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"DIGITAL TRANSFORMATION AND INTERNATIONALIZATION PROCESS: CASE STUDIES ANALYSIS OF ITALIAN COMPANIES"

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The root of our problems is not that we're in a great recession or a great stagnation, but rather that we are in the throes of a Great ***Restructuring****. Our technologies are racing ahead but many of our skills and organizations are lagging behind.*

So, it's urgent that we understand these phenomena, discuss their implications, and come up with strategies that allow human workers to race ahead with machines instead of racing against them.

(Brynjolfsson & McAfee, 2011).

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INTRODUCTION

We live in a world surrounded by deep transformations in every field. It is due to the technological improvements that enhance the possible new ways of living, new ways to interact with things, house, people, new ways of doing business, and even to create new digital worlds.

We live the "second half" of the chessboard about technology.

"The second half of the chessboard" is a sentence by Ray Kurzweil, director of the engineering division of Google, referring at the Persian legend of Sissa. With this sentence he wanted to explain why we live in the age of hyper-digitalization (where technology really create a tremendous impact in the world) and the consequences of Moore law (Venier, 2017).

The Moore law affirms that the calculation power[1] of a microprocessor is doubling every year and a half. This law has been verified in the last fifty-two years and what is interesting about it is that not only the calculation process grows but even software and algorithms.

The Persian legend of Sessa (an ancient Indian minister) tells the invention of the chess game and the way in which it was donated to the king. He decided to grant just one Sessa's request. Sessa asked to the king an amount of rice starting with a grain of it in the first chessboard square and doubling this amount for each successive square. Thinking it was an insignificant request for a king, he accepted Sessa's proposal. Actually, doubling the amount of rice till arriving to the last remaining square, the result was 400 million tons of rice (reaching a complexive volume greater than Everest's one). Kurzweil noticed that at the beginning it seems to be like a linear incremental, but later he realized that it is actually an exponential one. In fact, until the 32nd chess square, the increase is significant but "under control". It is only when the second half of the chessboard is reached that the improvement starts to become incredibly significative. This way of thinking was inconceivable for that time just like imagining what computers can do now with a computer a dozen of years ago. Indeed, if we consider as first chess square the 1958 year when the American economic minister introduced the term "information technology" as a category of investment and, knowing that the processors double its power every 18 months, we reach the 32nd chess square in 2006 (Venier, 2017). Inventions like self-driving cars can be seen as inventions that we will see in this second half of the chessboard.

Indeed, technologies is driving an incredible change nowadays and these changes and transformations are going to be exponential.

[1] Because increase the number of transistors that is possible to insert in the same space of the microprocessor

It is essential to understand this digital transformation and all the technologies at the basis of them, in order to interpret the change and to use technology as an enhanced tool to obtain a competitive advantage in the models of doing the business of companies.

In this contest, this dissertation seeks to understand the relationship between digital transformation and the internationalization process of Italian companies.

The first chapter introduces the theme, explaining what digital transformation was in the past and what it is today, through an analysis of the concept of Industry 4.0. Successively, the different *tools* of this digital transformation (such as big data, analytics, machine learning, artificial intelligence, additive manufacture) are presented.

In the second chapter, the effects and possible outcomes of digital transformation are examined, to be precise: the effects inside and outside company (internal and external value chain), the relationship with the suppliers and the production process.

In the third chapter, the attention is focused on the relationship between digital transformations and internationalization process. It is discussed "*if"* and "*how"* the digital technologies of this fourth digital revolution can impact the different degrees of internationalization of companies. This hypothetical impact is contextualized in the choice of entry mode of companies, in the relationship between foreign subsidiaries and headquarter, and in the studies of the trade-offs related to different internationalization strategies.

After having understood the contribution of literature describing the relationship between digital transformation and internationalization, two questions are asked to understand if literature topics are confirmed and to try to give a contribution on future definitions:

Does the Digital Transformation impact the Internationalization of Italian companies?

How does Digital Transformation impact the Internationalization of Italian companies?

In order to answer to these questions, in the last chapter nine case studies of Italian companies that operate internationally and decide to implement a digital transformation process are reported.

In the conclusion of the dissertation, the result of the investigation and the answers to the research questions are presented.

CHAPTER I

1 DIGITAL TRANSFORMATION vs DIGITAL STRATEGY

Digital transformation (DT), digitalization, industry 4.0 and smart factory are all terms that are becoming common in nowadays especially correlate to the possibility of leverage on them, to obtain benefits for the organizations. Companies to use these theologies, must, first of all, understand what the meaning of all these terms are, what are the changes correlate to digital transformation and which are all the technologies at the basis of the digital transformation. It is essential to understand these themes, in order to interpret the new environment (and correlate possibilities) in which companies live today and so, use the technologies that are at the basis of our changing world as the enhances tools to obtain competitive advantage and improve and create new models of doing business.

For example, Uber in San Francisco, without having any cars of propriety, put out of the business the biggest taxi company and last year were valued ten times more than Hertz. Airbnb, thanks to the potential of the sharing economy, has more rooms of the Hilton group, and it is valued the double with its 800 employees versus the 152'000 of the Hilton group. Alibaba is valued 200 billion and don't own any store, Walmart is valued 190 billion but has to manage 11'000 stores.

These examples are the reason why every companies and organization must understand the Digital Transformation with its shadows, the origin and technologies, the concept of the smart factory in order to take advantage from them and use appropriately as a restructuring time for them as affirmed by Brynjolfsson and McAfee in 2011.

1.1 Digital Transformation

1.1.1 The beginning of the digital transformation

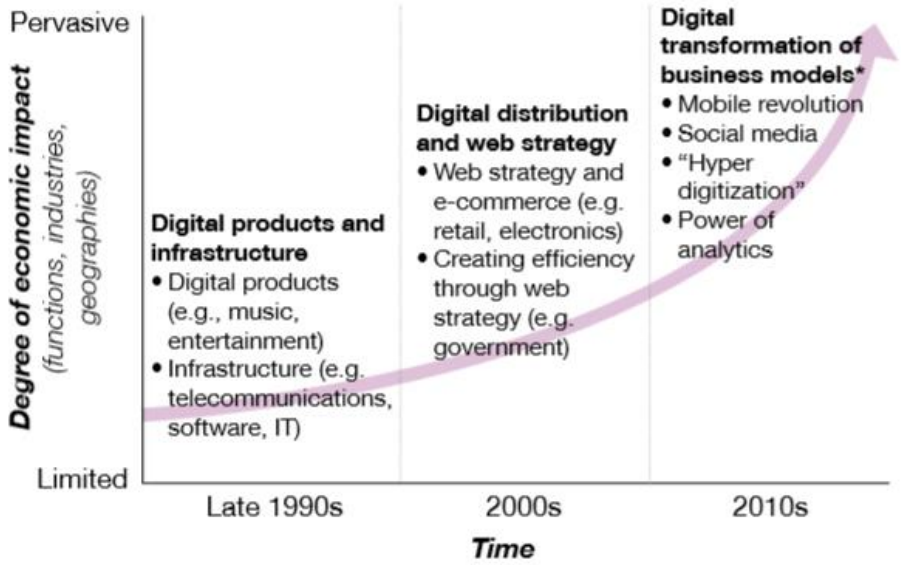
Business leaders have long used information technology to improve productivity and efficiency, reach new markets and optimize supply chain (Berman & Bell, 2011).

Digital transformation is one of the most impactful trends of today that company must understand and exploit its potential instead of ignoring it or see it as a threat.
Poggiani Alessandra and Tedeschi Gionata in "Looking Forward – La trasformazione digitale" (2014) affirmed that the implication of this new industrial revolution seems to be so impactful to change the strategy of growth of the companies and the balance of many industry sectors.
Before analyzing the argument and its implication is essential to clarify what is the meaning of "Digital transformation" and when this transformation begins.

-The application of digital technologies in everyday life- This began in the 1960s; however, after the Web exploded decades later and so many processes were moved to Internet-based datacenters, digital transformation has affected everyone. It has also altered the way people think about and do business, as the virtual nature of computing services often conflicts with traditional approaches[2] (Yourdictionary.com, 2018)

The Digital transformation, or better the digitalization of companies, began several years ago in companies of select industries - that were exploring digital products and service – and over the years it is possible to see an evolution of the impact and in the sectors where was adopted as showed in figure 1.

Figure 1: Evolution of Digital Transformation (IBM, 2011)



[2] (digital transformation. (n.d.). Retrieved October 04th, 2018, from http://www.yourdictionary.com/digital-transformation)

The music industry gives a good insight into the impact of digital because it was one of the first industry transformed by the digital revolution. Consequently, of the new standardize the mp3 format for digital music and the availability of broadband internet connection, the impactful change inside this industry became clear. “Traditional music companies are expected to lose more than 35% of value between 2003 and 2012 with a loss of 4 billion dollars… however, at the same time, other parts of the music ecosystem experienced significant growth” (Berman & Bell, 2011)

Indeed, the global recorded music sales in 1997 were 27.4 billion of US $ and in 2011 just 10.2 billion of US $. This because of the digital changes entirely the dynamics of the market.

As IBM affirmed in his report[3], at the same time, were some companies starts exploring digital product as music, the infrastructure took the lead in building the information backbone to improve efficiency and productivity across the specific function. Thanks to the boom of the internet in the following year's customer, as they became increasingly empowered based on access on online information link with a multiplicity of choices and channels, their expectation and needs dramatically increase. “As result, the customer has now become the primary force behind the digital transformation” (Berman & Bell, 2011).

Considering that the digitalization and more generally digitalization is not new to the business the real difference today’s world exits a fast-development case of hyper-digitalization. Advanced computing systems, big data collection, analysis, smart factory, provides unprecedented opportunity to unleash the value of interconnected data.

1.1.2 Digitalization and Digital transformation: the use of information

The alignment process of digital technology, skills, organizational process, and business models that aim at the creation of new value to the stakeholder and maintain the stability the organization in a digital ecosystem that is in continuous development (Venier, 2017)

The core of digital transformation is the use of digital inside the companies to reach a new level of improvements and reach objectives impossible to reach without it.

[3]Bernard, S. J., & Bell, R. (2011). *Digital Transformation: Creating new business models where digital meets physical.* IBM Global Business Service.

Newman (2017) in *Digital intelligence: The heart of successful digital transformation*, affirms that "the goal of digital transformation is to create a better, smarter, faster business that can better anticipate and meet its customer needs" (Newman, 2017).

Information today is a crucial element because the use of the right information at the right time gives the company the possibility to enhance the knowledge necessary to reach that objective (Kane, Phillips, Kiron & Bukley, 2015).

Building an intelligence platform is the tool inside the digital transformation that allows that.

Newman (2017) explains why the intelligent platform is one element of a digital transformation process that demonstrates the importance of information.

Data management is the element that permits the company to obtain data from every aspect - internal and external - of the company and collect them. Thanks to the new technology (not just IoT but IoE internet of everything) everything and everyone is connected and from this is possible to collect a tremendous amount of data that became the commonly called Big Data. Strong data management is the core of any digital intelligence platform because prediction is good as good are data.

The second component of an Intelligence platform is *embedded analytics*. Analytics and predictive analytics are the final goals in order to obtain useful data in line with the company need to know or understand.

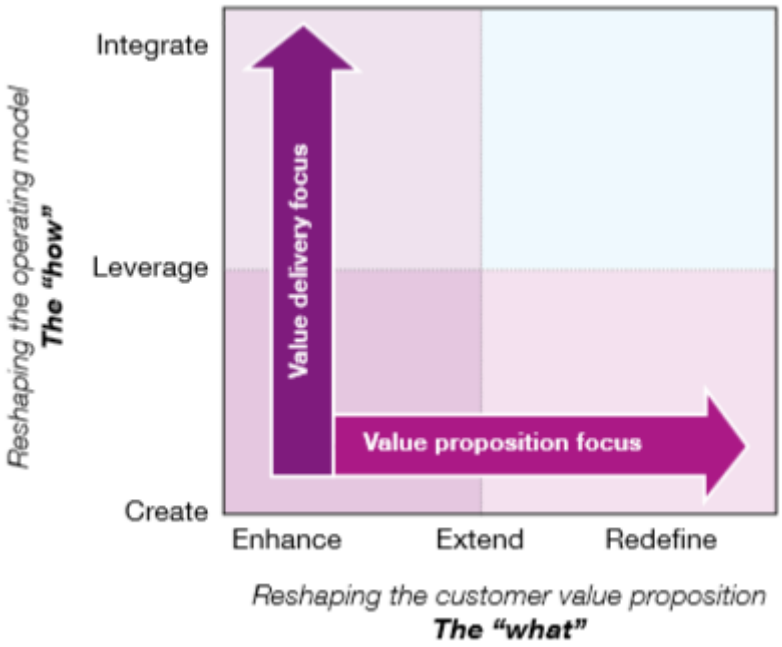
The *machine learning* and AI are the elements that allow to analyze all the tremendous amount of information from analytics and make sense to them. This because there is a gap between all the information available and the best information. Humans can manage a hundred keyboards at once, AI hundreds of thousands.

At this point, the company can arrive at the *real-time decision making* in order to make decision or action that can improve the company in both margins: internal and external. The most digitally intelligent company can make a real-time decision with artificial-hyperintelligence. Harley Davidson dealers is an example. After they using a marketing software (CRM) powered by AI, analytics and appropriate introduction of big data, by the third month, its leads growth by almost 3000 percent[4]. The marketing software was completely automated to determine which words and images were working most effective and use them not just to increase the leads through micromarketing campaign but also to increase customer action and response knowing what customer wants and aspects. (Newman, 2017).

[4] Newman, D. (2017). *DIGITAL INTELLIGENCE: THE HEART OF SUCCESSFUL DIGITAL TRANSFORMATION*. FUTURUM.

A useful tool to understand the direction of digital transformation and its elements is the two area of digital transformation by IBM as shown in figure 2

Figure 2: Elements of Digital Transformation (IBM Institute for Business Value analysis, 2011)



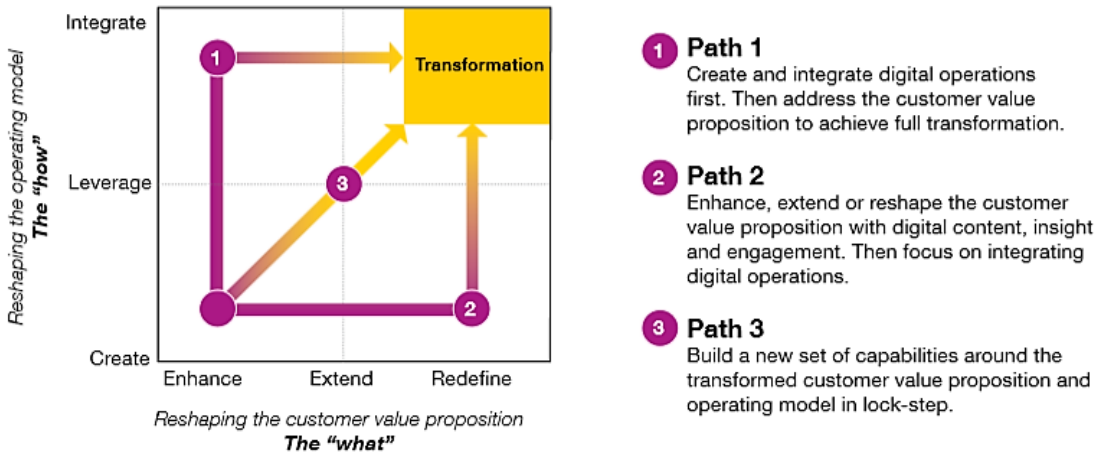
Since digital transformation is not just an investment in IT, is possible to use at least two main area in which the company operates their DT (Berman & Bell, 2011).

- In the horizontal axes the technology that can change the "**What**" about the customer value proposition: products and service, information and customer engagement can be reshaped. The challenge can be how to monetize this new customer value proposition.
- On the other hand, the "**How**" referring to the operation model. This area can be considered in line with the customer preferences, requirements inform every activity in the buying and selling the chain. In order to do this means integrating all business activity and proper use of data thanks to a digital platform. (Berman & Bell, 2011)

According to this scheme, IBM[5] identifies three basic approaches to digital transformation. One focused on customer value, another on transforming the operating model and the last one a combination of these two.

[5] Bernard, S. J., & Bell, R. (2011). *Digital Transformation: Creating new business models where digital meets physical.* IBM Global Business Service

Figure 3: Paths to digital transformation (IBM Institute for Business Value analysis, 2011)



Even if the third path can be assumed as a logically strategy that is implemented in the long run, every company should assume, the decision in which path collocate the DT for a particular company should depend on its strategic objective, industry contest competitive pressure and customer expectation (Berman & Bell, 2011).

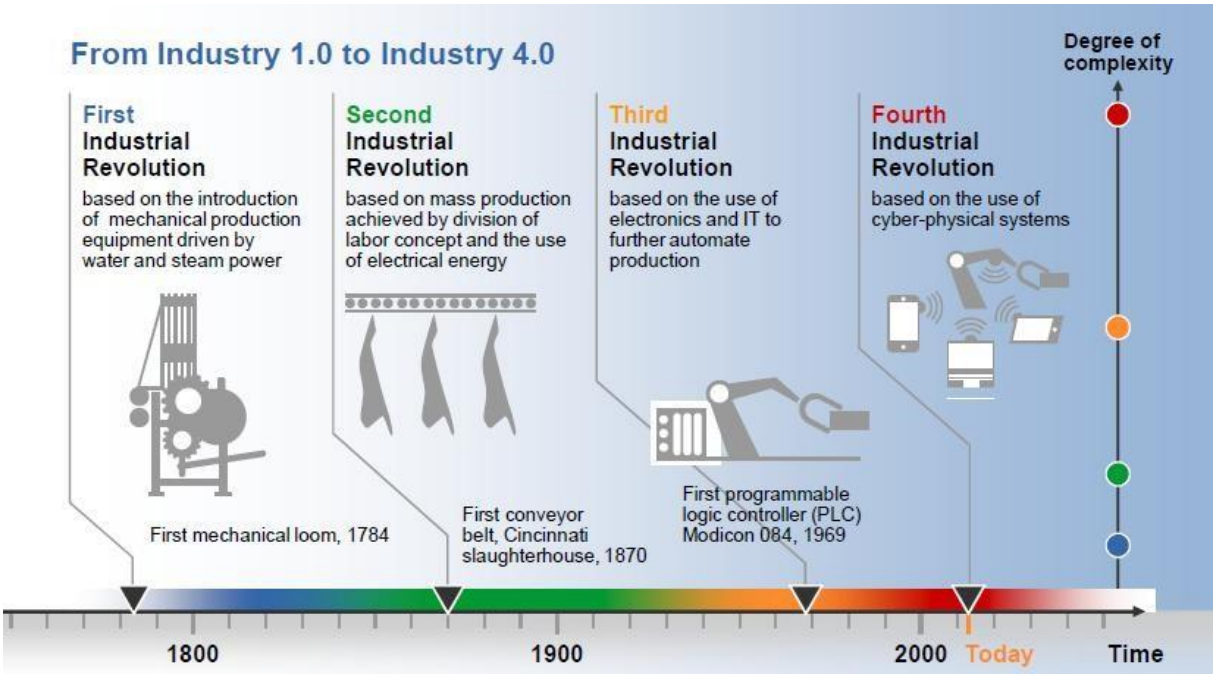
1.1.3 From Industry 1.0 to Industry 4.0: the smart factory

The term "Industry 4.0" refers to the fourth industrial revolution after mechanization, industrialization, and automation (Sàlifou[6], 2018)

An industrial revolution can be considered as a set of new technology that dramatically changes the productivity and every aspect of people life. (Anderson, 2012).
Each industrial revolution represents an acceleration regarding improvements.
In the past, every kind of goods was manufactured by hand or with the help of work animals. In the 1800s, began a dramatic change with the introduction of the so-called Industry 1.0, and it is possible to recognize how operations rapidly developed from there (Crandall, 2017).
The picture shows the commonly recognize "four industry revolution"[7] and what does that characterize each one from production and operations.

