product, but first of all Ares Line emphasizes the service that surrounds every product as a mean to increase the value of the good and needed to make the customer perceive the added value that the company offers to better compete. Everyone in the organization must be aware of what are the key business concepts, rules and procedures that must be shared to get an excellent service, the company philosophy must be delivered by the management down to all the departments until to the end user to make him comprehend the firm's propensity towards the customer. This requires a good training and that's why the company invests on all the aspects that may affect the service because from this service derives the fundamental distinction of quality products and this is the best way to enhance the quality of the product from which, in turn, customer satisfaction derives.

As an open-business model Ares Line tries to integrate its own organization competencies with the customers' individual preferences into a collaborative network that aim to enhance higher value through the co-creation of products and services perfectly fitting to the clients' requirements in order to increase their involvement and experiences. The inclination towards customer satisfaction is pursued by the company thanks to the performance of more complete and advanced services and products that allow the customer to feel more involved, and therefore they also raise the quality of the company itself. This fact finds a proper explanation in Fonology line, the contract area that tends to satisfy the customer not only at the product level but

also on a sensory and acoustic level to increase the welfare of the individual in more liveable spaces. Through the research of advanced materials and the use of technologically advanced measurement tools, Ares Line develops solutions aimed to improve the response of space to sound in order to maximize the acoustic experience of each environment. To the functional aspect is also matched the aesthetic one, in fact once again it is about on-demand solutions where the utmost creative freedom is offered to the customer thanks to a choice of shapes, colors and graphic materials which are studied in collaboration with the company to get to the full satisfaction of customer needs, as the top strategy wants, and simultaneously get the final guarantee on functionality, according to the production strategy. Through customization of each Fonology idea, the company achieves its goal ensuring the customization and therefore customer satisfaction, high functionality and deep experience, to which the strong impact of Italian design is added. Furthermore, thanks to the use of technologies for the purpose of satisfaction of the end-user and increase of his experience, Ares Line presents in the market its ability to create smart products: the continuous seeking for and inclination to improvement combine once again functionality and design to offer customers innovative solutions to benefit the community. An example is the on-demand chairs realized for the theatre in Lintz where in every seat is installed one touch screen from which the viewer can read the Opera script in the preferred language and get access to various interactive services such as the choice of the point of view and the view of the stage, get information and details that enhance the scenic effect while making the user experience unique. Moreover, during the breaks some advertisements are broadcasted and that benefit the theatre thanks to the revenues it can get from.

Besides the technical and functional performances, the use of the digital is also considered with regards to the communication with the customer. Communicate with the customers means paying attention to their needs to grasp what are the points upon which the company has to work in order to respond quickly and coherently with the requests, hence in this way gather all the benefits and the competitive advantage related to the final customer satisfaction. But it also means being able to convey to the market the corporate message, extolling the core competencies of the company in order to help the company to be chosen and to position itself ahead of the competitors. In addition to the classic paper catalogue as a business card with which

the company introduces itself, which contains the major projects carried out by Ares Line to support their success and their goals, other more direct and engaging communication methods are also used which exceed the static nature of the paper as the printing and publishing phases are time-consuming and though limiting a frequent updating. Customization and customer service are supported by custom catalogues that Ares Line produces for each on-demand project it undertakes. From paper to multimedia, in tune with the desire of offering a high-quality service, through customized presentations the company pushes towards a high interaction with the customers directly involving them in the explanation of the project developed by the firm. Each presentation begins with a general overview of the company as in happens for paper catalogues, to ensure the customer to have chosen a qualified company, and continues with the presentation of the proposal of the project to be realized in a 3D format which describes all the general characteristics of the space and of the individual components that will be included in as the chairs or the acoustic panels.

Figure 3: 3D rendering

(source: Ares Line storage)

Three-dimensional rendering allows the company to obtain results close to the ultimate reality, so being able to give a clear and concrete idea to the client of what will be the final solution and allowing the company to evaluate the possible changes in real time. Thanks to a multimedia presentation then, the company also put video and other dynamic files in it to have full overviews of the spaces and products in order to transparently communicate with the client and especially actively increasing its interest in a high-involvement experience and with a great impact in his satisfaction. Finally, always with the goal of serving the customer with the best means to increase the satisfaction coming from the product and to promote the product as well, Ares Line participates in the most important and populated fairs of its business field. Thanks to these events, the company manages to create spaces in which greet customers and engage them as spectators in front of a real demonstration of the functionality of its products that could not be done with the same impact by other means. In this case the company has the ability to create multipurpose spaces where they can communicate directly with an expert and interested public and being able to prove their experience, their own way of working and their own innovations in a dynamic, realistic and impactful way: the experience and the involvement will be translated then into interest and curiosity about the products that can be met immediately by the direct contact with on-site technical staff. A comprehensive service that transmits the technical excellence and quality of Ares Line in full respect of the client’s care.

Being on-demand solutions and taking as its starting point the collaboration with the client, the strategy pursued by Ares Line is a pull one in which the production comes from listening up to the market demands in order to achieve successful results according to the that needs. Due to this, all the projects are studied with great professionalism in order to create the best products, both in terms of function and quality, with the best fitting reachable. Get the best match between the needs of the customer and the solution designed leads to achieve a double benefit, not only a confirmation of the company's ability to be faithful to the objectives that communicate and to always reach them, thus increasing its credibility and prestige in market and so consolidating its reputation as a leader in its field, but also an economic benefit related to the higher propensity of the customer to pay a premium price since he

recognizes the added value given by the quality and the excellence of the service and by the functionality and performances of the product.