[6] Sàlifou, D. (2018, April 7). Retrieved from iBASEt: https://www.ibaset.com/blog/industry-4-0-heart-european-investment-according-plan/
[7] Crandall, R. E. (2017, October). *APICS Magazine*. Retrieved from APICS: http://www.apics.org/apics-for-individuals/apics-magazine-home/magazine-detail-page/2017/09/20/industry-1.0-to-4.0-the-evolution-of-smart-factories

Figure 4: From Industry 1.0 to Industry 4.0 (engineers journal.ie)



- **Industry 1.0** By the beginning of the 19th century, water- and steam-powered machines were developed to aid workers. As production capabilities increased, the business also grew from individual owners to organizations with owners, managers, and employees serving customers.
- **Industry 2.0** In the 1900s, electricity became the primary source of power. It was easier to use and to concentrate power sources on individual machines. It became possible to design machines with their own power sources, so making them more portable.

  During this period thanks to the development of management programs were possible to increase the efficiency and effectiveness of manufacturing facilities. The division of labour, where each worker does a part of the total job, increased productivity. Frederick Taylor introduced approaches to optimize jobs, worker and workplace method. Mass production of products using assembly lines became commonplace, and Fordism is the example that reassumes these methods. Lastly, just-in-time and lean manufacturing principles additional refined the way in which manufacturing companies could improve their quality and output reducing waste.
- **Industry 3.0** In the last few decades of the 20th century, the introduction of electronic devices made it possible to automate individual machines to supplement or replace operators more fully. This period also spawned the progress of software systems. Integrated systems, like material requirements planning, were superseded by enterprise

resources planning tools that enabled humans to plan, schedule and track product flow through the factory. Pressure to reduce costs and need to be close to the foreign market and customer caused many manufacturers to transfer component and assembly operations to the low-cost country or strategically located: off-shore. The widespread geographic distribution resulted in the formalization of the concept of supply chain management.

- **Industry 4.0** In the 21st century, Industry 4.0 connects the internet of things (IoT) with manufacturing techniques to allow systems to share information, analyze it and use it to guide quick actions. The development of new technologies has been a primary driver of the movement to Industry 4.0.

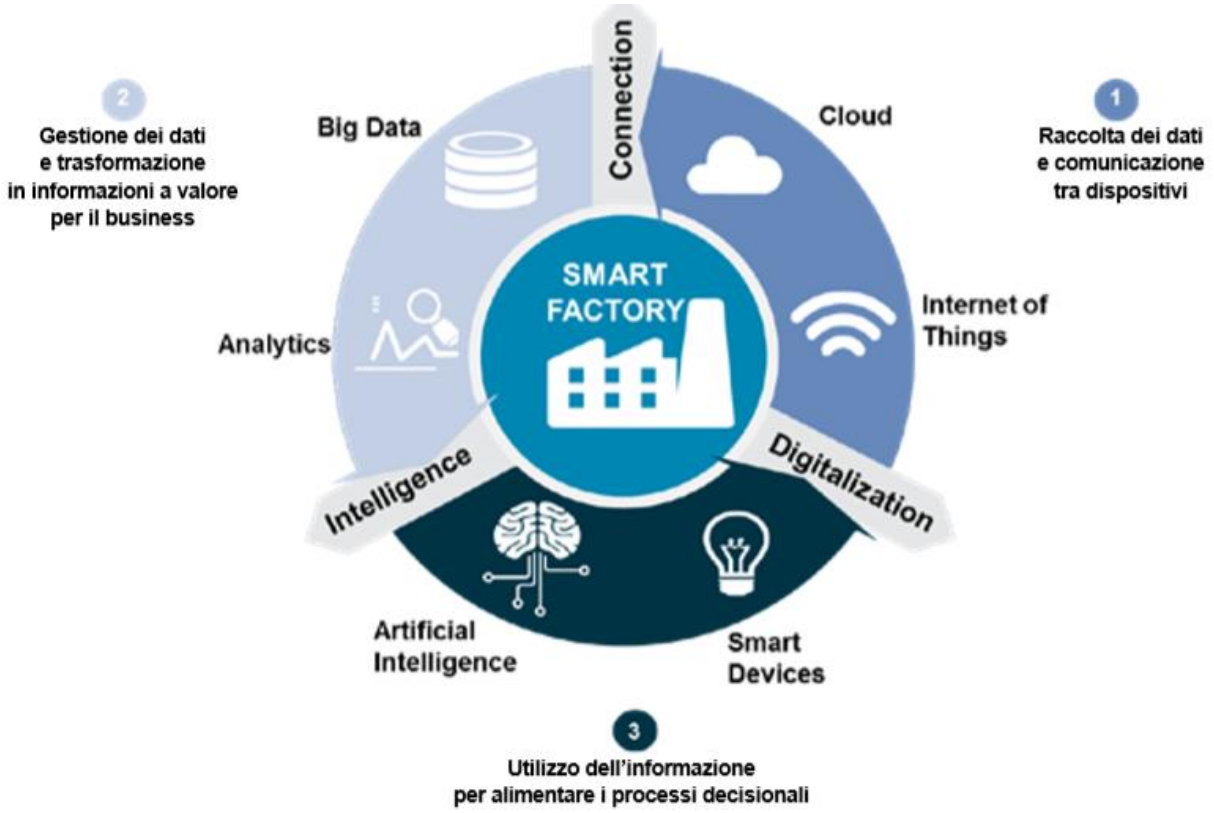
One interesting characteristic of Industry 4.0 is that this revolution is predicted *a priori* and not observed only ex-post as the previous revolutions (Drath & Horch, 2014).
Industry 4.0 is the name of the national strategic initiative launched in 2011 from the German government to establish Germany as a lead market and provider of advanced manufacturing solutions.

"*Industrie4.0 is a national strategic initiative from the German government through the Ministry of Education and Research (BMBF) and the Ministry for Economic Affairs and Energy (BMWI). It aims to drive digital manufacturing forward by increasing digitization and the interconnection of products, value chains, and business models"* (European Commission[8], 2017)
Indeed "Industrie 4.0" is one of ten "Future Projects" identified by the German government as part of its High-Tech Strategy 2020 and it represents for Germany their opportunity to establish itself as an integrated industry lead market and provider (GTAI, 2018)
This 4th revolution is characterized by the integration of physical process with the new digital process, by the information to support the activities of production and the execution of efficient process: this gives the possibility of significantly increasing the value generated by the factory and the company.
This changing gives the company the tools and models appropriate to manage levels of complexity, flexibility, and efficiency impossible to manage with the traditional technology.

[8] Demetrious Klitou; Johannes Konrad & Morten Rasmussen; CARSA and Laurent Probst & Bertrand Pedersen; PwC. (2017). *Germany: Industrie 4.0.* European Commission.

The evolution of this technology and the application in the plant is the concept of "smart factory" (Poggiani, Tedeschi, Pagliai, Sperimburgo, Poli, Martini, & Petronio, 2014).
To describe the "smart factory" is fundamental to understand his three-mayor directive that distinguished a Smart Factory from a traditional one: *connection*, *digitalization*, *intelligence* (Poli, Martini & Petronio, 2014).

Figure 5: The Three Characteristic of the Smart Factory (Accenture strategy, 2014)



1. **Connection**: It is the progressive increase of connections between tools and machines of the factory. This capacity refers to the possibility of data and information collection and their exchange between the device and the communication with the central informatics centre and outside the factory.
2. **Digitalization**: It results in the rethinking and redesign of the logical and physics process thanks to the support of digital technology that allows new potential regarding efficiency and effectiveness, indeed of new solution otherwise impossible to realize (as the use of 3D printing to eliminate the minimum batch of production and smart glasses)
3. **Intelligence**: It is the capacity of the technological systems to develop information/data and provide information/instructions to the workers (or machines). Intelligence is based on the capacity of collection and interpretation of parameter (standard) of the process.

The progressive application of the digital transformation, follow these three directives of the smart factory. Today this application is allowed (enhance) by technological model (elements) as *internet of things* and *cloud computing* (that support the collection of data and the informatics exchange between device thanks the network); *big data* and *analytics* (that support the composition and management of the tremendous quantity of data collected and registered); *artificial intelligence* and *smart device* (that support the elaboration of information in order to help the decisional process maybe also with an algorithm that enables semi/automatic decision). (Poli, Martini & Petronio, 2014).

1.1.4 Elements of Digital Transformation

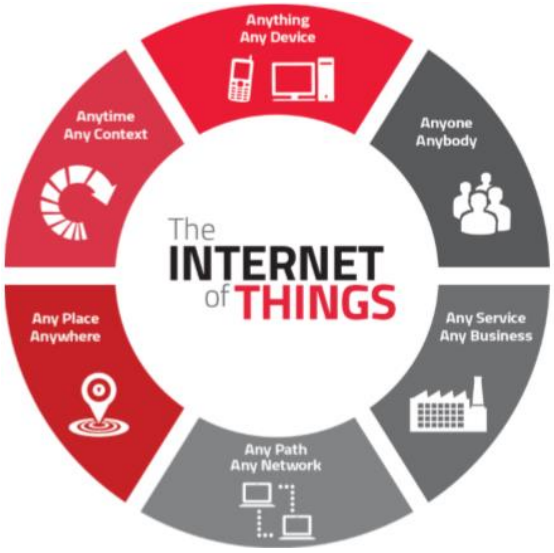
Internet of Things

Internet of Things, which is also commonly recognized as IoT, is at the foundation of Industry 4.0 and so of the digital transformation. This because this is the embedded technology that allows the existence to all other technology and technological model used in a smart factory (Poli, Martini & Petronio, 2014).

The IoT concept was coined by a member of the Radio Frequency Identification (RFID) Development community in 1999 (Keyur & Sunil, 2016).

"Internet of Things" is formed by the two words "internet" and "things." The internet is the global system of interconnected computer networks that use the standard Internet protocol suite to serve billions of users in the world. It is a network of millions of networks of local to global scope, which is linked by a broad array of electronic, wireless and optical networking technologies. About the "things" that can be any object or person which can be distinguishable by the real world. Everyday objects include not only electronic devices we encounter and use daily and technologically advanced products, but "things" that normally are not considered related at the "electronic" world (as food, clothing; and furniture; materials, parts, and equipment). That means here, in this contest, things can be both living things like persons and non-living things like industry machine (Madakam, Ramaswamy & Tripathi, 2015).

Figure 6: Internet of Things



The International Telecommunication Union (ITU) for instance, defines the Internet of Things as ''a global infrastructure for the information

society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies'' (ITU[9], 2012).

Another definition is given by Gartner, the world leading information technology research and advisory company defines the IoT as "the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment" (Gartner, 2018).

Is possible define IoT into three categories or consider Internet of things as an internet of three things: people to people, people to machine /things, things /machine to things /machine, interacting through the internet (Madakam, Ramaswamy & Tripathi, 2015).

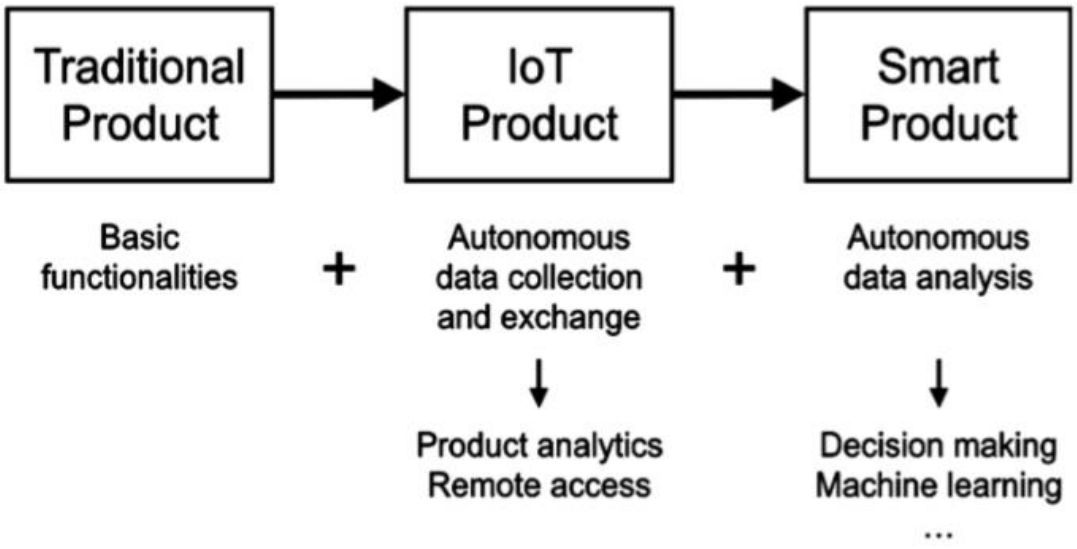
The core of the Internet of Things is to enable things to be connected anytime, anyplace, with anything and anyone ideally using any path/network and any service.

Innovation in the Internet of Things is characterized by a combination of physical and digital components to create new products, generate and extrapolate more value and enable novel business models.

These new products extend their basic functionalities of regular products by (additionally) providing the ability to collect and share data thanks IoT. This new category of data collecting and sharing products are calling IoT-ready products (IoT products, for short). Such IoT products can be seen as an interim stage in the development of "smart products," which can be able to analyze and, potentially, "interpret" data in a goal-oriented way. (Decker & Stummer, 2017).

[9] Wortmann, F., & Fluchter, K. (2015). Internet of Things: Technology and Value Added. *Business & Information Systems Engineering*, 221-224

Figure 7: Development stages from traditional products to IoT products and smart products (Decker & Stummer, 2017)



Cloud

Cloud computing, often referred to as simply "the cloud," is the delivery of on-demand computing resources — everything from applications to data centers — over the internet on a pay-for-use basis. (IBM[10], 2018)

The National Institute of Standards and Technology (NIST) outline Cloud Computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, services, applications, and storage) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011).

"Computing" is transformed into a model of services that are commoditized and delivered in ways that follow the same logic of utilities such as water, electricity, gas, and telephony. In these models usually, users can access services based on their requirements without regard to where the services are hosted or how they are delivered. The term Cloud Computing denotes the infrastructure as a "*Cloud*" from which businesses and users can access applications from everyplace in the world on demand.

Nowadays, it is common to access content thanks Internet independently and without reference to the underlying hosting infrastructure. This infrastructure consists of data centres that are monitored and maintained around the clock by content providers. Consumers, such as

[10] IBM. (2018). *IBM: What is Cloud Computing?* Retrieved from IBM : https://www.ibm.com/cloud/learn/what-is-cloud-computing

enterprises, are fascinated by the opportunity of reducing or eliminating costs associated with the "in-house" provision of these services (Buyya, Yeo, Venugopal, Broberg & Brandic 2009). The NIST[11] identifies five essential characteristics of a cloud model:

- On-demand self-service. Customers can unilaterally easily ask for computing capabilities/resources, automatically without requiring human interaction with each service provider
- Broad network access. Capabilities are obtainable over the network and accessed through standard mechanisms by different kind of client platforms.
- Resource pooling. The computing resource providers pool its resources (physical and virtual) in order to serve a myriad of consumers. Some of these resources are storage, processing, memory and network bandwidth.
- Rapid elasticity. Capabilities provided are flexible and scalable in order to fulfil with demand. The consumer can perceive that the capabilities are unlimited and can be appropriated in any quantity at any time.
- Measured service. Cloud systems automatically control and optimize their resource. Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

Cloud providers offer different kind of service (Male & Grance, 2011):

- Software as a Service (SaaS). The capability provided to the consumers is to use the provider's applications thanks internet, instead of buying or building their own. The applications are available from various client devices.
- Platform as a Service (PaaS). The service provided to the consumer the possibility to have a platform in order to help the customer develop applications. This service is possible through to the availability of using programming languages, libraries, service and tool that are supported by the provider.
- Infrastructure as a Service (IaaS). This service provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer can arrange and run arbitrary software, which can include operating systems and applications. Shortly thanks this option, a company can rent the hardware it needs like memory, CPUs, storage etc. This is the case of Amazon since 2015. The company had excess infrastructure so decided to offer it at companies.

[11] Mell, P., & Grance, T. (2011). *The NIST Definition of Cloud Computing.* NIST National Institute of Standards and Technology (Special Publication 800-145).

According to the type of owner, a cloud can be Private, Public, Community or Hybrid (He & Xu, 2015).

A private cloud is an infrastructure operated solely for a single organization (even comprising multiple customers as a business unit), whether managed internally or by a third party and hosted either internally or externally. Private clouds can take advantage of cloud's efficiencies while providing more control of resources and steering clear of multi-tenancy.

Public cloud infrastructure is provisioned for open use by the general public. With public cloud services, users do not need to purchase hardware, software, which is owned and managed by providers. The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns. In the hybrid model, a company exploits the potential of more cloud (He & Xu, 2015).

The benefit that the cloud computing can give to a company can be easily explained thanks to the pay-per-use policy and the case of Pokémon Go video-game.

The cloud architecture supported this game developed by Niantic. This was the perfect tool to allow the flexibility that the company needs. In fact, during the first months the application was used by hundreds of millions of people, and after time the number was drastically reduced. If Niantic instead of using a cloud computing solution had chosen to buy the hardware it needs to comply with the initial demand, then Niantic would have lost a tremendous quantity of money (Torchiani, 2018).

Of course, there can also be some problem link with the Cloud as standards, dependability, transparency, security, the need for internet connections, availability, and legislation.

Big Data

Roger Magoulas, from O'Reilly media in 2005, was the first that introduced the term "Big Data" to the computing world in order to define an enormous amount of data that traditional data management techniques cannot manage and process due to the complexity and size of this data (Hadi, Shnain, Hadishaheed & Ahmad, 2015).

Nowadays "big data" is defined as "data that's too big, too fast, or too hard for existing tools to process" (Madden, 2012). "Too big" means that organizations increasingly must deal with petabyte-scale collections of data; "Too fast" that big data must be processed quickly and "Too hard" refers for data that doesn't fit neatly into an existing processing tool (Madden, 2012).