A strategy that has as its focal point in the customer, in his welfare and his satisfaction to be achieved through tailor-made products is also the base of researches and innovative growth towards which the company is pushed. The entire research and development phase is carried out within the company by the technical staff, but many ideas and initiatives come from the customers. Ares Line takes a challenge every time to meet customer requirements that are becoming more complex and sophisticated, and forcing in this way the company to seek new and innovative applications and solutions, going to the most advanced and creative design levels. The goals set by the client serve as a stimulus for innovation and growth for the company and, consequently, to defeat the competition thanks to the continuous improvement imposed by the market and the trend of the demand in order to find technologies and designs that ensure comfort, space optimization and aesthetic quality.

3. Digital and traditional manufacturing: the production strategy

Ares Line production model totally aimed to increase the competitive capacity of the company thanks to a strategy based on the lean thinking to improve efficiency and reduce waste in accordance with the new organizational models developed to respond to new market dynamics. All Ares Line products are highly innovative, technologically advanced and with excellent functionality and even with great attention to the accurate and linear design and to the high quality of materials used. A production in which technology and tradition come together to create unique and competitive projects in which the passion for ancient quality rooted in the Made in Italy culture is enhanced and modernized by the force of a technically advanced industrial structure. In addition, to meet all the requirements, the production becomes flexible in order to achieve on-demand solutions in which every single detail is cured in order to obtain tailored results through additional optional, materials and functionalities customization. In order to support this production paradigm, Ares Line

has developed a strategy based on the optimization of production times, reducing waste and errors, increasing the best fitting with great efficiency to reach the upper goal of satisfy the customer.

Whether it will be individual customers or public tenders, the best way to win the project is being able to respond promptly with a proposal of a complete and tailor-made project: speed and quality of the service are the two key factors to emerge from competitors. In order to respond to the market quickly, the digital manufacturing provides for reacting fast enough to the opportunities that the demand brings by responding just-in-time and in a satisfactory way before all the others players. This means that when the order is received the internal team works throughout the company to quickly conceive and develop a 3D project already well-finished in details because the CAD model gives the opportunity to study the spaces directly during the construction of the product, then this is printed to have a 3D rendering on paper and multimedia that concretely demonstrates what will be the final result, in order to get the approval, continue with the implementation of the project and create the prototype. Thanks to rapid prototyping and rendering in 3D Ares Line can get the flexibility to develop and modify the product when necessary in real time and at the same time offer a complete, quick and clear service to the customer by offering solutions that are closed to the ultimate reality.

-PRODUCT DEVELOPMENT-

The company starts the planning and design process of the project and of the all products that are going to compose it with the study of the areas and the requests upon which it must work in order to seek solutions that fit perfectly to the context without losing quality or functionality. Therefore, an accurate representation should be obtained in order to get the geometric data necessary to develop a CAD model that perfectly correspond to the reality. Then, by maintaining the shape and all the features acquired, every detail can be modified effortless and in real time. If the product, either a component or a finished one, can be directly produced in house through an AM machine by simply sending the CAD data to the machine. If the production requires higher size batches, Ares Line just has to send data to its own external provider that will produce exactly the product received in 3D format. This is

the case for example in which the company has to develop a series of chairs to be placed within an already-defined space.

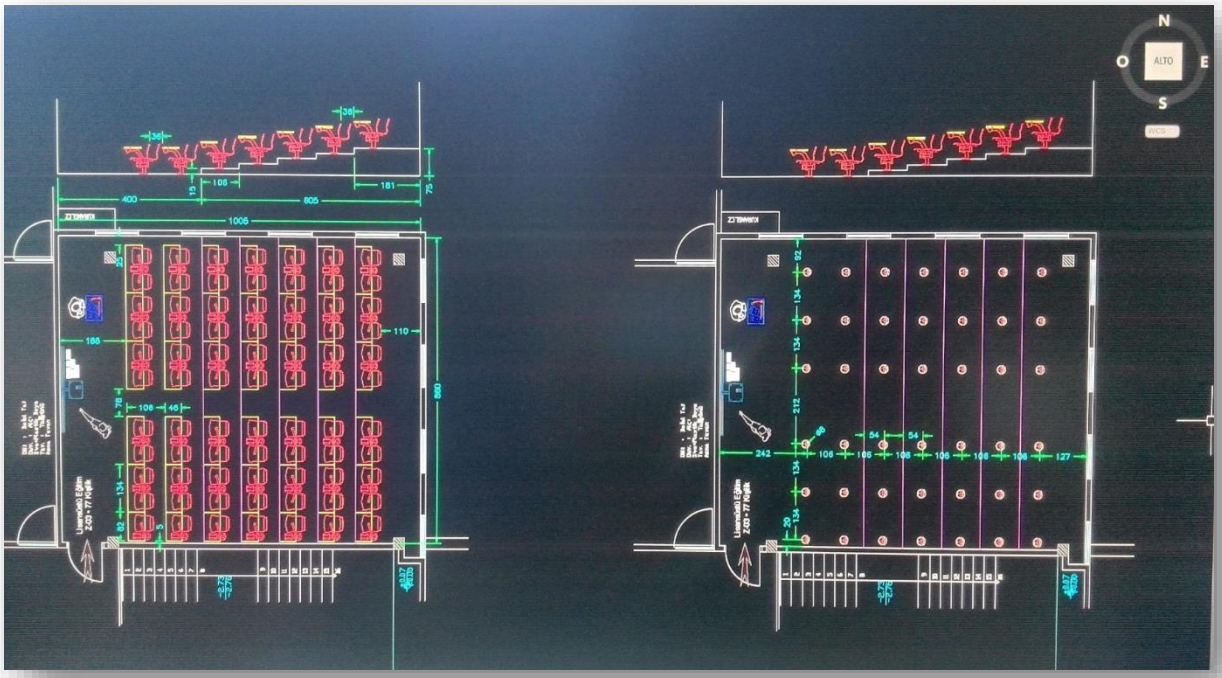

Figure 4: CAD file example
(source: Ares Line storage)