Big data is not a new phenomenon. The term "big data" as research and the scientific topic was present in research beginning in the 1970s. Company and organization have been collecting and

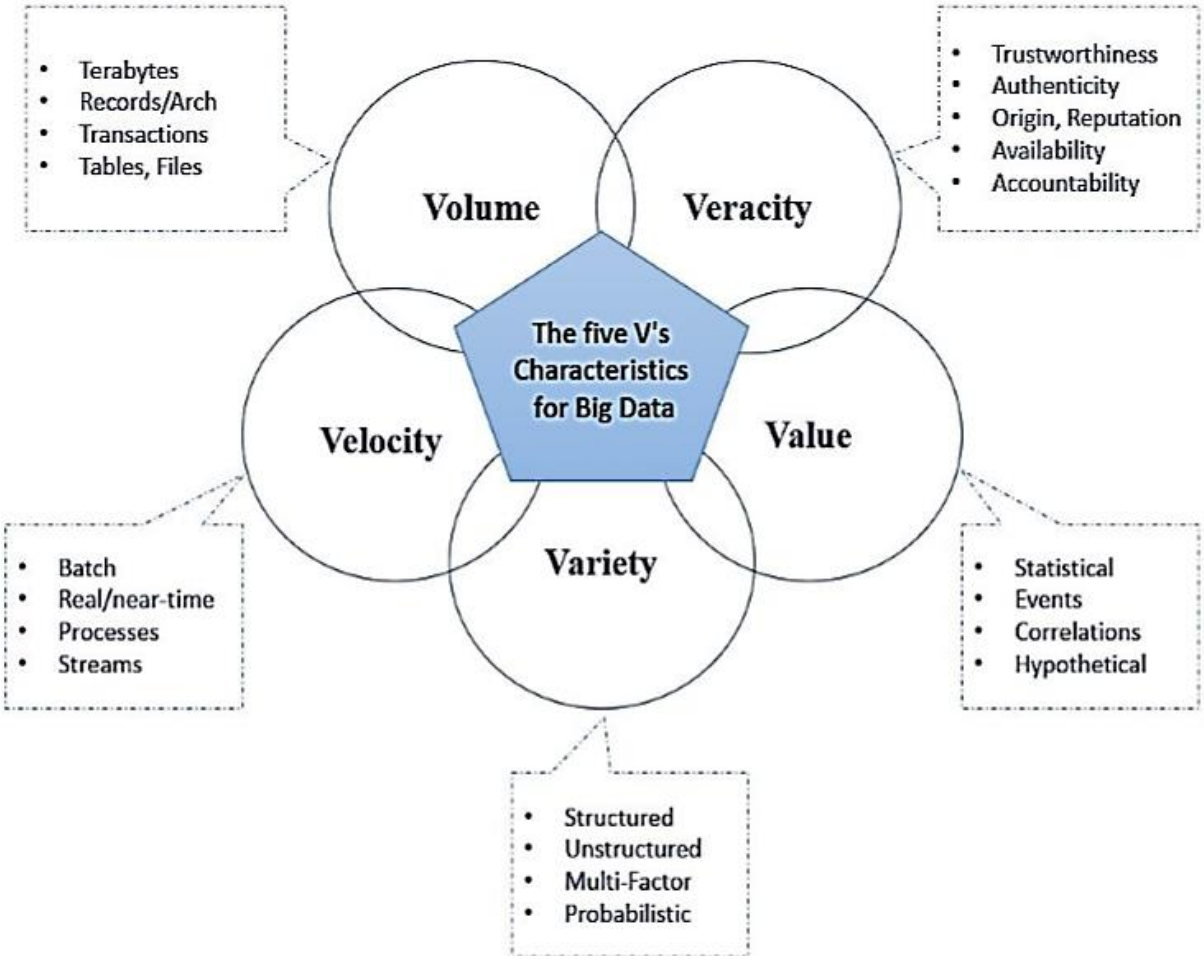
analyzing large amounts of data for years (Hadi, Shnain, Hadishaheed & Ahmad, 2015). Nowadays, the big data concept is addressed from various angles, demonstrating its importance. Today thanks to the proliferation of the Internet, collection, and analysis of data have been drastically improved. The diffusion of the Internet and social media can be an essential driver of dig data. The proliferation of the Internet of Things devices and sensors has furtherly enhanced these (Poggiali & Tedeschi, 2014). Indeed, the digitization of almost everything (like sensor signals, documents, images, videos, music, and maps) can be considered as another significant contribution to the creation of big data.

The key to understanding this "revolution" of big data is that data should be used in such a way that can support real-life profitable or beneficial outcomes. The significant amount of data generated potentially allows companies to make decisions in a timely manner where money can be saved, and operations may be better optimized regardless of the sector in which they operate. For example, if we considering the retail business, consumer behaviour and preferences maybe understand thanks to the analysis of big data, such as customer movement in a store, navigation of a website, product searches, and so on.

Big Data can be deeply understood thanks their characteristic. Gartner promulgated the breakdown of the "three Vs": volume, velocity, and variety (Madden, 2012). Some authors consider five aspects in total, and several other authors consider other additional three attributes instead.

Regarding[12] the "five Vs" as shown in the figure 8:

Figure 8: The five V's of Big Data (Hadi, Shnain, Hadishaheed & Ahmad, 2015)



1. **Volume**. Big Data as to be "big" and its size is measured in volume. Volume refers to the tremendous amount of data generated every second not only and just terabytes but also zettabytes and brontobytes. This Big Data dimension refers to the amount of data that is either created or collected by an organization or an individual.
2. **Velocity**. It refers to two related concepts: the speed at which new data is created and the speed to which the data is processed and elaborated (maybe at real-time). Initially, organizations analyzed data following a batch process because the process was slow and costly, but nowadays real-time analysis can be often considered a norm
3. **Variety**. It refers to the data that can be processed. These can be originated from heterogeneous source so can be structured, unstructured and semi-structured. Big data

[12] Hadi, J., Shnain, A., Hadishaheed, S., & Ahmad, A. (2015). Big Data and V's Characteristics. *International Journal of Advances in Electronics and Computer Science*, 16-23.

consists of any type of data such as video, audio, text, sensor data, click streams, log files and so on.

4. **Veracity**. It refers to the uncertainty and the consequent unreliability which are embedded in data sources. Such issues are due to incompleteness, inaccuracy, latency, inconsistency, subjectivity, and deception in data. With all the different forms of data and its volumes, quality, and accuracy are less controllable. For example, the differents post on Twitter with the hashtags, abbreviations, colloquial sentence and as well the accuracy and reliability of the different contents.
5. **Value**. It refers characteristic of the data which is defined by the added value that the collected data can bring to the deliberate process, activity or predictive analysis/hypothesis of the company. Data value will depend on the events or processes they represent such as stochastic, probabilistic, regular or random. Indeed, not all data may have the same value. In a Company, resources can be limited, and it is necessary to decide what data to obtain and to compute. The core of Big Data idea is collecting data, but if a company are not able to retrieve the value from such data, the whole activity is being carried out for nothing. A research of Cio.com shows that today the 80% of data collected by companies is never actually used to make improvements (Newman[13], 2017).

About that the set of attributes, considered by different authors, they are not equal. In fact, it is possible consider another characteristic:

- **Variability.** This characteristic refers to the inconsistencies which arise during the data flow. Variability regards data flow and its fluctuations. For example, considering that a trending content on social media can be the cause of a peak. Data flows are unpredictable, and peaks imply difficult decisions regarding computational capacity. This can be the same situation that a manufacturing company invest too much to underutilization of assets (Due, Kristiansen, Colombo-Palacios & Hien, 2015)

Being digital for a company is not just about collecting data but using it intelligently. This means using tools to sort and analyze all the data available.

[13] Source: cio.com

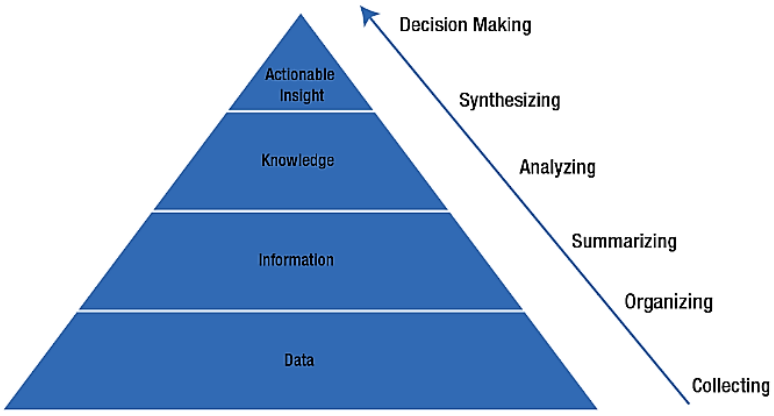
Analytics

Analytics is the scientific process of discovering and communicating the meaningful patterns which can be found in data.

It is concerned with turning raw data into insight for making better decisions. Analytics relies on the application of statistics, computer programming, and operations research in order to quantify and gain insight to the meanings of data. (Technopedia, 2018)

The business-dictionary at the date 23/10/2018 define analytics as "The field of data analysis. Analytics often involves studying past historical data to research potential trends, to analyze the effects of certain decisions or events, or to evaluate the performance of a given tool or scenario. The goal of analytics is to improve the business by gaining knowledge which can be used to make improvements or changes" (Businessdictionary.com).

Figure 9: Transforming row data in action-guiding windsom



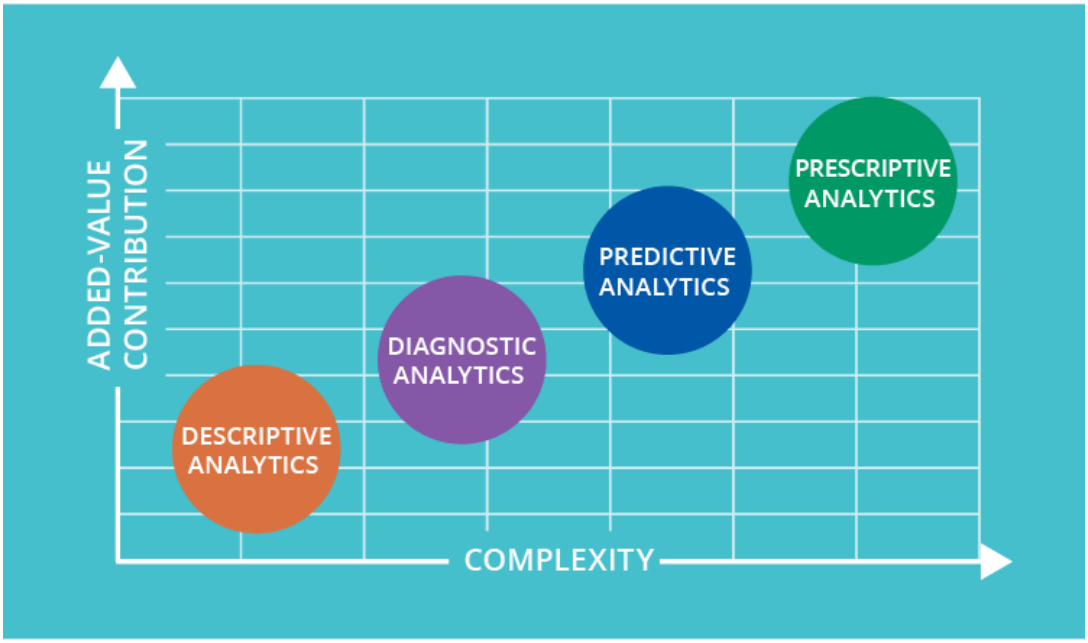
Indeed, big data analytics can perform real-time analysis of data, presenting it in a way that is useful and easily understandable by users. Analytics consent the transformation of raw data into information and that can become knowledge useful to the decision-making process.

Analytics can be divided into four types: descriptive, diagnostic, predictive, prescriptive (Bekker, 2017).

Figure 10: The four types of Analytics (Information Builders)

1. **Descriptive**. Descriptive analytics answers the question of "what happens." These analytics manipulates raw data to give insights into the past. These findings are merely signal that something is wrong or right, without explaining why. Regard a retailer; he can know the average weekly sales volume; a manufacturer instead can learn the rate of products returned for a past month. In the case of a manufacturer, it can decide of focusing on some product categories based on the analysis of revenue, monthly revenue for each product group, income by product group.
2. **Diagnostic**. Diagnostic Analytics answer the question of "why something happened". Thanks, these there is the possibility to find out dependencies and to identify patterns. Companies use these analytics, in order, to obtain insight into a problem. On the other hand, a company should have detailed information at their disposal. Otherwise, data collection may turn out to be just "individual" for every issue and time-consuming.
3. **Predictive.** Predictive analytics answer to the question "what is likely to happen." These analytics thanks the use findings of descriptive and diagnostic analytics can detect tendencies, clusters, and exceptions, and predict future trends, which makes it a valuable tool for forecasting. Even if the advantage of predictive forecasting is considerable, it is essential to understand that forecasting is just an estimation. The accuracy of which highly depends on data quality and stability of the environment.
4. **Prescriptive**. Prescriptive Analytics answer the question "what action to take*"* to eliminate a future problem or take advantage of a promising trend. This type of data analytics requires both historical data and external information due to the nature of statistical algorithms. Prescriptive analytics uses sophisticated tools and technologies, as machine learning and algorithms, which require a sophisticated level of implementation and management (Bekker, 2017)

Figure 11: Analytics related to added-value contribution (ScienceSoft, 2017)



Machine Learning and Artificial Intelligence

"For a long time, we were trying to replicate our thought process by putting in a lot of different rules into the computer, by programming them… a lot of logical rules that went one by one — and the computer could follow them, and eventually, we thought if we had enough of these rules, we could come up with Artificial Intelligence (AI). That turned out to be a terrible way forward, in that many of the tasks that we can now solve cannot be solved using that approach of write down a bunch of rules. Instead, we write down an algorithm that can look at a lot of data and learn from the data. machine learning is this idea of marrying algorithms and statistics, learning from data. Deep learning[14] is a subset of machine learning".

With this speech[15], Reza Zadah, CEO and Founder of Matroid, during an interview for intel briefly introduce and explain the AI and machine learning and the relationship between that.

Bernard Marr in 2016 affirmed that "Artificial Intelligence is the broader concept of machines being able to carry out tasks in a way that we would consider smart" and that "machine learning is a current application of AI based around the idea that we should really just be able to give machines access to data and let them learn for themselves".

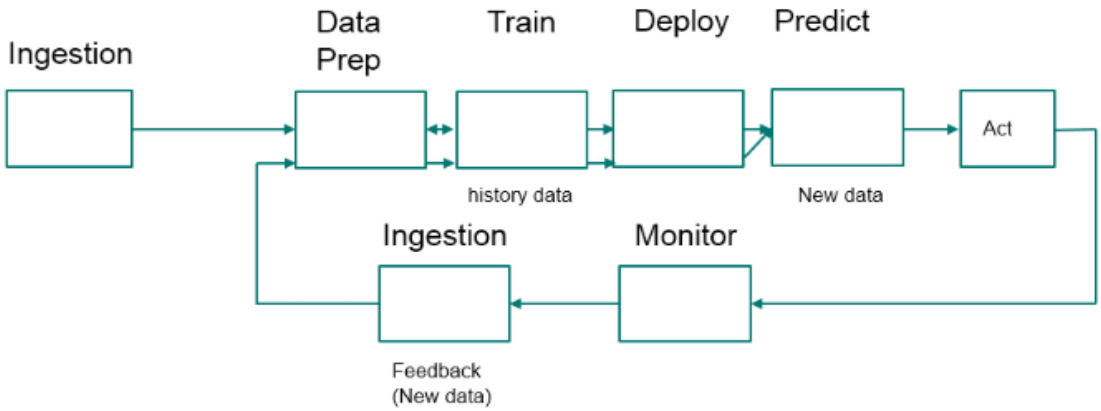
[14] Deep learning is an approach that requires 1) labeled data for training, 2) algorithms for the neural nets, and 3) special purpose hardware to run the algorithms.

[15] Zadah R., Intel,. (2016). *AI Luminary Series: Reza Zadah Explains the Difference Between AI and Machine Learning*. Retrieved from Intel: https://www.intel.com/content/www/us/en/analytics/ai-luminary-reza-zadeh-video.html

Machine learning indeed is a method of data analysis that automates analytical model building, allowing computers to finding hidden insights through iteratively learning from data, without being specially programmed (Ye, 2018).

"The main idea of machine learning is to create algorithms that can receive input data and use statistical analysis to predict an output value." This requires searching through data to look for patterns and adjusting program actions appropriately (Hembara, 2017)

Figure 12: Machine learning workflow



In general, machine learning involves two stages, training and testing. In the training stage, a model is learned based on the history data while in the monitor stage, the model is applied to produce the prediction.

Machine learning methods can be divided into three fundamental categories:

- Supervised learning: the learning process is guided uniquely by data
- Unsupervised learning: the learning arise with the help of training data
- Reinforced learning: the learning process occurs with the introductions of actions and reward. Interacting with the environment in a trial-and-error manner aiming to maximize rewards from the environment.

Other learnings methods are semi-supervised learning, online learning, and transfer learning, and these can be seen as a variant of the three basic types.

Regarding AI, Turing (1950) in order to describe the "intelligence" components of an AI consider elements as Learning; Knowledge representation; Reasoning and Prediction/planning. In the past, each of these ingredients must have been considered a significant challenge. Today most of the challenges have been resolved, and the AI is evolved, this just considering Siri of Apple and Alexa of Amazon, and the terminology is possible to distinguish different stages of AI (Wirth, 2018).

- **Narrow AI**. Narrow (or also called weak) AI is tailored to a specific problem or task and cannot deal with other challenges without being re-trained and/or modified. These systems are not provided of the flexibility of the human intelligence even if they are very powerful in their domain. The majority of AI of nowadays are inside this category (as Siri, Google Assistant, Alexa, and AlphaGo).
- **Strong AI**. Strong AI (also called full AI or AGI) is as powerful and flexible as human intelligence. Indeed it is not tailored to a specific problem or task. Strong AI has not been achieved yet.
- **Hybrid AI.** Hybrids AI are solutions that combine multiple narrow AI modules. So not Strong AI but with a little capacity of adapting to new challenges (Wirth, 2018).

In the last years, it is possible to observe that artificial intelligence (AI) has been advancing rapidly regarding the numbers of resources devoted to it and regarding its outputs. Outputs, considering that AI is a term used to describe a range of advanced technologies that exhibit human-like intelligence, including machine learning, autonomous robotics and vehicles, computer vision, language processing, virtual agents and neural networks. (Furman & Seamans, 2018). The Economist[16] estimated that AI-related mergers and acquisitions were 26 times larger in 2017 than in 2015.

Smart Devices

"Smart Device or Product is an electronic gadget that can connect, share and interact with its user and other smart devices. Smart devices typically have the computing power and understand simple commands sent by users and help in daily activities" (Techopedia, 2018).

Dhebar[17] in 1996, presented a detailed analysis of the impact of IT on products to make them "Smart" (Gutierrez, Garbajosa, Diaz & Yague, 2013).

While Dhebar claims that models for classifying these products Rijsdijk[18] introduces that "smart products can collect, process and produce information, and can be described to 'think' for themselves" (Gutierrez, Garbajosa, Diaz & Yague, 2013).

Smart products are the next level of IoT products, which enable new potential. The denomination "internet of things" often is arisen to reflect the growing number of smart,

[16] The Economist. (2018, March 28). The workplace of the future: As artificial intelligence pushes beyond the tech industry, work could become fairer or more oppressive. *The Economist.* https://www.economist.com/leaders/2018/03/28/the-workplace-of-the-future.