The study of the measures, the spaces and components to be produced takes place via a CAD drawing in which the chairs are made and positioned in a way to optimize real spaces, then through data reprocessing, each change of the product is made at the time such as decreasing the measures of some chairs depending on their location to ensure that the final result, visible in every moment on the CAD file, will have all the armchairs perfectly aligned, without cluttering the movements between rows and avoiding that the different dimension of the chairs can be perceived to ensure the aesthetic quality. The initial study of the project is crucial as it is demonstrated by Fonology line with which the company aims to determine the acoustic properties of structures and of the elements that it realizes: for that reason, Ares Line uses technologically advanced equipment in close collaboration with the world of research to check the sound parameters of the interiors, from which it can study the best solutions and the choice of materials in order to correct the sound output, thereby maximizing the functionality of the project and collaborating with

customers for the qualitative selection of materials. The materials on which it relies are sophisticated and require some technical abilities to be machined, in fact they are panels on which predefined themes or supplied by the customer are digitally printed, sound-absorbing materials, printing on metal, perforated concrete, lichens, felt and magnets: each material is innovative for an optimum functional performance and customizable both aesthetically and in the usage for high-design configurations. The study of the environments results in a more professional and rigorous product development process in order to optimize spaces and to provide solutions that can satisfy even more areas of application. An example is about the technologies used in the production of stairways and of other mobile structures on which the chairs are integrated: in this case Ares Line developed a product in response to multi-functionality environments, using technologies and automation that allow to differently use the chairs depending on the situation, by using modern and accessible mechanisms.

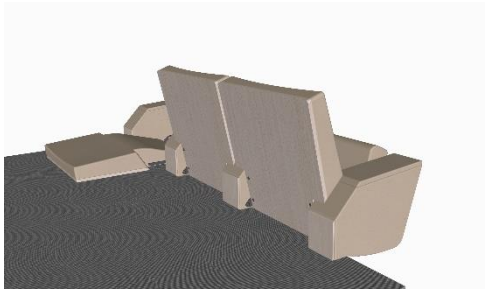

Figure 5: 3D rendering
(source: Ares Line project storage)

Product development is not only related to the spatial functionality, but it also addresses the user's welfare. For this purpose, different technologies are employ to test the materials that are used to make the products in order to ensure the best ergonomics possible and to be appropriately installed in the chairs. Ares Line has developed in collaboration with Pininfarina a gel material that fits to the body shape to increase the benefit and the quality of the seat, and this is applied to the chair instead of the usual rubber that instead tends to create an opposing force to the body.

Hence, Ares Line wisely uses the technologies in the first phase of research, study and development of products in order to have a high impact to the customers' perception, allowing the firm to later produce projects with both highly functionality and quality design.

-PRODUCTION PROCESS-

Ares Line uses some in-house additive manufacturing machines such as the 3D printer, lasers, robots and quality control machines. Through the digital manufacturing the company produces prototypes, components or finished products with all the advantages that this method entails compared to the traditional one.

Figure 6: 3D printer and quality machine

(source: Ares Line storage)

Initially, years ago, Ares Line leaned to a model maker who, with his craftsman skills, had to manually create the so-called zero model drawing it completely from the raw material, thus by committing from twenty days to a month. In order to not to extend time too much, the geometries achievable were limited and rather simple, since each extra detail required more time. Furthermore, the model was carried out starting from a drawing on the paper and therefore it was very easy that some features were incorrect due to the wrong interpretation of the basic drawing. As a result, every correction and modification required could be made after the model was sent back to the company to let it check how it was, and then it had to be sent back again to the model maker who had to rebuilt it again in the correct way. With the advent of molding and tooling machines, the situation was certainly improved, but times,

changes and costs were however still high. Instead, with the use of the most innovative digital technologies every aspect of the production has been improved and enhanced.

Thanks to rapid prototyping any issue concerning the production of prototypes expired given that it provides for a reconfigurable system that makes production adaptable to new situations. Though, the expensive manufacturing and set-up of conventional tooling and moulding machines and the risk linked to the possible need of redesigning the product because it might be not functional are then overtake by rapid manufacturing. That is, digital manufacturing is arranged for changes in product configuration and real time redesigning by just affecting the 3D data model before the manufacturing stage.

Starting from the CAD model editing time and prototype production time are reduced, together with decreasing errors that were previously caused by a wrong interpretation of the paper drawing. Learning how to use the CAD software in fact requires very short times and this is an education that Ares Line requires in order to facilitate the whole process by speaking and understanding the same design language. Therefore, the firm faces less waste in terms of time and material thanks to the continuous check by the designer and thanks to the possibility of modify any aspect in real time, moreover a lesser material waste is reached as we are talking about methods where the material is added layer by layer rather than by subtraction, so that the production that Ares Line realizes for example through the 3D printer of the components or of the final products, if it is in small batches, is more efficient and also reduce the waste of energy consumed. Another example of waste reduction is given by the machine with which Ares Line cuts the fabrics and leathers: in the machine's computer, a digital file is plugged in that contains the shapes and the real dimensions of the parts in which the fabric has to be cut; via a laser projection these geometries are arranged side by side and in the most efficient way in order to occupy all the empty spaces of the fabric to avoid any waste of material once carved.

Figure 7: Digital cutting machine
(source: Ares Line storage)

A sort of blade starts and cuts the shapes following the contours projected in a continuous cycle, thus ensuring not only less material waste, but also a high precision cutting and the elimination of errors related to shapes and sizes. Lowering

of waste in terms of time, space and costs is a key point in a lean production system, and Ares Line better configured its machine-organization in order to cope with this issue. The production in fact has been resized in order to bring the cutting and fixing phases of textiles to the frame of the final structure to ensure that the textiles stretching is correct before proceeding with the complete assembly of the final product so as to be able to intervene immediately in case of errors.

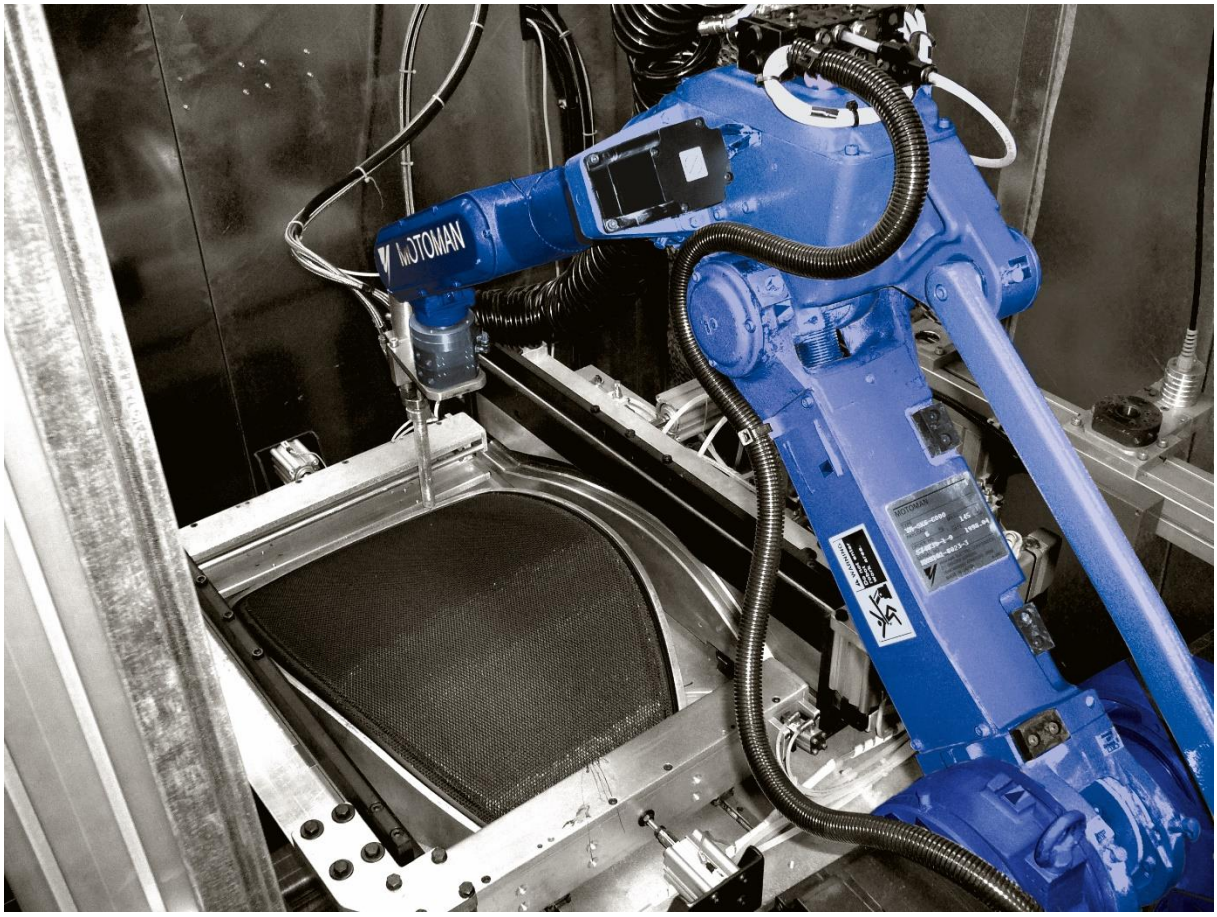

Figure 8: Ionisation robot
(source: Ares Line storage)

To maintain high levels of production quality every phase must be developed according to excellent methodologies, so for example by the use of robots that allow to obtain an ionisation of the fabric to increase the adherence of the glue for the manufacture of frames without screws as expression of the high quality and the technological efficiency resulting, and thereby improving the following phases as they are based on products that are already optimized and well-constructed to reduce any margin of error and waste and make the production more agile. Moreover, a lean production is also related with the concept of pull systems and flexible manufacturing

where through AM techniques it’s possible to develop make-to-order strategy which is the idea of getting the order and linking it directly with the manufacturing stage as it happens in the case of the configurator which guides the user throughout the configuration of his personal item and translates it into bill of materials that are already set and producible, without middle stages in order to avoid any distortions and so, any waste.