[17] A. Dhebar, "Information technology and product policy:'Smart'products," European Management Journal, vol. 14, no. 5, pp. 477–485, 1996

[18] S. Rijsdijk, "How Today's Consumers Perceive Tomorrow's Smart Products*," Journal of Product Innovation, no. January 2007, 2009

connected products and highlight their new opportunities. The internet as previously explained is simply one mechanism for the transmission of data. What makes "smart," the products/devices is not the internet, but the changing nature of the "things." (Porter & Heppelmann, 2014).

Figure 13: Evolution from Products to Smart Products

PRODUCT			SMART PRODUCT	
	Bulb	IoT stack →	Light	Security
	Bin	IoT stack →	Storage capacity	Automatic replenishment
	Tractor	IoT stack →	Towing vehicle	Predictive maintenance, optimization

Porter and Heppelmann affirmed that Smart products have three core elements:

1. Physical Components. They are the mechanical and electrical parts of the product. For examples, in a car, these include the batteries, tires and engine block
2. Smart Components. They are components as the microprocessor, sensors, data storage, controls, software, and, usually, an embedded operating system and enhanced the user interface. The smart components increase the capabilities, use and so the value of the physical components. In a car can be the engine control unit and the touchscreen displays.
3. Connectivity Components. They are components that comprise the ports, antennae, and protocols enabling wired or wireless connections with the product. Connectivity can be of three dimensions (which can be presented together):
    - One-to-one: a single product connects to the user, the manufacturer, or another product through a port or other interface
    - One-to-many: a central system that is connected to many products simultaneously.
    - Many-to-many: different products connect to many other types of products and often also to external data sources (Porter & Heppelmann, 2014).

The proliferation of smart devices, as previously underline, can be one of the drivers of Big Data nowadays. Consumer's everyday life has already been marked by these smart products as

the smartphones: they can collect information regarding the user's position, health, and behaviour in real-time continuously. Smart products allow the monitoring of their condition, external environment, and usage. Through installed sensors, they can be controlled through remote commands or algorithms that powered the software of products. These capabilities of smart products allow companies to optimize performances of their products: smart products may be endowed with algorithms that, considering both historical data and in-use data, can improve "output, utilization, and efficiency." The capabilities of smart, connected products can be grouped into four areas: monitoring, control, optimization, and autonomy. Each capability need the presence of the preceding one; in order to have control capability, for example, a product must have monitoring capability. (Porter and Heppelmann, 2014).

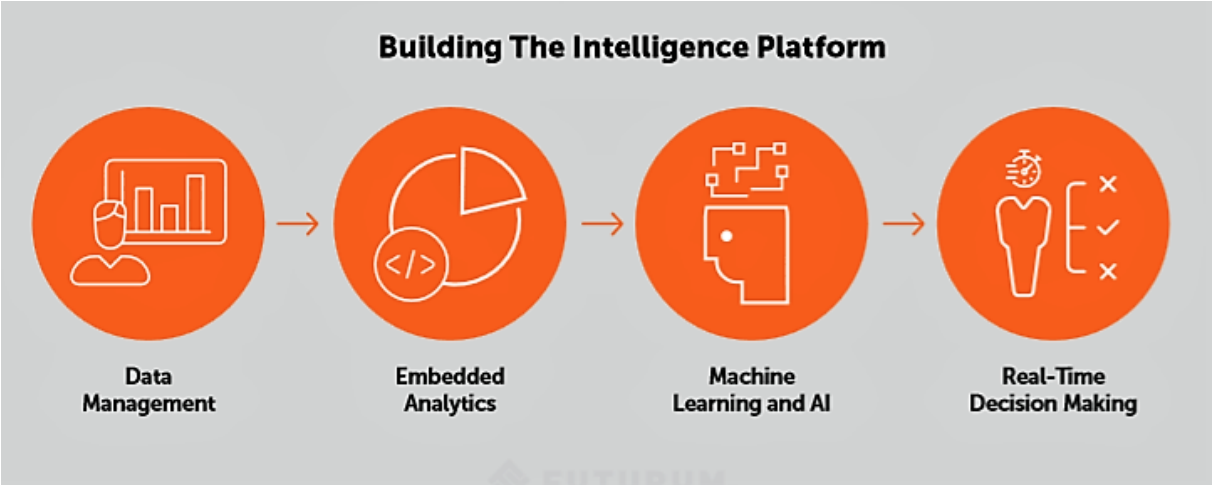
Intelligence Platform

Digital (Intelligence) platforms consist of software processing data in the cloud. Fortran and Unix pioneer Stuart Feldman explained that a computer science definition would be "that platforms provide a set of shared techniques, technologies, and interfaces to a broad set of users who can build what they want on a stable substrate." (Zysman & Kenneya, 2018).

The term "platforms" usually, refers to multi-sides digital frameworks that outline and intermediate the instructions that participants follow to interact. The power of the platform is generated through direct and indirect network effects that can confer enormous power to the platform owner. Indeed, Platforms are thus algorithm-enabled cyberplaces where elements can act, interact, and transact (Zysman & Kenneya 2018).

Daniel Newman (2017) consider that the element of an intelligence platform (as previously described) can be grouped in four categories: data management; embedded analytics; machine learning and AI; real-time decision making.

Figure 14: Digital Intelligent Platform (Newman, 2017)



Additive Manufacturing: 3D printing

"Process of joining materials to make objects from three-dimensional (3D) model data, usually layer by layer, as opposed to subtractive manufacturing methodologies" (Huang, 2015).

This is how the ASTM International Committee F42 on Additive Manufacturing (AM) Technologies defines AM. Indeed, Additive manufacturing can be seen as an appropriate term to describe the technologies that build 3D objects by adding layer-upon-layer of material (as plastic, metal, ceramic, biological components). These technologies are the Rapid Prototyping (RP) - in the past 20 years this was the dominant application of additive manufacturing, Direct Digital Manufacturing (DDM) and the 3D printer (3DP). Commonly is used refer to the 3D printer and Additive Manufacturing as synonymous, this mostly because the 3D printers are today the most used application and translation of the concept of Additive Manufacturing.

AM's synonyms include rapid prototyping, additive fabrication, additive processes, additive techniques, additive layer manufacturing, layer manufacturing, freeform fabrication, solid freeform fabrication, and direct digital manufacturing (Huang, Leu, Mazumder & Donmez, 2015).

Common to all the AM technologies is the use of a computer, 3D modelling software (Computer Aided Design commonly called CAD), machine equipment and layering material. After a CAD sketch is produced, the AM equipment reads the data from the CAD file and lays downs or adds successive layers of liquid, powder, sheet material or other, in a layer-upon-layer fashion to fabricate the 3D object (Additivemanufacturing[19], 2018).

[19] Additive Manufacturing. (2018). *Basics - What is Additive Manufacturing?* Retrieved from Additive Manufacturing: http://additivemanufacturing.com/basics/

Additive manufacturing main advantages are flexibility and efficiency. Flexibility is enhanced because complex goods can be created in one step and setups are not costly. Is possible to produce just what is demanded to the customers or create elaborating items that differ from the traditional production that may be costlier and more time-consuming. Efficiency instead concerns both the number of raw materials used and the kind of resources that are needed to complete the production: thanks AM, many secondary machines can become useless (Huang et al., 2013). Jeff Immelt, when he was CEO of GE, he views Additive Manufacturing as a game changer. He affirmed that by 2020 General Electric Aviation plans to produce more than 100'000 additive components for its engines (Conner et al., 2014).

It is possible to identify several advantages strictly linked with the intrinsic nature of AM:

- Additive Manufacturing objects can be more complicated than the objects allowed by subtractive manufacturing, the traditional manufactured process (Steenhuis and Pretorius, 2017)
- Final Product of 3DP have minimum porosity, so the quality and durability is higher than products made with different ways
- 3D Printing allows satisfying customer demand following the "Make to order" logic. So, reducing the risks link with high production volumes (inventory cost) and don't require costly set-up (Berman, 2012).
- Allows Elimination of the time lag between design and production
- Since waste can be reused for subsequent production, AM can permit savings in term of material. It generates less pollution than traditional manufacturing (Hang et al, 2013)

Laser Cutting

Laser Cutting is a non-contact process which utilizes a laser to cut materials, resulting in high quality, dimensionally accurate cuts (Amada Miyachi America[20], 2018).

Laser cutting uses a high-powered beam to cut materials, and it is based on computer-controlled parameters. The cutting process refers to the laser that guides its beam along the material, and consequently, everything in its direct path is vaporized, burned or melted (Amada Miyachi America, 2018).

Laser cutting technology is divided into two primary systems:

[20] AMADA MIYACHI. (n.d.). *Educational Resources - Laser Cutting*. Retrieved from AMADA MIYACHI AMERICA: http://www.amadamiyachi.com/glossary/glosslasercutting

- Gantry systems: in these systems, the position of the laser is perpendicular to the material, and the machine physically directs the beam over its surface. Manufacturers commonly use these systems for the production of prototypes because Gantry Systems are slower then Galvanometer ones.
- Galvanometer systems: these systems use mirrored angles to reposition the laser beam. Indeed, these systems can cut "as fast as 100 feet per minute" and this is the reason why manufacturers commonly use galvanometer systems for full-on production work (Thomasnet[21], 2018).

In manufacturing, laser cutting is one of the more flexible cutting methods. Automated CAM software can create efficient part nests to minimize waste material, and another benefit of these technologies is that the cut product usually don't need any finishing work because of this process ensures a high-quality surface finish (Dewil et al., 2014).

1.2 Organizational Transformation

Becoming a Digital enterprise requires far more profound changes than merely investing in the latest digital technologies. Companies will need to search for new business models, fundamentally rethink their operating models, revamp how they attract and foster digital talent, and consider afresh how they measure the success of their business. (Bruce Weinelt et. Al. World Economic Forum, 2016).

Giovanni Costa referring at the definition[22] of Francesco Venier of Digital Transformation affirmed that this Digital Revolution was so important, articulated and impactful that would have been a mistake to "leave the floor" to only informatics and engineers. In fact, Digital Transformation process inside a company is an organizational transformation, not just an investment in IT, as every aspect (work life, family life, recreational and so on) is touched by this new technology and this can may result in an anthropologic change (society 5.0).

[21] Thomas. (2018). *Thomasnet Insight*. Retrieved from Thomasnet: https://www.thomasnet.com/articles/custom-manufacturing-fabricating/laser-cutting-technology

[22] *The alignment process of digital technology, skills, organizational process, and business models that aim at the creation of new value to the stakeholder and maintain the stability the organization in a digital ecosystem that is in continuous development. Francesco Venier "trasformazione digitale e capacità organizzativa"*

Digital transformation is correlated with organizational transformation, even because these are the two faces of the same medal. On one hand, organising/structuring (organizational view) means designing action processes in which technology is a fundamental part, on the other hand innovating/renovating technology inside a company means organizing new knowledge under models - implicit or explicit – that are correlated to the way the company devise/understand the work, therefore, enhancing its organization (Venier, 2017).

In order to obtain the benefits linked with these new digital technologies, companies – regardless the sector in which they operate – have to committee themselves in a profound change that is both technical and cultural. This concept is fundamental in order to change the way companies do business, with the primary objective of transforming the new digital potential in a source of value (Trombetta et al., 2014). Indeed, the process of introduction of new technologies raises questions regarding the management of the organizational change: how to modify the organizational asset and implementing inside the company this innovation in order to get the maximum benefit from them. Fadel believes that the care of the manager should shift from "if" and "how often" ad Informatic Technology is used, to "how to" it is used. That is, because it is important to focus on the change of people inside the company about how they deeply understand and exploit the potential of the new technology – in fact, the incremental use of an informatics system is not necessarily correlated to an incremental of the performance, it is rather more a meter of quality and deeper understanding of the use of new technology (Venier, 2017). Together with the technological side of the structurally technological transformation, managers should see the psychological well-begin of employees as an integral part of the change. Considering that the human factor is an important component in every organizational change, who is in charge of digital transformation process should really consider this aspect. This is, because even if the change plan is designed in order to give an advantage to the company and increase their performance, it is common that during and after the implementation of the change, that will result in a lower result or a loss (Venier, 2017). Due to the persistent changes links with the continuous innovation and improvement of technology, nowadays companies should be organizationally ready to changes/adapting in time with the new technology and the evolution of the needs of the market. Due to this need of "velocity," the classical model as "unfreeze-change-refreeze" of Lewin may need to be updated because there is a great need of organizational agility and IT ambidexterity (Venier, 2017). The first one is defined[23] as" the capability of a company to rapidly change or adapt in response to changes in the market. A high degree of organizational agility can help a company to react successfully to the emergence of

[23] Definition from: http://www.businessdictionary.com/definition/organizational-agility.html

new competitors, the development of new industry-changing technologies, or sudden shifts in overall market conditions" (Businessdictionary, 2018). IT ambidexterity (a particular case of organizational ambidexterity) is the capability of a company of pursuing exploration and exploitation in the IT resource management simultaneously. This capability can be considered as an earlier element then Organizational agility (Venier, 2017).

Venier wrote that IT ambidexterity can be defined as the capacity of a company of experimenting technology with a highly promising potential of innovation and implementing an efficient process to leverage on these technologies. Indeed, it means to manage appropriately both: the actual technology and the emerging ones, and simultaneously to understand and to learn their potential values (plus-value extraction) to the company.

If the market believes that evolution through the digital world is an unstoppable process, people will have to find a clear strategy, to follow/enhance people and organizational structures in that challenge (anticipating the future needs of competencies, behaviors, tools, skill, and leadership), so to become fundamental to the success of companies (Trombetta, et al, 2014).

1.3 Why a Digital Transformation Process?

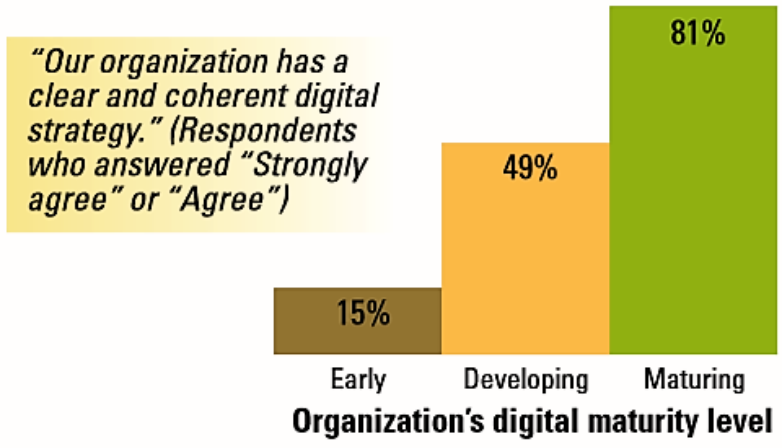
Why should a company decide to start a digital transformation process? Which are the drivers? A commonly answer to questions like this in management and economics is "It Depends." Even in this case, in order to analyze and understand the question and the solution given by researching, it is important to underline the "It Depends" - i.e. the variable. The variable considered in this case is the "Digital Maturity" of a company.

In 2015 the MIT Sloan Management Review in collaboration with Deloitte, in order to understand better the dynamics of digital inside companies, issued a report[24] from a survey in which more than 4800 executives and managers in 129 countries and 27 industries were interviewed. The findings of this research were based on an assessment of digital maturity and how maturing organization differed from others. To assess company digital maturity, they asked the respondent to rate (from 1 to 10) their companies against the ideal digital transformed organization (one transformed by digital technologies and capability that could improve processes, engage talents across the organization and drive new- value -generating business model). Three group emerged: early 26% (1-3 points), developing 46% (4-6 points) and

[24] Kane G., Kiron D., Palmer D., Phillips A., Buckley N. – *Strategy, not Technology Drives Digital Transformation*, 2015, MIT Sloan Management Review.

maturing 29% (7-10 points). Even if they allowed respondents to mark their companies instead of being market by the interviewer, the result gave a good insight on how the digital maturity is the variable in "why digital transformation" and which is the driver. According to the result, maturing digital companies have their focuses on integrating digital technologies (as cloud, mobile, and analytics) in order to transform how their business work: their business model. Less mature businesses focus on solving business problems with "individual digital technologies." The main difference among a maturing digital company and the ones in the early or developing stage is an inside aspect of the organization and first of all, a clear and coherent digital strategy. 50% of companies that are in the early digitalization stage affirmed that the lack of strategy was their biggest barrier to digital maturity, followed by too many priorities and lack of management understanding. Digital maturing companies behave differently from others: they are committed to transformative strategies thanks to the support of a collaborative culture inside them that is open to risk-taking. Digital maturing companies are the ones that successfully use/adapt/integrate and develop a real digital transformation process. The prior element to achieve digital maturity is to have got a clear strategy. Indeed, strategy (yet, not technology) drives digital transformation. In other companies where a full process of digital transformation is not yet achieved, the resolution of every single business problem is the drives of introducing digital technology.

Figure 15: A digitally maturing organization follows a clear and coherent digital strategy (MIT Sloan & Deloitte, 2015)



This is also confirmed in the PwC's 2015 Global Digital IQ survey[25] where is affirmed that: "Top-performing companies are more deliberate in their digital strategy, innovation, and execution. They are more likely to have CEO commitment, strategic clarity, and shared

[25] Sample of 2'000 business and technology executives.

understanding. They are more apt to take a broad view when applying technology and to identify sources of innovation. Moreover, they are more prone to being skilled at turning their data into insight, proactive in cybersecurity, and consistent in measuring outcomes from digital investments." (PwC, 2015).

1.4 Conclusion

Digital Transformation is not a trend; it is a totally restructuring process that change every aspect of our world, especially the business world related. Knowing the rule – therefore, all basis instruments (Machine Learning, Artificial Intelligence, Laser Cutting), at the pattern of this transformation - is fundamental in order to reimage the way the company do their business, improve their performance (as with the support of CRM software powered by AI) and obtain a competitive advantage.

Companies need to understand that now is the right time to approach this transformation with a clear strategy base. PwC in his report "What is your Digital ROI" (2016) underline that companies should be cautious in their approaches to digitization because even if they are moving slowly or even believe they do not need to approach it, their competitors are not. They are completely reimagining their business models to take advantage of the imminent wholesale shift from strategies based on selling physical products to strategies built around selling the data and services now becoming available through digitization (PwC, 2016).

CHAPTER II

2 EFFECTS OF DIGITAL TRANSFORMATION

At the basis of every company strategy, or in general of any choice, there are some effects that the organization desire to obtain by choosing them. Once Companies know what digital transformation is and which are the elements at its base, the second step is knowing which the impact of digital transformation inside their companies can be: which outputs can happen.
Even a pizzeria could have leverage on the effect of the implementation of simple use of database and analytics which can power an ERP or MRP system. Starting from the collection of data regarding all the ordination from customers and external events (such as a football match, a birthday, a day of the week and a month), then analysing those data thanks to analytics, a pizzeria could obtain fascinating insight from the quantity of raw material needed depending on external factor and the behaviour of its clients. After that, by a machine-learning approach and a system integrated with the order of the raw material from suppliers, they can avoid waste of food, by ordering the right amount according to the specific need already discovered. Indeed, the impact will be a reduced cost of raw material avoiding waste, increasing quality thanks to the freshness of the food, and better preparation and allocation of resources to specific needs, since they already know "precisely" what may be needed.

2.1 Benefits of Digital Transformation

According to a study[26] of PwC, four out five companies will see their industry transformed by digital in Europe, by 2020. On average, European industry plans to invest 140 billion euro per year by 2020 with a turnover estimated of 110 billion euro per year.
Considering this (estimated) numbers, at this point is important to ask: Which are the effects of a digital transformation process inside companies? According to the findings of PwC, digital transformation reduces cost and increases the productivity of companies:

- The increase in productivity is estimated to grow to 18% over the next five years
- The cost savings should be of 2.8% per year

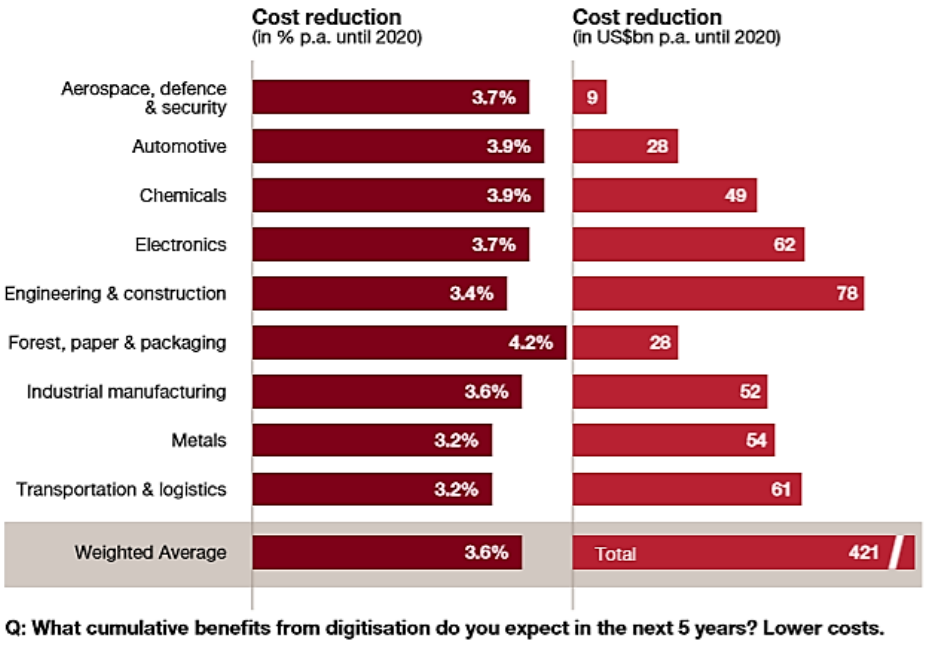
[26] Sàlifou, D. (2018, April 7). Retrieved from iBASEt: https://www.ibaset.com/blog/industry-4-0-heart-european-investment-according-plan/

Furthermore, thanks to the new technology (such as databases, analytics) companies will better meet the needs of the customer who are increasingly customized. PwC, moreover, shows that companies which are already digitally transformed, have high growth rates: after three years by a digital transformation on average they reach a growth of 6% to 10%.

The global report[27] (over 2000 respondents in 26 countries) "Industry 4.0: Building the Digital Enterprise" of PwC reported that globally across different sectors interviewed, companies expect to have:

- **2.9 %** of annual digital **revenue increase** on average: US$ 493 billion in digital gains p.a. in the next five years.
- **3.4%** of **cost reduction** on average p.a.: respondent expect to obtain US$ 421 billion in cost and efficiency gains in the next five years (Figure 16)

Figure 16: Companies in every industry sector expect significant cost reduction (PwC - Global survey, 2016)



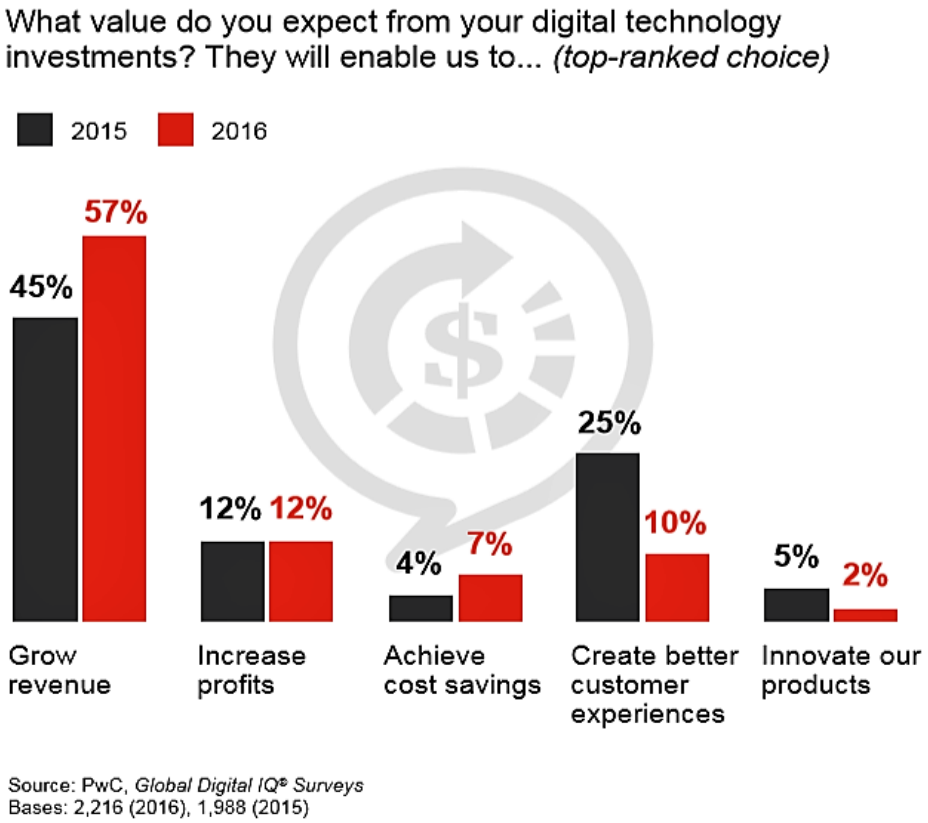
- Companies of industrial sectors are planning to **commit 5% of revenue** on average, to industry 4.0: US$ 907 billion in annual digital investments. Moreover, 55% of the investments expect a payback within two years.

First movers who combine high investment levels with advanced digitization are set to achieve even more dramatic gains (PwC, 2016).

[27] PwC, Geissbauer, Vedso, Schrauf. (2016). *Global Industry 4.0 survey - Industry 4.0: Building the Digital Enterprise.* PwC.

According to the Global Digital IQ Survey of PwC published in 2017 is easy to collocate the benefit the company expects (figure 17). Between 2015 and 2016 grow revenue remains the first driver of investment in digital transformation.

Figure 17: Value Expected from Digital Technology (PwC - Global Digital survey, 2017)

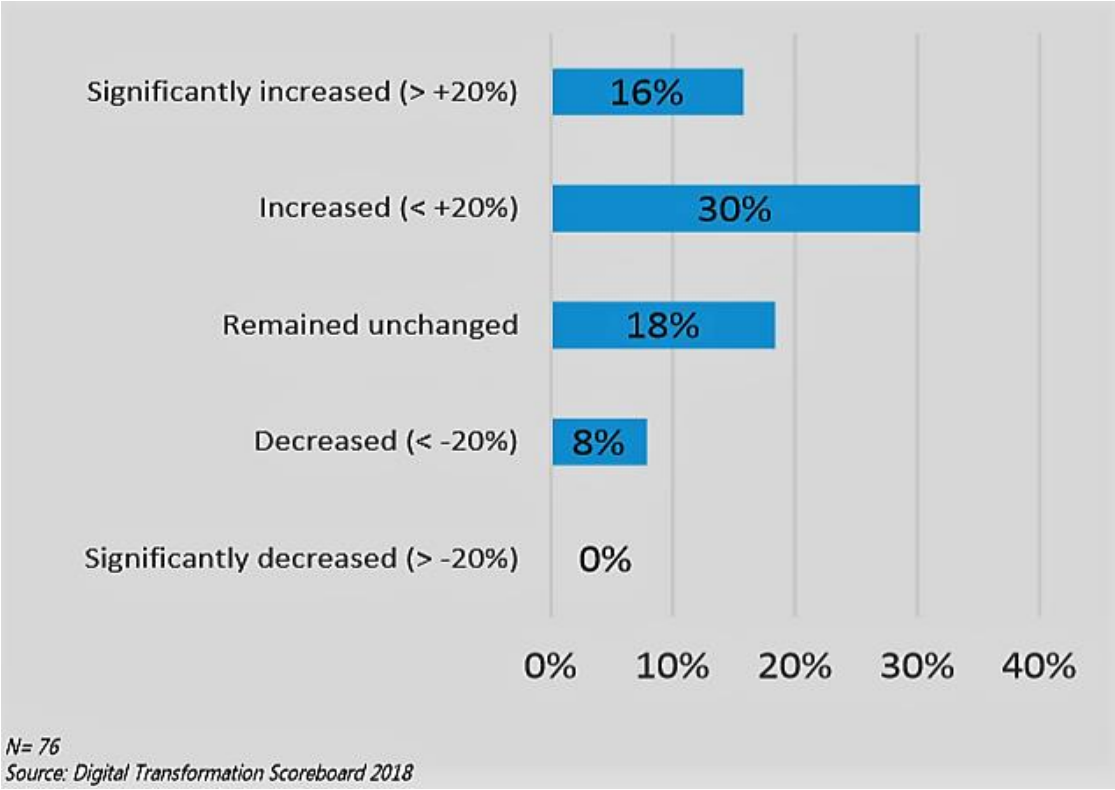


These expectations are confirmed (by companies) as show the European Commission in the report[28] "Digital Transformation Scorecard 2018". The economic impact observed from Digital Transformation confirmed that technology adoption leads positive result on annual turnover and have also impact on operational cost. The 46%[29] of companies investing in digital technology, affirmed that obtain a medium to large increase in their annual turnover over the last three years following the adoption of technology (figure 18). The 8% of companies have seen a decrease in their operational cost.

Additionally, the integration of new digital technologies such as social media, big data and analytics, and cloud technologies enable digital adopters to act more quickly on business opportunities and to increase and maintain the customer base (Probst et al., 2018).

[28] Probst et at. (2018). *Digital Transformation Scorecard 2018: EU businesses go digital: Opportunities, outcomes and uptake.* Luxemburg: European Commission.
[29] Of Companies participants at the survey that have invested in digital technology

Figure 18: Impact of technology adoption on annual turnover -last three years (European Commission, 2018)



Similar results of the others report are highlight by the research of the University of Padua. Di Maria E. et al., in the report "Manifattura Digitale," showed the impacts of Industry 4.0 inside Italian companies which adopt a DT process (figure 19).

According to the report, over a half among the companies who adopt Industry 4.0 technology, got a reduction of production cost and improvement of internal efficiency (60%), an increase of the productivity (54%) and better customer service (53%). These results were followed by an improvement of the turnover (39%) and the increasing of the product range (37%).

Figure 19: Impact[30] of Industry 4.0 in Italian Companies (Laboratorio Manifattura Digitale UNIPD, 2017)

Garrett in his report "The benefit of Digital Transformation" (2017) said that in one word is possible just say that they are "*plenty"* regarding the benefit of digitalization.

The Center for Global Enterprise (CGE) predicts that through the digitalization of the supply chain potentially, the procurement cost can be reduced by 20%, the supply chain process cost can be lowered by 50% and revenue could increase by 10% (Garrett, 2017).

Digital technology thanks a profound transformation can "deliver improved procurement performance through reduced costs, faster access to procurement platform solutions, accelerated access to information, flexibility in working, increased innovation and creativity, and improved procurement intelligence" as reported in the Garrett report by Gordon Murray[31].

Regarding procurement (as well as the others operation process) companies have a different degree of understanding and so, approach. The first step is usually moving to the cloud path logic, but more advanced company integrated processes and operation applying big data, analytics (predictive and prescriptive ones), artificial intelligence and so forth (Garret, 2017). This technology (especially advanced analytics) can help companies to find the right supplier fast, it can analyze which can be the result (the outcome) of choosing different supplier instead of selecting one, just because of previous works to others or feedback from the markets which can be subjective to the single perspective of needs. From others perspective, a digital

[30] Considering a % of companies which obtain that result with high motivation (ranked 4 or 5 in a scale of 1 to 5).

[31] Strategy and change management specialist with procurement expertise for Tata Consultancy Services

transformation of this aspects will predict some risk may occur as a delay in row material needed or regarding production or meet client needs and request (Garrett, 2017).

PwC in his Global Industry 4.0 survey (2016) shows how companies are delivering revenue, cost and efficiency gain (figure 20).

Figure 20: How Industry 4.0 is delivering revenue, cost and efficiency gain (PwC, 2016)

Additional revenue from:	Lower cost and greater efficiency from:
Digitising products and services within the existing portfolio	Real-time inline quality control based on Big Data Analytics
New digital products, services and solutions	Modular, flexible and customer-tailored production concepts
Offering big data and analytics as a service.	Real-time visibility into process and product variance, augmented reality and optimisation by data analytics
Personalised products and mass customisation.	Predictive maintenance on key assets using predictive algorithms to optimise repair and maintenance schedules and improve asset uptime
Capturing high-margin business through improved customer insight from data analytics	Vertical integration from sensors through MES to real-time production planning for better machine utilisation and faster throughput times
Increasing market share of core products	Horizontal integration, as well as track-and-trace of products for better inventory performance and reduced logistics
	Digitisation and automation of processes for a smarter use of human resources and higher operations speed
	System based, real-time end-to-end planning and horizontal collaboration using cloud based planning platforms for execution optimisation
	Increased scale from increased market share of core products

About "additional revenue," companies can obtain an increase of them from digitalizing both, products and services portfolio. They will get 10% or more of additional revenue following this area (PwC, 2016). Digital services - based on digital solution or just on data analytics, serving a customer ecosystem - will be drivers of the revenue growth.

Moreover, real-time data availability can allow companies to realize personalized products and customize solutions. These customized products can enhance the generation of significantly higher margins than mass-production can offer (PwC, 2016).

Both, lower costs and efficiency can be reached in different ways. Companies can improve asset utilization and production throughput time thanks to an integrated shop floor planning: integrating planning and scheduling for manufacturing thanks to a system that combines data from inside the companies with information from outside (external/horizontal value chain) as inventory level of supplier or changes in customer demand. Another example is the use of *predictive maintenance* of machinery and assets. This one is based on the uses of predictive algorithms to optimize repair and maintenance schedules and improve asset uptime (PwC, 2016). Another technique that can significantly improve efficiencies and reduced inventories is allowed by the system based on real-time end-to-end planning and horizontal collaboration.

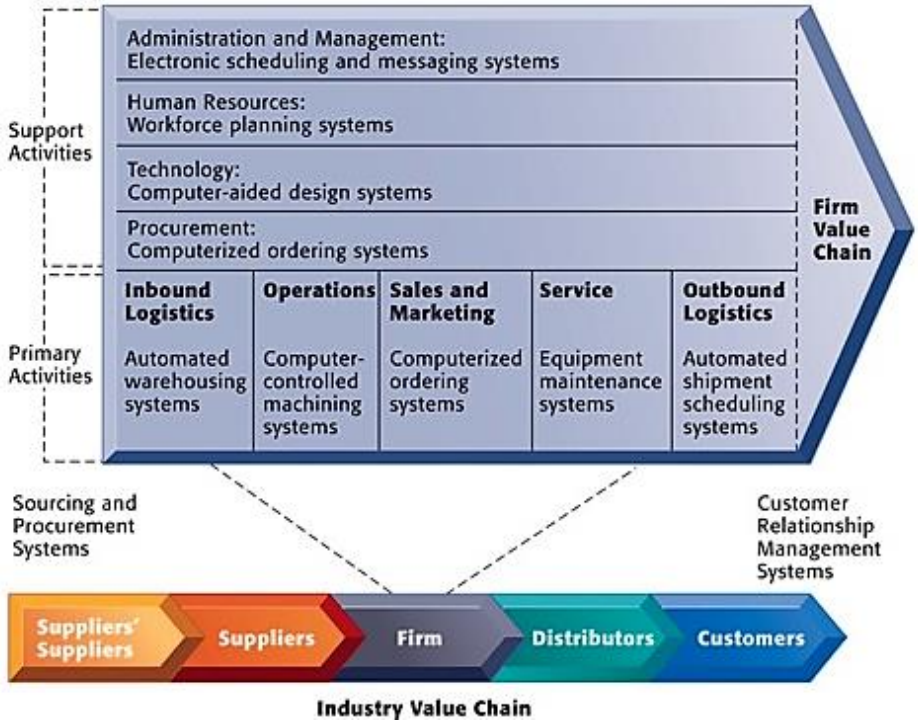
This is viable using cloud-based systems (allowing a better collaboration of the company with external partners as suppliers and even customers).

2.2 Internal and External Impact: a whole connection

Industrial leaders are digitising essential functions within their internal vertical operations processes, as well as with their horizontal partners along the value chain (PwC, 2016)

In order to have a better clarification of the "range" where technology can have an impact could be useful consider the different path of where can act: internal and external (internal value chain and external value chain) or vertical and horizontal. As internal is considered inside the value chain of a company and as external the value chain considering all the actors outside the company as suppliers, clients, customer and even distributors (depends on the company vertical dimension). Figure 21 illustrates examples how every element of the value chain can digital transformed and powered in order to leverage on digitalization.

Figure 21: Example of Digital Impacting the Value Chain (BINUS University, 2014)



In the internal path, digital has a proved positive impact inside a company: thanks, the new technology is possible to reduce the cost of inbound logistics and operations and increase the quality of products (just considering the "perfection of products" or the lower level of porosity allow by additive manufacturing). In the Sales and Marketing activity, thanks to the CRM systems powered by an intelligent platform can increase the performance considerably as in the case of the Harley-Davison already mentioned. Indeed, the service and the outbound logistics are natural links with the previous effects. In a total Digital Transformation process, there will be the presence of ERP systems powered by a strong alignment of information and technology that link the total industry value chain: from suppliers to customers. This allows better allocation of resource, and the possibility to increase value and even follow a lean management philosophy (Cappellozza F.; CONSIDI[32], 2018). Through the elements at the basis of the Digital Transformation and the democratization of several of them is now possible "really" put the customer as the core of company: mass customization became possible, and the relationship can be totally changed, not just company to customers but the company to single customer "x." The customer should and can be at the centre of the changes to products, service and even of the organizations. Products and services will be exponentially customized to customer needs, and already some companies plan to use data and analytics to understand customer and even final customer. Moreover, industrial companies will need to "own relationship" with their final customer and with drive the demand. Thanks, technology companies can integrate platforms that allow them to interact with customers efficiently (PwC, 2016)

2.3 Conclusion

Digital Transformation has a tangible impact on companies that decide to invest in this technology. Researches demonstrate the benefits and the possible outcomes, as revenue increase, cost are reduced and they get better efficiency. Industry 4.0 allow to digitalize and integrate processes both inside and outside companies. This integration consequently gets data to rise thanks to that given new efficiency level of organization.