Since changes in demand and high customization are so common, product variety and product customization can be reach by the firm without any loss in time-to-market, cost and quality thanks to flexible manufacturing which let the production process to react and adopt any wanted changes and offering in this way highly customizable products. The agile production allows Ares Line to achieve not only economic benefits related to the efficiency of the production process which becomes faster and responsive to demand flexibility and uncertainty, but also benefits from the profits linked to greater customer satisfaction, which results in a greater willingness to pay a premium price and in an increase in market share and market reputation. A better design and manufacturing process provide for a better fit of products for clients' wellness. The positive tendency of clients comes not only from the satisfaction of having the customized product, but also by the benefits arising from products that are ergonomically friendly with body and more advantageous in use thanks to the integration of additional functionality. Through digital manufacturing Ares Line has improved its solution on demand with the installation of touch-screen and other added functionalities increasing the complexity of the geometries and products that become smart products caring about users’ security and users’ experience. Furthermore, new garments and other materials can be produced with these innovative methods improving both the texture and the garment body fitting, adding new solutions as assembled garments and textiles with built in functionalities. To sum up, Ares Line is aware that the digital manufacturing is able to provide for a lean production system thanks to the reduction of waste, better flexibility and customization compatibility through fast re-configurability methods.

The technology efficiency is also applied to the logistic and organizational level of the warehouse, where to optimize spaces Ares Line is orienting the logistics towards the radiofrequency system that allows to store the stocks, only necessary for the products in the catalogue, in a more advantageous way: initially, any product was

stored in a specific space reserved only to stocks related to that product, this, however, required to add new spans for each new stock that was added although some spaces remained empty but that could not be filled as used for different products. Now through a bar code, typical of the radiofrequency, that encodes every product, stocks can be stored in any free space and subsequently be easily localized by a computer without forcing the company to increase the cost of rent for new space as it did in the case of series division.

As initially stated, the technological production will be combined also with the high-quality craftsmanship. Ares Line uses the digital manufacturing techniques to get all the benefits related to the production of those parts of the product that can be implemented technologically. The technology is crucial but today these production techniques are well spread between the competition as well. The economic advantages thus resulting from these methods of production are not sufficient to distinguish Ares Line from the other players. For this, the company leverages a lot on a well-known feature in the market but linked to a knowledge that just a few holds and knows how to apply it: the Italian manufacturing tradition. Introducing itself as a symbol of the traditional craftsmanship of its region, Ares line emphasizes his passion for tradition and attention to every detail of its products, supporting the importance of human intervention to bring out those subtleties that are typical of the high design and Italian style as a symbol of uniqueness and quality that only with the ancient knowledge can be realized, without the use of any technology but with the only dexterity. All the seams of Ares Line’s chairs are handmade; the fabrics are padded by the trained staff to ensure proper adhesion and maximum comfort. All aspects regarding the upholstery and the strictly artisanal phases are realized according to traditional methods and procedures to achieve high quality finishing, distinctive and only own by this company.

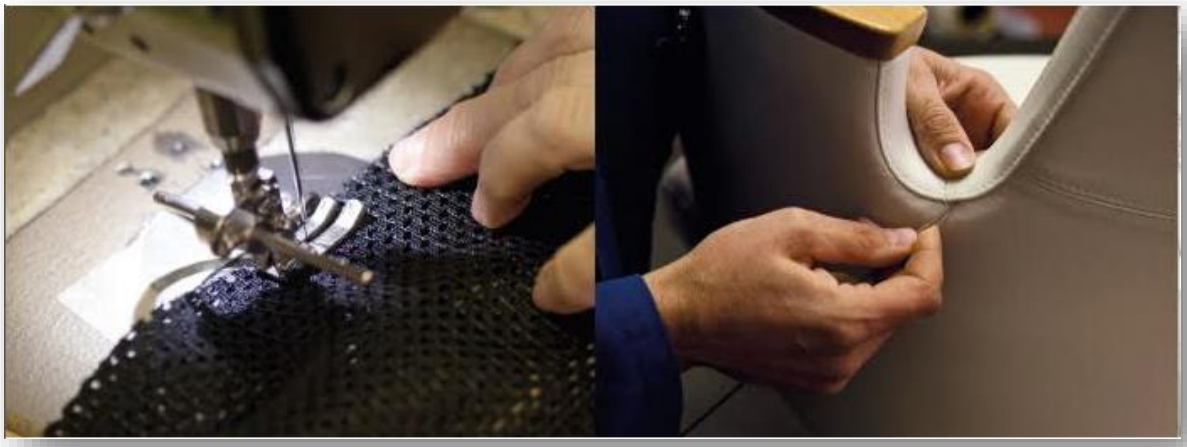

Figure 9: Handmade finishing
(source: Ares Line storage)

The advantage over the competition comes from the fact that the craftsmanship knowledge requires an extensive training and handed down learning, originally rooted in the area, that cannot be acquired by everyone as it happens for CAD experts. In fact, today it's not easy to find upholsterers, but Ares Line has highly qualified and competent personnel that the brings it to move ahead of the competition. Manual work certainly requires much more time than the production through digital machines, but the ability of the company is to compensate with the time gained by the typical production speed of digital manufacturing for the longer time required to achieve the excellent manual finishing. This strategy allows to obtain excellent results without any loss, combining the advantages of technological production with those of craft production into a perfect union of time and quality. After all, some more additional time needed to customized a product with these unique and excellent features is a little premium price that the customer is willing to pay for a better result since it is related to his satisfaction.