Indeed, all reports agree that digital transformation has an impact on efficiency instead of efficacy. This is observable even in the short run, in fact, what makes efficacy good is the whole

[32] Cappellozza F.; CONSIDI . (2018, 09 18). Retrieved from CONSIDI Web site: https://www.considi.it/industria-4-0-cosa-e-opportunita-consulenza-analisi-formazione/
Interview with Cappellozza Fabio, President of CONSIDI, 2018, 09 18

strategy at the basis of a real transformation, whereas technology and digital transformation are seen as *enabler* tools.

According to the reports, the expectation of these benefits is, regarding efficiency, in line to the "why" companies expect to more than double[33] their level of digitalization by 2020(PwC – Global Industry Survey, 2016).

[33] PwC – Global Industry Survey, 2016

CHAPTER III

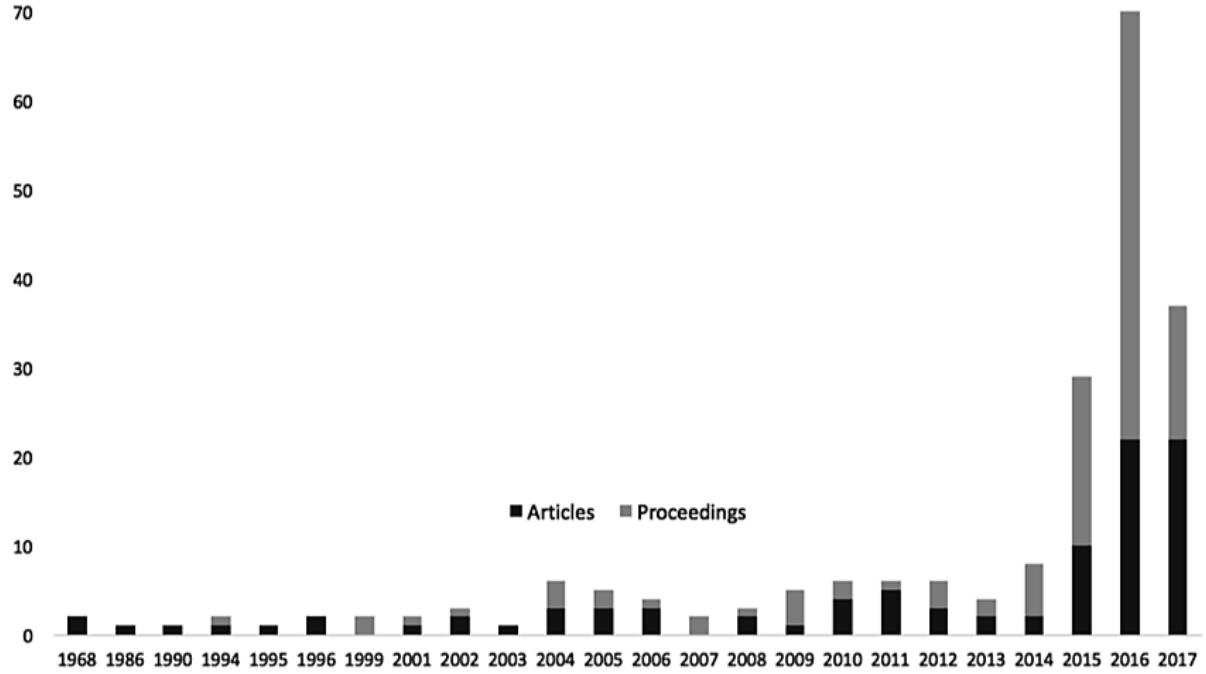
3 CORRELATION BETWEEN DIGITAL TRANSFORMATION AND INTERNATIONALIZATION

The benefits that the new technologies can bring in the internationalization process are a subset of the impacts of digital transformation. There is not yet a suitable amount of empirical research regarding these aspects in literature, although it is better saying that it is at the beginning.
Nevertheless, it is possible to track the probable impacts of digitalization in internationalization analyzing what is already demonstrated. The first step is analyzing the "traditional" approaches and dynamics of the companies which decide to enter the international market and successively compete internationally. Subsequently, it is possible to estimate the correlation (in terms of benefits) of digital transformation to internationalization, overlapping what literature has already proved with the (demonstrate) potential of digital technologies. Finally, thanks to the new opportunities that digitalization has brought, it could be even possible redefine the traditional trade-off which characterizes internationalization in the pre-digital market.
Internationalization is a kind of strategy common to companies' growth path that can be described as a complex and multidimensional decision process (Kraus et al., 2016).
Certainly, the whole business related to internationalization is "strategy", but, in this dissertation, the word entry mode/degree of internationalization is used to describe the strategy related to the access in a foreign country, and with strategy the traditional strategy choice on how compete international and manage globally/worldwide the organization.

3.1 Digital transformation: the studies in a new global digital market

The development of the literature regarding the "digital transformation" started recently, even if it is not really a "young concept", as demonstrated in the literature review made by Reis J. et al. in March of 2018 and shown in figure 23.

Figure 22: Publications Distributions (Reis J. et al. 2018)



As exposed in the second chapter of this thesis, publications (or precisely, several reports) confirm that companies can already know which could be the effects of Digital Transformation inside their company, even if we are at the beginning of the exploration of this "restructuration". Organizations have some initial directions about Digital Transformation and the correlation between possible implemented technologies and benefits.

The scenario appears different when searching a concrete (quantitative and measurable) outcome regarding the possible existence of a relationship between Digital Transformation and internationalization or even globalization.

Bill Gates stated: "Globalization is forcing companies to do things in new ways" (Thompson et al., 2013).

Digital transformation could be one of the new ways in which companies will do things as a result of globalization. This is the reason why it is important investigate on them.

Wittkop et al. (2018) in their publication "How Digitalization Changes the Internationalization of Entrepreneurial Firms: Theoretical Considerations and Empirical Evidence", state: "the internationalization of firms has mainly been analyzed and explained by considering observations in a pre-digital business environment. Thus, the applicability of the internationalization theories to digital ways of conducting business needs to be challenged".

It is also fundamental to distinguish digital native companies, which established the business model on a digital environment, and services companies from manufacture companies. Since their structure and business model is entirely different, even the dynamics of

internationalization should be considered as two different fields. These “new” companies are favoured by their intrinsic nature to expand internationally, in particular companies which have scalability potential thanks to their digital products or services (Wittkop et al. 2018). Indeed, the determinants of competitive advantage and the correlation to competing and expand internationally are different for these companies. (Wittkop et al. 2018). This native digitalised companies can become instantly and immediately international thanks to their presence on the web, even if they do not have the intention to become international. Moreover, these new technological developments may give the opportunity to companies to internationalise themselves differently from the past. (Coviello et al., 2017).

In this dissertation, the focus is on the “traditional” production companies which operate and start operating in an international contest. It is nowadays characterised by a digital environment that is impacting companies through the restructuring process already defined as digital transformation.

3.2 Degree of Internationalization

Before describing the different “degree of internationalization”, it is interesting to underline the reasons behind the question “Why do companies need to internationalize?”. The reason is that the degree of internationalization strategy chosen by the company should be correlated to the answer of that question (Thompson et al., 2013).

The reasons that lead a company to the decision of becoming international or expand to a foreign country can be different, but they are mainly five:

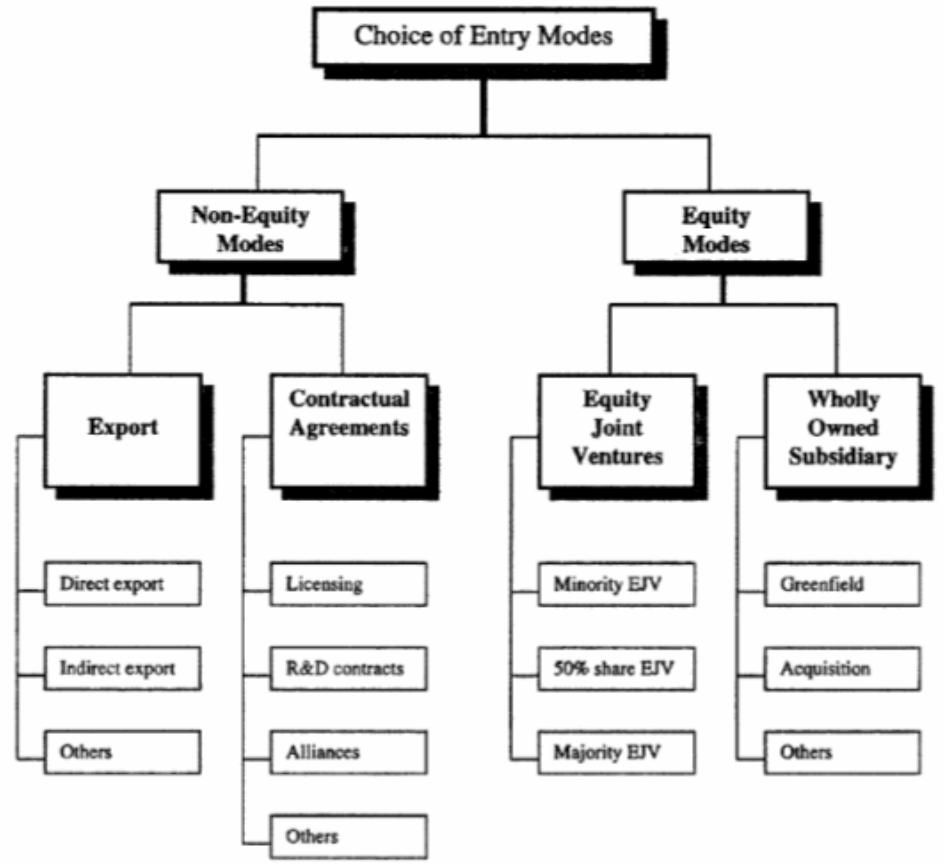
- To gain new customers
- To achieve lower costs through economies of scale and experience, and to increase purchasing power
- To further exploit their core competencies
- To acquire resources and capabilities from foreign markets
- To spread the business risk across a wider market base

Another reason can be found in “supplier companies,” which often expand abroad in order to follow their main customers (Thompson et al., 2013, 2017).

After having understood the reasons why a company decides to expand abroad, the degree of internationalization depends on the strategy chosen by the company to enter the foreign market. The entry mode decision represents the first strategy decision step in an internationalization process (Anderson & Gatignon, 1986). Indeed, the process of internationalization can be specified through different entry mode that are based on their characteristics as risk, return,

control, and integration associated. (Anderson & Gatignon, 1986). Moreover, analyzing how these characteristics link with each entry mode, it is possible to underline a dichotomous decision: equity and non-equity entry modes that are based on the financial and human resource available by the company (Kumar & Subramaniam, 1997; Pan & Tse, 2000)

Figure 24: Hierarchical Model of the Entry mode decision (Pan & Tse, 2000)



The picture 24 shows the different degrees of internationalization based on the decision between non-equity and equity mode. The main entry modes are respectively: export, contractual agreements (licensing, franchising, and alliances); joint venture and foreign direct investment (greenfield and brownfield).

Export

An export strategy is the first step to test a foreign market and to pursue international sales because there is often a low capital requirement and the risk associated, with this strategy is usually at the minimum. It consists in using the home country plants as the production base (Wach, 2014). Then, the manufacturer can limit the involvement using foreign experienced wholesales (indirect export) in importing goods, in order to let them manage the entire distribution and marketing functions in a specific country. Otherwise the exporter can sell to

the final customer carrying on the activity of the foreign wholesales (direct export) (Thompson et al., 2013). The advantages of export are:

- Low capital requirement
- The opportunity of exploiting the economy of scale using the existing production capacity
- No risk associated to the distribution
- No direct investment risk

The disadvantages are:

- Loss of channel control: knowing just the wholesales as intermediary, company does not know what happens in the foreign country and risks to lose information about the final customer,
- Maintaining relative cost advantage of home-based production: if the production costs in the home country are higher than in exporting country -where competitors have a plant – the exporting strategy becomes vulnerable
- Transportation and shipping cost
- Exchange rate risk
- Possible presence of a tariff or import duties

The main trade-off of export is that companies had a lower risk but also a lower control (Anderson & Gatignon, 1986; Wach, 2014).

Licensing

This "entry" strategy is often used when companies have something precious for the foreign market, as technical know-how, a patented product or an appealing brand, but they do not have the resources and capability to enter directly in foreign countries. Thanks to licensing, companies do not have any cost or risk associated with entering the foreign market; they can generate income from royalties (Thompson et al., 2013).

Indeed, the advantages are:

- No resource requirements
- Income from royalties
- The opportunity of expansion in many countries quickly

On the other hand, the disadvantages are:

- Maintaining the control of proprietary know-how: since they are given to foreign companies
- The possibility of loss operational and quality

Franchising

Franchising is a common strategy used by service and retailing enterprise which want to grow internationally. Franchising has almost the same advantages and disadvantages of licensing strategy with a few differences. The franchisor's costs are related to the resources to recruit, train, support and monitor franchisee. The main problems of a franchisor are maintaining quality and controlling over the franchisee (when they do not show commitment to consistency and standardization); and whether allow the foreign franchisee to adapt the product offered by the franchisor, to better satisfy local demand (Thompson et al., 2013).

Foreign Subsidiary

For those companies that need to maintain a direct control over all the aspect related to operating in a foreign country, the best strategy should be the establishment of an owned subsidiary. According to Kindleberger (1969), there must be some *imperfection* in markets for goods or others similar factors to let a direct investment (foreign subsidiary) to thrive abroad (Kumar Subramaniam, 1997). In others words, it is essential that a company has some unique firm-specific advantages (FSAs) that are valuable abroad and that can be transferred/recombine in the foreign country in order to prosper abroad with this entry method (Coviello et al., 2017).
This strategy also called FDI -Foreign Direct Investment- can be pursued in two ways: greenfield and brownfield.
Greenfield venture is a subsidiary business established by *setting up the entire operation from the ground up.*
Greenfield venture is commonly used when a company has the resources, capabilities, and experience in getting a new foreign subsidiary to compete successfully and profitably. Successful greenfield could offer higher returns in order to compensate for the higher risk and slower path (Thompson et al., 2013). The main benefits are:

- High level control
- Direct transmission of the firm's technology, skills, business practice, and culture
- "Learning by doing" on the local market (even if it could be considered a disadvantage, depending on the contest)

Instead, the disadvantages are:

- High capital cost and complexity of the initial development
- The slowest strategy of entry in new markets

Brownfield is the acquisition of a local company. This strategy is quicker than Greenfield one and it overpasses some risks of greenfield associated to the entry barriers, such as: gaining

access to local distribution channels and building relationship with suppliers or even with government officials (Thompson et al., 2013).

The advantages in that case are:

- High level control
- Quick, large-scale market entry
- Avoiding entry barriers
- Access to the skills of the firm that has been acquired

The disadvantages could be:

- Cost of acquisition: especially when the company decides to pay a premium price for a successful local company
- The complexity of an acquisition process and consequently integration of the firms' structures, operations, cultures, and personnel

Alliance and Joint Venture

Strategic alliances, joint venture and other cooperative agreements with foreign companies are a common entry mode strategy.

In a Joint Venture, the company joins with a foreign firm, in order to sell or produce products/services abroad. Both firms agree to share commitment, operational control, risks and returns in order to benefit from partner's knowledge or to access to foreign markets with legal restrictions on foreign ownership (Dominiguez. 2012)

This degree of internationalization process may have several benefits:

- Gaining partner's knowledge of local market conditions or technical/peculiar expertise
- Achieving economies of scale through joint operations
- Sharing distribution facilities and dealer network, and strengthening each other the partner's access to buyers
- Concentrating competitive energies on mutual rivals, avoiding competing each other
- Establishing working relationships with principal officials in the host country government

In contrast, the disadvantages can be:

- Knowledge and expertise of local partner can be less valuable than expected
- Cultural and linguistic barriers
- Cost of establishing a working arrangement
- Conflicting objectives and strategies and different opinion about joint control

- Differences in corporate values and ethical standards
- Loss of legal protection of proprietary technology
- Over-dependence on foreign partners for essential expertise and competitive capabilities (Thompson et al., 2013).

The main trade-off of these strategies is: in one hand, companies can leverage on the strengths of both companies, on the other hand, there is the possibility of a future "threat" from one side or problems related to a different strategic view. In literature, these kinds of cooperative agreement are considered a "temporary" balance.

Learning has been cited as primary motivation for engaging in alliances – Jay B. Barney -

These alliances can be seen as a "race to learn" the strengths of the partner, so that companies can become autonomous and obtain an advantaged position towards the partner in future (Hammel, 1991).

3.3 The elements of Digital technology may correlate with each degree of internationalization

Technology has profoundly impacted firms' functional and geographic configurations since the Industrial Revolution. Technological milestones such as the development of railways and the invention of telegraph and telephone reduced distance, improved communications, and enabled cross-border transactions (Coviello, Kano & Liesch, 2017).

Digital technologies should not be considered "alone" a driver of internationalization, because the complex phenomenon of internationalization is the "tool" to reach other objectives as described previously. In this dissertation, the elements of digital technology (as part of the digital transformation) are considered the elements that could have an effect in entering and competing in a foreign country.

Export

There is a positive correlation between digital technologies - as internet, web site, social media, e-commerce, digital marketing activities – and the international presence of Italian manufacturers companies in foreign countries, especially in the field of export (Cassetta, Meleo & Pini, 2016). This correlation may exist for different reasons. Thanks to this digital technology

is possible to reduce the cost of being present for a company in the foreign market and increase the degree of information and consequently lower costs of control (Cassetta, Meleo & Pini, 2016). This aspect is usually the main disadvantage of an export strategy. Since companies do not have control after selling products to the foreign wholesalers, they even risk not to know the final customers and what happens to their products and brand image (Thompson et al., 2013). Thanks to digitalization, smart product and IoT products, companies can obtain information directly from the final customer. Moreover, digital firms have the opportunity to explore foreign markets and obtain inbound lead, prospect and customer without investing in abroad production or even local sales and support. This could be possible managing website data to identify attractive markets and by leveraging interactive technologies to build a widespread user base and customer relationship (Coviello et al., 2017). The capability of rising information, maintaining low cost, is the effect of digital technology in this degree of entering strategy, redefining what was previously considered as a significant disadvantage of this strategy.

Licensing and Franchising

The Digital can also be connected to licensing and franchising as entry strategies. The main disadvantages (quality and operation control loss) can be bridged thanks to a global connection between products/productions and the company. Through IoT and more specifically through the concept of smart factory, a company can check both quality of products, operations and production, and all the aspects related to them, regardless their allocation in the world. Of course, a specific agreement and commitment between all the companies involved will be required.

Foreign subsidiaries

As already mentioned before, the reason for establishing a foreign subsidiary through a foreign direct investment is the company desire to maintain a complete control in the foreign country. A hidden problem is how to manage the control from the head-quarter to the subsidiaries. This matter becomes particularly delicate when, on the one side, there is the need to give some freedom to the foreign subsidiaries, such as making regular decision or manage critical customer (as in the business-to-business field) and, on the other side, the necessity of control and align the foreign subsidiaries with the headquarter.

The “connection” technologies (intelligent platform, cloud) can be useful also in this case. Through an entire connection enterprise, the control can become a smooth and speedy standard since information flow is automatically (Strange & Zucchella, 2017). So, the headquarter can

set its preferred/needed control up in an effective way. This connection, linked to big data collection obtained from the subsidiaries and to the market in which they operate, results useful also in the case of a brownfield approach. In this case, even if there is a high cultural distance, the headquarter can understand the dynamics of the foreign market and how subsidiaries operate. Moreover, a connected intelligent platform can become a useful tool in the integration path after an acquisition. Considering the essential importance in transferring the unique firm-specific advantages in the subsidiary (FDI) in order to prosper abroad, this aspect can be facilitated by digitalization, when the specific asset can be codified. Indeed, digitization allows a superior transferability of firm-specific assets. This underlines a reduced dependence on location bound (Autio & Zander, 2016; Coviello et al., 2017).

Alliance and Joint Venture

Digital transformation can impact some aspects of the traditional trade-off of international cooperation agreements as alliances and joint venture. The main reason for co-operating with a foreign company is the need to use their expertise and knowledge of the foreign market, and leverage on the strength of both companies. The main disadvantage can arise when companies begin a "race to learn" (field as the local knowledge or capabilities) to overcome the miss-knowledge and to be competent in the future and become autonomous. As previously described, digitalisation can be a useful tool to have information and learn efficiently independently from the distance. Massimo Pavin, CEO of Sirmax (an international company with headquarter in Cittadella), referring to a Joint Venture project in India with a local partner, affirmed[34]that he was considering the idea of adopting an integrate CRM software (as salesforce) even in the new foreign joint venture. This solution could give the opportunity to know better the local customers even if the day-by-day management of the foreign new entity should be a duty of the local partner.

[34] In a meeting for a case study project, in 2017.

3.4 The possibility of overcoming the traditional trade-off

Technological and related institutional advancements are indeed disrupting the landscape in which international firms operate, regardless of their age, size, industry, or extent of internationalization, and these changes are unlikely to be transitory (Coviello, Kano & Liesch, 2017)

3.4.1 Traditional Trade-off in competing internationally

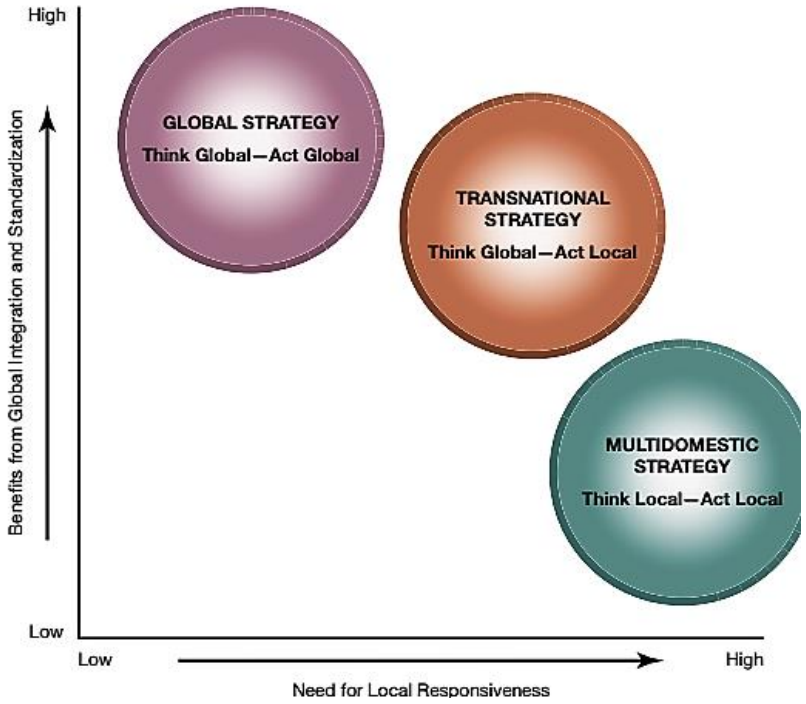
International companies operating in two or more countries simultaneously must decide their international strategy and how to compete in the international contest. The main trade-off in their decision is whether adopting a standardization or customization approach for each country in which the company operates (Thompson et al., 2013). This trade-off, also identified as the integrations-responsiveness (I-R) framework, is correlated to a contingency approach, whose core idea can be related to the differentiation and integration dimension introduced by Lawrence and Lorsch in 1976 (Ates & Prange, 2012). Several other studies recognize this dual imperative as one of the most important challenges for success in competing in the international market (Ghoshal, 1989; Doz and Prahalad, 1991; Harzing, 2000; Ates and Prange, 2012)

Indeed, there are pros and cons to both strategies.

Standardization of products and services (in every country) gives the opportunity to obtain efficiency gains. Adaptation approach gives the opportunity to deal with local markets needs and offers a better fit of products.

Companies traditionally have three main options in dealing with this trade-off. They can adopt a multidomestic, a global, or a transnational strategy (Thompson et al., 2013).

Figure 23: Three approaches to competing internationally



With the *multidomestic strategy,* companies vary their products offering a competitive approach to each country they operate. This strategy is useful to meet the different customers' needs and to deal with different market conditions. This strategy is essentially a "think local, act local" approach. This approach is possible only when decision making is decentralized; headquarters should leave the power to craft and accomplish strategies in the country market they are responsible to the local managers. The main disadvantages of this strategy are correlated to the misalignment of strategies, information, capabilities, knowledge and resource because the company's effort is not integrated or coordinated across countries (Thompson et al., 2013).

With the *global strategy,* companies adopt a standardized, globally integrated approach. Thanks to this strategy, companies push the same competitive approach in all the countries in which operate, using the same resources and capabilities. This strategy represents a "think global, act local" approach. Global strategies are usually characterized by centralized value chain activities which are favored by centralized decision making and strong headquarters control. Since these kinds of strategies do not dress different local needs, companies are less responsive to change in a local market condition and they can determine the high cost of coordination due to the globally integrated enterprise (Thompson et al., 2013).

The third option is the *transnational strategy*, also called "glocalization." This strategy was firstly introduced by Barlett and Ghoshal (1989) as a development of the integration-responsiveness grid.

This one has elements of both global and multidomestic approach. This strategy is particularly useful when there is the need of local adaptation with a high potential benefit ensued from standardization. This strategy is considered a "think global, act local" approach that aims to balance these competing objectives. Traditionally, companies use mass-customization to implement transnational strategy. Due to the complexity correlated to characteristics of this approach, a transnational strategy is the most difficult to implement because the high level of coordination and control required (Thompson et al., 2013).

Table 1.0: Advantages and Disadvantages of Multidomestic, Global, and Transnational Strategies (Thompson et al., 2013).

	Advantage	**Disadvantage**
Multidomestic (think local, act local)	• Can meet the specific needs of each market more precisely • Can respond more swiftly to localized changes in demand • Can target reactions to the moves of local rivals • Can respond more quickly to local opportunities and threats	• Hinders resource and capability sharing or cross-market transfers • Has higher manufacture and distribution costs • Is not conducive to a worldwide competitive advantage
Global (think global, act global)	• Has lower costs due to scale and scope economies • Can lead to greater efficiencies due to the ability to transfer best practices across markets • Increases innovation from knowledge sharing and capability transfer • Offers the benefit of a global brand and reputation	• Cannot address local needs precisely • Is less responsive to changes in local market conditions • Involves higher transportation costs and tariffs • Has higher coordination and integration costs
Transnational (think global, act local)	• Offers the benefits of both local responsiveness and global integration • Enables the transfer and sharing of resource and capabilities across borders • Provides the benefits of a flexible coordination	• Is more complex and harder to implement • Entails conflicting goals, which may be difficult to reconcile and require trade-offs • Involves costlier and more time-consuming implementation

Indeed, it is possible to observe that traditionally there is a central trade-off between standardization versus adaptation, global versus local, in competition for international

companies. This trade-off is managed considering a matrix (figure 25) where is collocate the benefits from global integration and standardization in the vertical axes and the need for local responsiveness in the horizontal one. The only strategy that tries to balance the benefits of both forces is the transnational one, but it is also considered the more complex to adopt and implement. From a theoretical point of view Ghemawat (2007) argue that in order to prospering in the global environment companies should exploit the potential of differences, in fact he introduced his framework "AAA" – adaptation, aggregation, arbitrage – to underline the potential of potential of a truly implemented transnational strategy (also considered a balance instead of a tension between the global and multidomestic strategy).

3.4.2 Digital enabling possibilities

The latest available technologies offer new opportunities in dealing with the traditional trade-off of standardisation against adaptation. Through the integration of the value chain (with the new IT connections), it is possible to better manage the multinational companies thanks to the flow of information (Strange & Zucchella, 2017). For example, the IoT offers a fundamental change in the management of geographically dispersed value chain. Traditionally, most companies monitor the flows of products with a separate flow of information. Thanks to the IoT technology there will be no need to coordinate and synchronise product and information flows because they will be inextricably linked (Strange & Zucchella, 2017). This approach can redefine the benefits of production and distribution efficiency in cross-border flows and reduce the transaction cost associated with international production and even a better global organization (Strange & Zucchella, 2017). Customers thanks to digital transformation can be better involved in the global value chain, as providers of information and feedback on the products. Thanks to additive manufacturing is possible to give a customisation of products both to every customer and to each country without the previous problem of the production cost of the minimum batch request (Strange & Zucchella, 2017). The standardisation versus adaptation decision – for long a key issue in international marketing theory and practice – will require a comprehensive re-evaluation in the light of this customisation (Strange & Zucchella, Industry4.0, Global value chains and international business, 2017).

Through the new technologies of Digital Transformation, the traditional trade-off from standardisation to adaptation in competing internationally is overpassed. It is possible to adopt a new powered/true transnational strategy where the "think global, act local" approach is encouraged without the traditional disadvantage.

Westerman, Bonnet and McAfee in their article[35] "The nine elements of Digital Transformation" published in the MIT Sloan Management review (2014), describe a *Digital Globalization*. *Companies are increasingly transforming from multinational to truly global operations. Digital technology coupled with integrated information is allowing businesses to gain global synergies while remaining locally responsive.* Indeed, companies have the resources to obtain from the global side shared services and capabilities (as for finance, human resource, brand image, unique strategy, knowledge, design) and simultaneously promoting global flexibility, efficiency and reducing risks (Westerman et al., 2014).

According to PwC[36], industry 4.0 is *accelerating globalization, but with distinct regional flavours.* Through a more global value chain and data network integration and connect, the digital transformation connects companies and countries even more closely. This connection will progressively promote globalisation (PwC, 2016).

Indeed, literature agrees that digital transformation overpasses the traditional trade-off on how competing internationally. From this point of view, it is possible considering a feasible convergence of the three traditional strategies to the transnational approach, since it could raise the benefit of both strategies, reducing traditional disadvantages.

3.5 Conclusion

Digital can affect not only the traditional ways in which companies become international but also their international strategy and approach. Thanks to the new technologies of digital transformation there is the need to rethink and redefine the traditional trade-offs. In literature, it is possible to see the first sign in this direction but there are different unanswered questions and the need to prove the several hypotheses formulated by correlating the potential of technologies to several international dynamics. Nevertheless, it is yet possible affirm that the trade-off of standardization vs adaptation can be exceeded thanks to the digitalization. Companies have the possibility not to consider it as a trade-off because potentially it does not exist anymore. Instead, they can freely choose in which shade they can collocate themselves between standardization and adaptation.

[35] https://sloanreview.mit.edu/article/the-nine-elements-of-digital-transformation/
[36] PwC, Geissbauer, Vedso, Schrauf. (2016). *Global Industry 4.0 survey - Industry 4.0: Building the Digital Enterprise.* PwC.

Digital transformation has the potential to reconsider the traditional internationalization processes of companies in terms of time, step, location, entry mode choice, foreign market learning, knowledge recombination, availability of required resources and capabilities and the ability of the firms to cope the liabilities of *foreignness* and *outsider ship* (Coviello et al., 2017).

CHAPTER IV

4 CASE STUDIES ANALYSIS

In order to verify the research questions will be analysed a sample of international Italian companies that decided to implement a digital transformation process.

At this point is important to underline the questions at the basis of this dissertation having as example the analysis of case studies. Does the Digital Transformation impact the Internationalization? How Digital Transformation impacts the Internationalization?

Considering Literature developments made till now, it appears that an answer to the first question has already been given while the second one remains partially unanswered.

This analysis of case studies focuses on how Digital Transformation affects the Internationalization. Former assumptions are verified in chapter three through the empirical results which confirm the literature findings reached till now.

Firstly, will be introduced the sample of companies that took part at the research made by the University of Padua, then the focus will move to the results of the case study.

4.1 Companies Sample: The profiles

The case studies analysis takes as a sample nine Italian companies: eight of those are manufacture ones and one of those is a service company, which operates in the field of digitalization as consultant.

Before dealing with the result emerged by the case study, it is appropriate to present the companies profile.

Caseificio Elda S.r.L.

The company Caseificio Elda srl is specialized in production of *bio* ricotta cheese as private label and own brand. Today this company is in business with large industrial customers and the large-scale distribution (*GDO*). Caseificio Elda was founded in 1917 by Giuseppe Zerbato, and it is still a family management company. Currently, the third generation (Giuseppe grandchildren) is managing the company: Eleonora (as CEO and commercial manager), Roberta (CFO) and their brother Luca (as production manager). Today the company has a

turnover of 12 million euros, where the 30% of it comes from foreign market (exactly the 20% of the turnover is produced in Europe and the remaining 10% outside Europe), with only 31 people working there. The entire production activity occurs in the plant in Vestanova (VR).

DAB Pumps S.p.A.

DAB Pumps is in the business of water handling and technology. It produces hydraulic pumps for various situations (domestic, residential, civil, commercial and agricultural solutions). DAB Pumps was founded in 1975 as a trading company of a group made up of four organizations.
The company created the group DAB Water Technology (DWT) after different steps: in 1977 there was the integration of those four organizations, in 1985 the phase of product differentiations and in 1998 the beginning of expansion and acquisitions deals.
DAB Pumps represents the most important brand with a continuously growing organization: more than 1500 employees and a 300 million turnover in 2017. The remaining three brands controlled by DAB Water Technology are: Tallas, Leader Pumps and Tesla Submersible Motors. The headquarter of the group is in Mestrino (PD) but it is present all around the world with its 7 production plants, 12 sales companies and 1 sales office.

Sariv S.r.L

Sariv Srl is a manufacturer company of blind rivets and fastening solutions operating as supplier in the business to business market, in which main customers operate in the automotive sector. The company was founded in 1990 in Fontaniva (PD) as a part of a family-owned group, which operated in the metal industry. Since the very beginning, the main markets have been abroad leading the company to the opening of 5 warehouses in Europe (Czech Republic, Slovakia, Poland, Croatia and Russia). The company produces 2.5 million of pieces every day and in 2017 the turnover was almost 9 million euro (80% arisen from the foreign market). Currently it has 40 employees.

Better Silver S.p.A.

Better Silver is specialized in producing bronze and silver jewels, chains, semi-finished and finished products for wholesalers, manufacturers and shops. It was founded in 1977 in Vicenza by the actual CEO Romano Bettinardi. The product range and target markets have been evolved over the time and, thanks to its products, the company is today present in 90 countries. Better

Silver spa has 90 employees, but the number rise to 280 when considering the total group under the holding Bettinardi Group. The other companies under this holding company are Easy Silver and Rbs Exim. The turnover is around 47[37] million euros and, referring to the production, only the 15% of it is produced by the home country whereas the remaining 85% derives to the foreign country. With its 5 production plants (four in Italy and one in Romania), the company produces 80 tons of silver, 10 million meters of chains and 20 million of silver products every year.

Texa S.p.A.

Texa was founded in 1992 by the current CEO Bruno Vianello. The company operates in the field of design, development and production of multi-brand diagnostic tools, exhaust gas analyzers, air conditioning charging stations and tele-diagnostic devices for cars, bikes, trucks, boats and farm machineries. Today Texa is present all over the world thanks to its extensive, worldwide distribution network and commercial branches. The company counts approximately 640 employees, and 400 of them working in the company headquarter in Monastier di Treviso, where all TEXA products are designed, developed and made. The turnover of the company is about 101[38] million euros. The European market is the most important and has a 60% of market share, without considering Italy. The company market share is the 13% outside Europe.

Baxi S.p.A.

Baxi Spa designs and produces heating and cooling systems: boilers, heat pumps, air conditioners, water heaters and hybrid and solar heating systems. The roots of the company go back in 1925 when the Austrian family Westen established Smalterie Metallurgiche Venete plant. At the end of the 70's, the company focused its production on the heating sector and in 1999 entered in the Baxi Ltd Group (European leader in the sector). In 2009 De Dietrich Remeha Group and Baxi Group announce the fusion of the two groups, successively creating the BDR Thermea Group in 2012. The Group turnover is 1.8 billion euros and in Europe it employs 6.400 people. Only the 33% of the turnover derives from the home market (Italy). The group is present in more than 70 countries through its subsidiaries. Baxi Spa has the biggest[39] production plant in Europe in Bassano del Grappa (where 800 employees work), with a production capacity of four thousands boilers per day.

[37] In 2016 http://www.bettersilver.it/it/numbers
[38] In 2017
[39] Referring to the sector in which the company operates.

Bravo S.p.A.

The company is leader in the sector of multi-function machines, which produces ice-cream, pastry and chocolate. The company was founded by Gnesio Bravo and his brothers in 1976 as supplier of components for the mechanic industry. In 1972 Gnesio invented the *Trittico*: a revolutionary machine which simplifies the way of producing artisanal ice-cream. Today Bravo Spa thanks to its foreign subsidiaries produces 15 million euros in sells and employs about 100 people.

Stevanato Group

Stevanato Group supplies solutions for pharma & healthcare sectors with 70-year experience in glass primary packaging, glass processing technologies and a huge range of glass and plastic products, systems and services. The first company was OMPI and it was founded in 1949. Through years, it has been growing thanks to greenfield and brownfield approaches. Today the company is known with the brand Stevanato Group which owns seven brands. The group is made up of two primary divisions: *pharma* and *engineering*. It is present in 9 countries with 14 plants (9 pharma and 5 engineering). The company reached a turnover of over 480 million euros in 2017 and its products are present in 150 countries. Stevanato group counts 3.500 employees and it is one of the main worldwide player.

FiloBlu S.p.A.

The "consulting" company FiloBlu was founded at the end of 2009 in Santa Maria di Sala (Venice). In last four years, the company registered a growth of over 800% with a turnover of 13.5 million euro[40] in FiloBlu provides business projects that link digital with internationalization strategy. The service range includes: *internationalization, marketing & communication, retail/store management and customer care, technology and system integrator, project management, strategy and planning,* and *business intelligence* (included in the service range recently).

[40] http://www.affaritaliani.it/economia/fare-e-commerce-s-impara-il-caso-filoblu-532315.html

4.2 Italian Companies Analysis: How does digital transformation impact internationalization?

4.2.1 Be International, to Be Local –Transnational Strategy

DAB Pumps – Stevanato – Sariv – Baxi – Elda

How does Digital transformation enable international companies to become effectively Glocal?