-DISCUSSION-

As we seen all along the case study, Ares Line's strategy has the client as the starting point and his satisfaction as goal to be reached. In order to that, Ares Line leverages on all the advantages provide by the digital manufacturing and its machines in order to design, prototype and develop a product quickly and that fits at the best the customization the client expects. In addition, the company emphasizes

its strength coming from the uncommon quality of the traditional craftsmanship as a plus to be ahead from the competitors. The outcome of these scheme is the creation of highly customized goods, distinguish by excellent quality and cutting edge innovation that are translated into benefits for both the improvement of clients' satisfaction and the improvements in the company's profits gained by a higher willingness to pay of the customer together with better recognition and visibility in the market.

The strategy works as it is confirmed by all the big successes that Ares Line boasts in its history that are showed by all the projects developed worldwide presented in the website and in its catalogues as a guarantee of the experience gained and the knowledge improvement. That is a solid base for a continuous growing and progress in development of its own competences to better exceed its limits. It is not surprising though, since the overall strategies is developed in accordance with the current trends of the market: if the demand for customization increases, Ares Line relies on a production system able to be reactive and reconfigurable in order to let the company respond with on-demand solution; if the dynamism of the market becomes more and more complex, Ares Line has a business model that provides for unlimited solutions and excellent services characterized by flexibility and efficiency coordinate by advanced technology and supreme ancient know-how in order to be at the forefront of the office and community chair sector. A winning strategy for a strong international brand that produces products to satisfy even the most discerning customers.

MUSIKTHEATER

Austria

Where
Linz, Österreich
Project
Opera House
Products
Solutions on Demand
Total seats
1250
Year of completion
2013

Figure 10: Musiktheater Linz
(source: http://www.aresline.com/it_IT/progetti/2/musiktheater-linz)

The Linz Musiktheater is one of the most advanced opera house due to its vocation for state-of-the-art technology. The project of this venue has been carried out by Ares Line together with Radio Marconi, a company part of the Contract Design Network. The main idea was to create an innovative environment in which design, comfort and benefits can be achieved in order to meet the growing expectations of modern audiences. Hence, high quality design furniture and technological devices were the two keys to succeed in offering a unique solution coherent with what was expected. Ares Line then provides custom-made seats integrated with touch-screen displays produced by Radio Marconi to best enjoy the experience heading to a greater level of customers satisfaction.

Figure 11: Digital rendering of the Musiktheater building
(source: https://www.landestheater-linz.at/musiktheater/Das%20Haus)

Ares Line realized a custom-made collection of armchairs due to specific requirements defined since the beginning of the project development: in order to ensure the best visibility to each viewer the seats are installed on stepped floors with three-dimensional curved rows since in this way no one is on the same sightline. For this reason, the company created 23 different models of chairs with different features in terms of dimensions and shapes, and exactly with 6 kinds of measures and 14 types of seat back. Even though the dimension can vary, every seat is realized according to the ergonomic requirements, with generous size for a comfortable accommodation and with micro-spring technology for a soft and gradual back support.

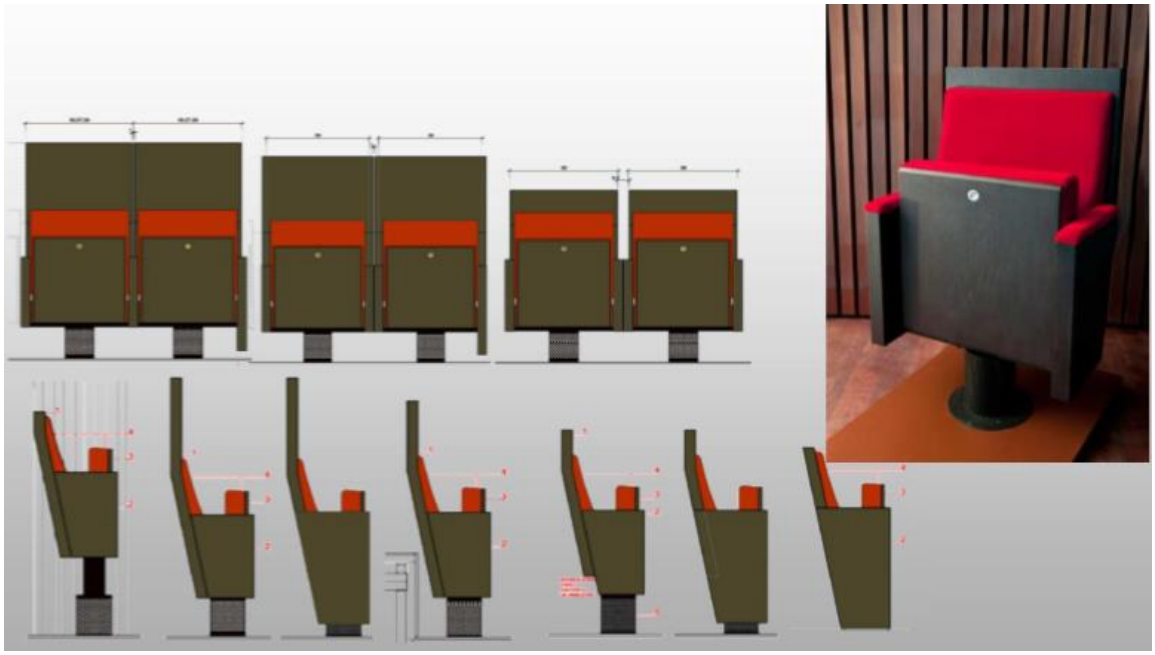

Figure 12: Different sizes and types of the Ares Line custom armchairs collection
(source: Ares Line storage)

Great innovation is not only used in the padding materials, but even in the additional functionalities of each chairs, in fact each seat is equipped with a cylinder for heating or air conditioning able to minimize the air flow noise in order to avoid disturbing the audience as in the case of the ultra-silent tip up system of seats when closing.

Figure 13: 3D render of the venue

(source: Ares Line storage)

The Linz Musiktheater has a multifunctional nature since its building is conceived to be rearranged every time is necessary according to the kind of performance that is going to take place. This means that instead of having a single production repeated for numerous weeks, the theatre can host an opera in one day followed by another one completely different the day after. To guarantee that the theatre can meet the technical demands coherently to each show, it was necessary to realize an easy system through which the chairs can be moved and rotated. Ares Line designed a quick release system thanks to which any seat can be removed from any row, liftable seat wagon can move entire rows without any effort with the result of changing the seating capacity when necessary.

Figure 14: Digital representation of the internal space
(source: Ares Line storage)

Custom sizes and custom backrest height were efficiently studied during the product development phase through digital techniques in order to match all the different installing position that the theatre could have to not affect the sightline, any position of the chairs was designed in a 3D rendering and every assessment was correct in real time to avoid any functional and aesthetic error. Finally, custom choices were available for the wood and the upholstery as the client preferred considering the acoustic design suggested by Ares Line tested and certified in the laboratory it has equipped with advanced quality testing machines.

Figure 15: Model of the chair
(source: Ares Line storage)

The quality design of the chairs and their high functionality are the two key elements that distinguish Ares Line manufacturing to which the company has integrated another feature in order to meet the requirements of the theatre. Thanks to Ares Line's interest in technology, almost all the seats are designed to host an interactive multimedia screen in the back since the aim of the theatre was on the one hand to find a system through which welcome the audience all along its stay to create a kind of relationship and engagement of every spectator; and on the other hand a solution by which some profit can be generated for the theatre. Together with Radio Marconi, Ares Line has developed a unique added functionality to its chairs to raise customers' satisfaction up to higher levels of experience since through this device the venue can be connected with audiences of all kinds

and ages and it can provide them with a customized communication respecting in this way every taste and addressing them personally. Through the screen, not only guests who are seated in the gallery seats where the stage can be hardly saw are able to watch the performance on the personal screen in front of them, but also every guest can read the Opera Libretto provided with multilanguage translations and a smart interface enables the viewer to both view the performance and the subtitles at the same time, can have access to the bookstore and to the theatre booking office, connection to reservation facilities, multimedia video and individual messaging.

Figure 16: Sample of the touch

The integration of technology in a Made in Italy collection of customized chairs was designed with the aim of enhancing the live performance as the viewer wants while let the theatre gaining advantages as well. In fact, the information displayed on the screen is entirely supervised by the management and marketing offices of the theatre that are able to include personalized advertisement, sponsoring and donation utilities and other options to gather benefits from the exploitation of the merchandising potential this device has. The opportunity this solution provides positively affects the return on the investment by including new sources of revenue and even more, by attracting new visitors thanks to the possibility of requesting and receiving suggestion and information from the audience in real time and so interacting with people by responding appropriately. This enables the theatre to refine its service and offering and improving them while raising its impact on guests' minds according to the changing preferences effortless since the flexibility of this technology was designed to be easily evolved following the pace of the growing services and interaction.

Figure 17: 3D render of the final product
(source: http://www.aresline.com/it_IT/progetti/2/musiktheater-linz)

To conclude, the combination between the expertise of Ares Line in producing comfortable and ergonomic seats with high quality handcrafted details and the use of advanced technologies not only during the project development phase but even in the final product, has allowed the company to successfully satisfy what was expected for the theatre. An on demand solution entirely customized for the realization of the opera house and moreover, a customized project that addresses directly the customers as well since it enables the theatre management to inform, support and serve every guest in a unique and personalized way: the screen is a marketing and communication tool on which the Musiktheater will leverage to grasp all the future advantages.

So, have a seat and feel the comfort: the show takes place.

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CONCLUSION

Today's society and business are undergoing a huge transformation in which they evolve, reshape and influence each other reciprocally. Due to the ubiquitous digital technologies, the boundaries between manufacturing processes, communication and digitization are unclear and tiny: consumer demands, the nature of product and the way of doing business are evolving under the wave of digital connections and information sharing that modify resources and competences necessary to properly compete.