The achievement of standardization of processes is the first step for companies that want to start a digital transformation. It is essential to underline that standardization has the meaning of lean concept in this context, consequently allowing the Kaizen approach. The standards let companies know better and analyze their process in order to improve and innovate the standard and the process itself. This elements appear as a fundamental initial step for the following steps, which will transform the international strategy of companies, and even allow them to become international in some cases.

From the introduction of automation, **Caseifico Elda** introduced a digital transformation process to reach higher quality, control and to connect the entire manufacturer process.

The automation creates standardizations. Through this tool, it is possible to lower the costs, better manage, check the production and, in general, increase the control of the different activities (Eleonora Zerbato, CEO of Elda).

Implementing the digital for Elda company means creating standards through the analysis of quality improvement and the current process in use. Improving the process was fundamental for Elda Company, because the business in which it operates did not allow high margin. Consequently, it was necessary to lower costs through an efficient process, in order to survive. Through the digital it is possible, and thanks to a better analysis and understanding of the process, the company innovates initially the process and then the products. The results were higher control (increment of quality) and a higher yield of raw material (lower cost). These are the main two factors that let the company obtain a better position into the market and give even the opportunity of starting operating into new channels. From the beginning of this digital transformation, Elda decided to focus only on the production of ricotta cheese to become both highly expert and reference point for the market. Indeed, after two waves of technologies

adoption, Elda obtains a smart, integrated (production and warehouse) factory. It allows to the company to innovate its products, like a peculiar 100% biological ricotta cheese which remains fresh up to six months, and increase both the production capacity and capability of mange the increase production of a range of different products (always allocated under the umbrella of ricotta cheese and its derivatives). Thanks to digital transformation, Elda is able to create massive quantities of products in a compact space, and to adapt ricotta cheese flavor, taste and derived products to the taste of each country in which the company operates (Europe, U.S.A., Japan, Korea, and Australia). Without a digital transformation, process should be impossible for the company to go abroad because of different reasons, even if, at this point, they are overpassed thanks to the digital. One of the reason is taste, because it changes in each country. Indeed, it is fundamental to adapt and innovate this product in order to sell it abroad because of the peculiar taste. Other reasons are: the limited space in which the company has to produce, depending on the geographical location; the time to market usually not adapt to sell this kind of fresh foods abroad; and the need to manage the production of different products maintaining low costs.

We know that without integration of all the activities, it should be impossible to manage all this complexities. Both in term of space, thanks to automated warehouse, and in term of effectiveness, thanks to the management software system (Eleonora Zerbato, CEO, Elda).

So the Digital transformation path of Elda was the transformation of the factory in a smart factory: *simple* automation for the first phase and *advanced* for the second, using remote control and integrating all company elements. It creates: process innovation, product innovation, and the consequently possibility to adapt its product to every destination country, standardizing the process and maintaining low cost and high quality.
The digital transformation of **Stevanato** is an example of strategy that drives digital. It was implemented to facilitate the development of the company and particularly the international growth. The value proposition of the company is to satisfy the need of clients, final users and, to be a “landmark” for the pharmaceutical company.

The company cannot rely only on the market request, but it must have the capability of being one step ahead. Through this way the company can be ready to any necessity.
It was necessary to the company to take the way of digitalization (Nicola Gianese, I-Digital Director, Stevanato)

Stevanato starts his digital transformation with the adoption of hardware infrastructures as foundation on which building the business intelligence and the digital infrastructure. Even in this case it is possible to observe how the digital transformation creates standardization of processes and systems, the innovation in the processes, which like in the case of Elda Company enabled high quality and better control over the entire production process.

Then came the innovation of products (in the form of *smart wearable product* or in the innovation in the structure of the material). Stevanato adopts several technologies (such as big data, cloud, analytics, ERP) to implement an intelligent platform *connected* with all the subsidiaries of the group worldwide. Moreover, the IT infrastructure allows the company to centralize the management of the subsidiaries and, at the same time, creates synergy between them.

The peculiarity is that these connections, the standardization process, and also the innovation of them and of the products have an impact on the internationalization of the group. In fact, in order to manage the group system, Stevanato chooses a truly transnational strategy based on the concept of "be *glocal"* as a corporate identity. The concept is local for local, defined by standard processes on the one side, and custom products on the other, not to just adapt to each country, but also to adapt to each customer's desire. Moreover, even if the management is under the control of the head-quarter, we can assume that the result of this whole connection of plants and standard processes overpasses the conceptual limit of centralized research and development. The structure is not just hierarchical but is also peculiar in the sense that each subsidiaries has the same opportunity to be a central node depending on the need. This system empowers the logic of "be local-for local".

One of the advantages (of this system/process/network) is the opportunity to create a pilot project in China, Brazil or any other country. According to the situation, the company will decide the ideal location in which to implant the roots of the project. Afterwards, thanks to the connection among all the establishments, it will be possible to replicate this project in other branches or even to centralize it in the headquarter located in Piombino Dese (Nicola Gianese, I-Digital Director, Stevanato)

To demonstrate how the digital transformation impacts the internationalization of a company, changing its business model, we will take **Sariv** as another example**.** The company (already international) needed to improve its position and value proposition in the market. In order to reach that objective, Sariv decided to start a digital transformation process introducing digital systems in order to obtain qualitative standards through a controlled process and the related

connections. The company became a problem solver thanks to the use of digital structures (such as automation, big data and cloud) and of elements such as the product data management or the manufacturing execution systems (MES). By linking the physical product with its unique service, Sarviv can have every customize product follow with efficiency and efficacy the request of every single customer.

Inside the production process, the machines are set to fulfil every single customer's needs. In fact, the company has the tools to fulfil different requests from customers, providing the best solution for each situation: all thanks to digitalization (Nicola Sartore, CEO, Sarviv).

Moreover, this strategy is in line with the effectiveness of transitional strategy allowed by the use of digital programs.
The company **Baxi** decided to utilize digital systems to implement the logic for the lean manufacturing, in order to make the production processes flexible and lean.

Agility and flexibility are just two of the benefits that digitalization can bring to an organization (Alberto Favero, CEO of BDR Italy)
The path on how digitalization affects the internationalization is similar to the other companies analyzed.

Baxi's fifteen production lines have the same features. However, we tried to modulate the various production batches based on the characteristics of the target market of the product. Baxi has succeeded in developing a type of line that would allow it to adapt production to the various customization needs (Alberto Favero, CEO of BDR Italy).

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Digitalization also represents a key element in the strategy of **DAB pubs**.
In DAB a real digital journey has been defined, shared on several levels thanks to the establishment of the Dab Digital Committee and to the digitalization manifesto (Sandro Stramare, CEO of DWT).

DAB is another case of Italian company that demonstrates how digitalization is positively correlated with a true implementation of a transnational strategy. The company is a representative of the "think global, act local" motto, because it focuses on the standardization and the integration of processes in order to let them transversal applicable. Even in this case, it

is possible to observe that the digital systems used by the company standardize the company processes. This structure enables the existence of a global shared (common) language which, sided by technologies in general that allow connection and reduce distance such as big data and cloud, make local adaption simple and implement the benefit of standardization.

Digitalization necessarily requires the standardization of processes, which has led to the exploration of some opportunities: since all the foreign branches follow a single way of acting, the standardization helps to carry out and manage some processes in a uniform way in all the branches, without neglecting the local adaption to meet the individual needs. The digitalization of processes is 'democratic' and easy to spread globally, since it speaks the same language for everyone (Sandro Stramare, CEO of DWT).

4.2.2 Marketing 4.0 – communicate worldwide

Stevanato – Better Silver – FiloBlu - Bravo

How is it possible to reach international market? And how is it possible to interact with it?

Digitalization creates new possibilities to contact, reach, engage, interact and obtain new customers in the international environment.

The digital communication of **Stevanato** begins in 2016, when the company felt the need of a digital infrastructure to support the launch of the Stevanato brand through the web.

Digitalization gave Stevanato the possibility to reach specific kinds of foreign customers impossible to reach without it: the company changed the way it connects with customers, especially the international ones. Stevanato uses digital systems to reach new international customers with high future potential, such as small biotech firms, university spin-off and start-up mainly located in North America.

Stevanato's objective is to reach these small companies since their first steps of operation. To carry this kind of scouting activities, digital systems represent a useful tool. In fact, if we think about how costly it would be to send the commercial departments managers to intercept each of the small companies, we realize how digitalization became an urgent business necessity. This tool not only is used for communication but also to give impetus to the business, thus it is the digitalization, which helps finding new clients and increase the revenues (Filippo Pietrobon and Chiara Pasqualetto, Marketing and Communication, Stevanato).

The technologies adopted are also fundamental to collect information (both from inside and outside the company), in order have better knowledge of customers and of the market. Stevanato is a data driven company where the use of information is fundamental in order to customize products, interactions, and contents to give every single customer a one-to-one relation. The digital path to this digital marketing is the use of big-data (collection, and analysis) and a strong CRM software that centralizes all the information. Stevanato uses digital custom contents to obtain prospect contact in order to interact/engage them with custom marketing automation activities with the CRM software. Certainly, digitalization enables this company to obtain new international customers and market knowledge thanks to the start of a one-to-one relationship customized for the single customer.

The more the digital moves forward, the more marketing becomes 'human' (Filippo Pietrobon, Marketing and Communication, Stevanato)

The Italian case of **Better Silver** is characteristic to demonstrate how a digital company needs an off-line store to be digital and obtain international knowledge about markets and customers. Indeed the online and offline presence of the company is complementary.

It was not possible to just focus on one method of sale or the other, but the two needed to coexist: if the physical store manages to steer customers to the online channels, the online channel can also influence the costumer to visit the physical shop, helped by the support of social networks and target-oriented, geo-located communication campaigns (Paolo Bettinardi, founder and CEO of Better Silver)

Thanks to the implementation of digital technologies, the store became the place where to obtain knowledge and study the foreign customers, to adapt the products, the communication strategy, the online presence and offer of the firm.

Certainly, the company located the stores in typical touristic Italian towns such as Venice, Verona or Florence in order to have a strong international customer base. The physical stores are not just a place where to sell products anymore, but they became the place where to obtain data, big data, information and finally knowledge of the international market. This model gives the company the potential to transform the trade-off of the export strategy: thanks to digitalization, it becomes possible to analyze foreign customers even by staying in one's home country. The digitalization was introduced into Better Silver years ago in order to reduce the distance between the company and the final customer: thanks to its knowledge, the company transforms itself into a problem solver and from be dependent of the wholesalers (since Better

Silver did not know the market) become a consultant for the wholesalers to help them sell abroad.

The digitalization is a necessary condition for the internationalization. *Today, if the company did not have its digital tools, it could not work in certain realities. Without digitalization, it could not maintain the leadership on the market* (Paolo Bettinardi, founder and CEO of Better Silver).
Of course, digitalization also has a central role in a production process that is far from the reality in which Better Silver is collocated.

Digital systems played a key role in the development of **Bravo Spa.** The firm uses digital tools (such as QR code, cd-room, web-site and web-community, YouTube channel and virtual reality,) to communicate its *revolutionary* products (such as the *Trittico)* worldwide. Digitalization is the tool used to create a connection with clients, final customers: they do not just get the possibility to be connect with the company, but they can also create a network among themselves. In this process, two peculiar elements were the digital corner in the ice-cream store and the creation of *Trittico community* (accompanied by other specific community network applications). Moreover, these elements give the company the possibility to create new revenue streams (like those coming from the selling of recipes online) thanks the combination of products and services.

Through the use of digital systems, Bravo Spa's business model changed: in a first phase, they were important to develop marketing campaigns and to increase machines sale, but today it also changed the sources of income (Giuseppe Bravo, CEO of Bravo).
It is interesting to see how in all Italian cases cited above, the digitalization enabled the addiction of extra-services to the products.

Peculiar is **FiloBlu**, the native digital firm that offers consultant services. In this case, it is possible to observe that thanks its digital services, Better Silver, is an enabler of the digital internationalization strategy for the clients but still needs a connection with the off-line reality. FiloBlu adopted an omnichannel strategy, by putting together the offline and online channel. In fact, thanks to the potential of digital presence of companies and of e-commerce, it is possible to rethink and redesign the physical stores as a starting point of the shopping experience that will finish in the online channel. As a consequence, the physical stores could be reduced in terms of space or be used in an innovative way as Better Silver does.

In order to boost this aspect, FiloBlu developed an intelligent business platform. To become international (through the following of mainly international customers), the company decided to open subsidiaries where there is the need to be physically present in order to help its customer better.
Thus, even to consulting companies, the time on the market is so small that, in some cases, they need a physical presence to be closer to the market.
These companies above highlight how digitalization can help companies be connected to their customers especially when the target market is in a country abroad.

4.2.3 Market Knowledge through smart products - Export 4.0

DAB Pumps – Texa – Baxi

Get in contact with the final client through 4.0 products.

The analysis of the above-mentioned companies discloses and confirms the new possibilities of companies to obtain market and customer knowledge directly from the customer thanks to IoT-products and smart-products that connect the customer directly to the company. This process can be considered a part of the previous sub-chapter because obtaining market knowledge and connecting customers to the company is a field of marketing. In this case, the enabler is the product itself.

In **DAB pumps**, every product is connected through the Cloud to the company in all the value chain. This fact implicates a total connection to and from every side: from the moment of the installation in the final customer, to the functioning phases of the products, and even during all the production steps. Through this process, the firm obtains several benefits, such as knowing the final customers without establishing a physical direct contact with them, but creating a truly digital connection. The same connection exists with the wholesalers and installer. Another benefit is the possibility to set oneself apart from the competitors inside the market and become the leader thanks to the unique solutions proposed, according to which the companies do not just sell the physical products, but also the relative services (thought this connection and flow of information).

The aim of digitalization is to reduce the distance from everybody (Sandro Stramare, CEO of DWT).

Moreover, the data obtained from every single product becomes the basis to innovate and adapt the production to the specific market.
The exact same logic can be found in **Texa's** strategy. The services connected to its smart-products are a plus-value to the entire value chain, for the customer companies, for the final consumers and also for the company. The common elements used to crate product powered by this kind of service are the IoT, big data, analytics and cloud: they enable the possibility of using remote control especially for to the tele-mobility sector and for the service offered as *Texa care.*

The digital services have always represented an additional element for creating exhaustive products. Because of it, new technologies have risen the quality of the goods (Luciano Marton, General Manager of Texta).

The connection methodology is the same in the case of DAB Pumps. The company exploted every potential advantage from the digital connection of products.
Besides, for **Baxi Spa,** The big data are the basis of a deep market analysis. This data collection did not impact the customer experience negatively, because it is thanks to the data and the whole digital connection that the company can give valuable services.

The data gathered are useful to solve more objective analysis on the market.
Today, just possessing a product is now enough: companies can make a fine product, but it has to be integrated with digital services and applications (Alberto Favero, CEO BDR Italy).

4.3 Conclusion

Digital transformation not only creates an impact in internationalization, but in the companies' sample is possible to see clearly the path through which it creates its restructuring process.
Two are the main areas where digital impacts the internationalization of Italian companies: the relationship with the market (customers), and its capability to operate globally. The transnational strategy is the main choice pursued by digital transformed Italian companies,

where the adaptation capacity of the companies is linked not just to geographically markets but even to every single customer.

The relation, between companies and customers, becomes one-to-one and is allowed by the key role of the industry 4.0 technologies, as: big data, cloud, IoT-products. These technologies enable the creation of an intelligent platform that coordinates and controls every aspect of the process, from product-making to customer relationship management.

CONCLUSION

The contribution that this dissertation wants to bring is not only the confirmation that digitalization has effects in the internationalization process of companies. With the case studies, it is also possible to start answering the questions on how digital transformation impacts the internationalization process.

In the sample that was analyzed, the result obtained from the case studies highlighted the different impact that digital transformation has on the companies.

- Digital transformation eliminates the trade-off of standardization against adaptation. The results of this research agree with literature and consequently with the previous statement. Industry 4.0 allows an efficient implementation of a transnational strategy and, adapting products not only to the local market but even to each customer, so it seems to be possible to take a step forward in regard to the current transnational strategy.
  In regard to the possibility to achieve this result, the emerging digital path is:
  1. Implementing digital systems incentives companies to set **standards**.
  2. The second step is the innovation of production processes. It happens thanks to the standard, and a better analysis of the as is processes. Standard and digital make the concept of Kaizen possible: the creation of standards gives the opportunity to improve both them and the company process.
  3. Product innovation is the third step. This may happens Thanks the implementation of technologies to the products or thanks the innovation production process that allow the development of new products.
  4. Finally, the company is ready to implement the transnational strategy 4.0: glocal centric approach.

- The second "how" concerns the capability of digital technology to allow an efficient use of the Marketing 4.0 or to better say: digital technology gives to the company the opportunity to be connected, to communicate and reach every customer worldwide obtaining information of the local foreign market without implementing foreign direct investment (or going abroad).
  It is possible to split the effect into two paths:
  1. Thanks to the use of connected objects, such as smart-product or IoT-products, companies leverage on the connection of these products to understand who the

customer is, how it use the products, what the customer needs are, to adopt a data-driven approach, and to use the already mentioned knowledge to start the new process of research and development to innovate the product and to better adapt it to the specific customer. Indeed, another element that allows this new modality is the opportunity to associate the physical product with an additional service that generates a surplus value for the final customer and for the entire value chain. The technologies that are used to implement these solutions are: the use of internet-of-things in relation to the product; the collection, the analysis and the use of big data; clouds; and even a CRM software and an intelligent platform.

2. Thanks to digital technology as web, e-commerce, virtual reality and automation marketing, the company can be in contact not just with the actual customer, but even with the potential prospect and it can also do scouting activity to a potential lead. All of this is possible thanks to an efficient process which reduces the cost of the activity that otherwise should be too expensive.

   It also emerged a considerable potential in using digital technologies for physical store. In this way, not only it is possible to optimize the synergies with the online channel, but also to transform the traditional shopping space in a place where companies can receive information about foreign customers like Better Silver is now acting.

These possibilities of obtaining market knowledge and being in contact with the foreign market, remaining physically in the home country, allow to rethink and recalibrate the strategy entry mode to an international market because the disadvantage of several of them can be eliminated or reduced thanks to the digitalization of the company. Indeed, the reconsideration of the entry mode paths described in the third chapter can be confirmed considering the analyzed business case.

Moreover, the achieved results by the companies demonstrate that digital allows international expansion even to small and medium enterprises because there is no the need of possessing a considerable amount of resources or specific dimensions to be successful in the international market.

This dissertation lays the foundation for a future research. Of course, the emerging result from the case studies analysis should be compared to the analysis of a higher sample of companies. Moreover, this sample may contain cases of companies operating in the business-to-customer field, so that it should be possible to investigate on the variables that could affect the way in which digital transformation takes place.

In conclusion, we obtained interesting answers that may help the future research in this field, to offer a more detailed support to companies that want to internationalize with digital tools. Digital transformation is a truly enabler of opportunities. It is the *tool* of the *great restructuring* process that we are living and in which companies should leverage to obtain benefits.

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