Customers are acquainted since they have access to lot of information and data about companies, products and services and they expect customized products and valuable experiences both realized upon their own preferences. This creates a great pressure on companies but new challenges and opportunities as well. The only issue, in order to capture the value and avoiding to be overwhelm by this situation, is the fundamental ability of a firm to develop a coherent business model to ensure it is prepared to thrive in a dynamic market, by focusing on internal capabilities as well as external incentives to cope with volatility in a fast pace environment. Hence, an open business model is where the organization should be oriented given that it provides flexibility and access to innovation by collaborating with other actors in a network where ideas, skills and assets are shared to enhance each firm's core business. Openness enables firms to be more competitive and to fill the lack of proper resources to get access to global opportunities and to exceed their own limits. Here it is where the concept of agile manufacturing shows up, a concept that heavily relies on digital techniques that are more and more common in the industry. As explained in this dissertation, digital manufacturing in all its different tools is essential to let the company gains advantages from their use and react quickly to the economic landscape through the ability of adapting and aligning its activities with agility. Numerous benefits are provided by additive manufacturing methods: impossible designs become possible and complex geometries have no influence on machine since no moulding or tooling are involved anymore, with the consequent result of improving product design optimization. Moreover, the production process is speed up by eliminating assembly phases as products can be built and consolidated in one moment. This in turn, allows for a faster time to market responsiveness which is

crucial in a situation where customization and high diversity in products delivered with quality services are the keys to create satisfaction and success in an evolving market. Furthermore, due to digital devices engineering and production are efficiently deployed by the possibility of changing and modify any feature before the realization of the item, with no additional cost as in the case of traditional production tooling changes. As a consequence, by an early validation of the manufacturing process, quality is increased and less errors and uncertainty allows for less waste and lowering cost. Customization is ensured together with higher profit since customers are willing to pay a premium price for custom-made goods and services, while flexibility strengthens the market position of a company able to offer target products efficiently.

A case study is presented in order to support all the facts stated along the dissertation, as proof that digital technologies and open collaborative innovation are the main sources of effective innovation since they rely on customers and entrepreneurs' synergies upon the designing of high quality, functionality and fitting to preferences. Ares Line is a great example of how the digital revolution is able to enhance the creativity and the quality of the Made in Italy manufacturing while offering new competitive standards and higher product and process innovation. The Italian approach to innovation has to take into account the particularities of its national entrepreneurial system. It is based on manufacturing, and it is made up of traditional companies that can profit from mutual synergies and collaborations. In this way they can have easy access to the higher competences and skills, access to credit, new ideas for renewing the business and cooperation to face the challenges of the international market. Ares Line is one of all the companies that can be taken as an example to explain how these technologies are shaping the future of market's trends. Firms, products, people's life and the society as a whole are affected by these new technologies, so it's really useful to leverage on those technologies as it is fundamental to follow the rhythm of this trend in order to understand the surrounding environment and keep on with the development of technological innovation since the future is about all these advancements. However, digital manufacturing and digital technologies are nowadays common and lot of companies can get easy access to digital knowledge, hence some distinctions might be done considering that some firms might be more acquainted about digital culture than others or might have more technological assets and better equipment. But, regardless the extent to which

companies are set up, these technologies (the additive printing, 3D scanning, robotics, laser cutting or the next-generation sensors) have been already integrated in manufacturing firms and so they are not a novelty anymore: they provide huge advantages to all the companies able to exploit their potential and to profit from them, so these firms can compete more or less at the same level if considering just the diffusion of technologies. Though, a company should find a unique attribute needed to differentiate its position and be ahead from all the others. What really make a difference in this case is the great value of the Made in Italy factor, which is something unique and rare, rooted in the historical culture of the traditional craftsmanship, this is the turning point to leverage on in order to differentiate Italian SMEs from the world's companies. To gain competitive advantage leveraging separately just on technologies or just on the reputation that the Made in Italy has it is not enough, these two concepts cannot stand alone in a firm's strategy. Hence, as Ares Line clearly shows, the breakthrough is the combination of these two principals in order to get agility and innovation from the exploitation of digital manufacturing together with the added value of the Italian excellence: it is a winning combination of two strong factors that are hard to be overcame by competitors, ensuring in this way an effective success in the market. Ares Line has technologies as its basis to which it adds its belonging to the Italian tradition in order to stand ahead and boost growth. The case is a fine example of how to re-imagine and reinvent the artisanal and creativity heritage of the Italian country by combining traditional manufacturing with new technologies, to realize great ideas for the future. In the middle of an evolving environment, with the tradition of craftsmanship of small and medium Italian enterprises and the advantages of the digital manufacturing, our country could be at the forefront again.

AKNOWLEDGMENT

I would first like to thank my thesis advisor *Prof. Stefano Micelli*. He was always passionate on giving me input and valuable comments on this thesis, helpful whenever I had a question about my research and writing. He suggested me on the right direction to follow to develop my work properly and he enhanced, in the same time, my personal interest on these topics from the first class I had attended throughout all these months.

I would also like to thank *Eng. Roberto Zuccato* and *Dr. Nicola Franceschi* who kindly welcomed me in their company. They were always open to inform and provide me with all the information I needed in order to successfully realized this project. Without their availability and of all the Ares Line personnel, the case study could not have been done in such a deep and truthful way.

Furthermore, I must express my thoughtful gratitude *to my parents* since they still support me now as the first day, providing me with everything necessary to be part of wonderful experiences to improve my knowledge and culture all along my years of university as they aim to assure me a great future. A special thanks to my brother *Edoardo* for the everlasting love I have for him and his constant and vital presence in my life, as I am sure he will always be there for me as I will for him.

I would sincerely acknowledge *Andrea*, for the happiness he had brought into my life and for always being unconditionally by my side, with unfailing encouragement and embracing love.

To *Corinna, Carlotta, Francesca* for being my daily joy, my light and my forever certainty, my strength and energy in times of need I have been through; to *Lisa, Sofia, Marianna and all my other friends and classmates*, both of a lifetime and new ones, here and all around the world, to *my new lovely neighbours* and all *my cousins*, my lovely *grandparents* and all my wonderful *relatives*, my profound gratefulness for all the moments we shared and the new we are heading to.

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