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Digital economy and internationalization

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Introduction

The emergence of the digital age or the digitalization is totally changing the fundamentals of the international businesses activity (Alcacer et al., 2016; Banalieva & Dhanaraj, 2019) forcing businesses to review its priorities (Eden, 2016). The fourth industrial revolution, or industry 4.0, has a disruptive nature (Tulder et al., 2019) and is leading firms to radical transformation in their systems, process, management and workforce (Hervé et al.,2020).

Even though the digitalization is radically changing firms and the marketplace, creating a new social paradigm, there are relatively few studies conducted to explain the impact of these technologies into the internationalization process (Hannibal&Knight, 2018; Brouthers et al.,2018; Tulder et al., 2019; Hervé et al.,2020).

This thesis consists in four chapters, and through a literature review, aims to explain how the fourth industrial revolution and the emerging technologies have affected the internationalization process of the firms. The first chapter addresses the issue of internationalization theory, as a way to explain and predict the how the firms' boundaries expand (Buckley&Casson, 1976). There is a wide literature about the drivers of internationalization (Hymer, 1976; Williams,1992; Alexander,1995; Vida et al.,2000; Moore et al. , 2000; Hollesen, 2001; Czinkota t al., 2002; Johnson & Turner, 2003; Etemand, 2004; Wrigley et al.,2005 Hutchinson et al. 2006, 2007); entry modes and models of internationalization from the traditional incremental models, to the born global firms (Johanson & Vahlne,1977; Oviatt & McDougall, 1995; Knight and Cavusgil, 1996; Knight et al., 2003; Chetty and Campbell-Hunt, 2003; Knight and Cavusgil, 2004; Rialp and Knight, 2005; Scott-Kennel, 2013) and internationalization strategies (Levitt, 1983; Douglas & Craig, 1986; Yip et al., 1988; Jain, 1989; Douglas & Vraige, 1995; Keegan & Green,1999; Keegan & Schlegelmich, 2001; Hollensen, 2001; Zou & Cavusgli, 2002; Theodosiou & Leonidou, 2003; Doole & Lowe, 2004; Onkvisit & Shaw, 2004; Shaw, 2004; Ansah, 2016; Chung, 2007; Vrontis et al., 2009; Tan & Sousa, 2013; Wei & Yazdanifard,2014; Ansah, 2016).

The second chapter addresses the issue of the digital economy, as the fourth industrial revolution taking place right now. Digitalization is entirely transforming the firms' production process, products/services, practices into data package, internet compatible, which can be created, stored and transferred in bits and bytes (Chen et al., 2018). In the first section an historical background of the industrial revolution is presented, in the following section the concept of industry 4.0 is explained (Kagermann et al., 2013; Hermann et al., 2015; Liao et al., 2017; Lu, 2017; Ghobakhloo, 2018), its drivers (Kelker, 2011; Westkämper, 2013; Kagermann et al., 2013; Clark, 2015; Bartodziej, 2017 ; Jadhav & Mahadeokar , 2019) and its key technologies: *IoT* (Giusto, 2010; Jadhav & Mahadeokar , 2019) ; *Cloud Computing* (Rüßmann, et al., 2015); *Big Data Analytics* (Grantz & Reinsel, 2012 ; Davis, 2014; Jadhav & Mahadeokar , 2019); *Augmented Reality* (Friedrich et al., 2002; Segovia et al., 2005; Rüßmann, et al., 2015); *Machine-to-Machine communication* (Chen and Li, 2012; Igarashi et al., 2012; Verma et al., 2016); *Robotics* (Rüßmann, et al., 2015; Wittenberg 2015; Wang et al., 2016; Jadhav & Mahadeokar , 2019); *Additive Manufacturing* (Gebhardt, 2012; Gabu, 2015; Rüßmann, et al., 2015; Satoglu et al., 2018 ; Jadhav & Mahadeokar , 2019); *Cyber Security* (Rüßmann, et al., 2015; Jadhav & Mahadeokar , 2019). In the following section are presented core concepts of industry 4.0, like smart factory, smart products, smart services, smart logistics and their actual level of implementation (Kagermann et al., 2013; Wang et al., 2016; Dalenogare et al., 2018; Frank & Ayala, 2019). The other section in chapter two address the Big Data Chain to explain how data flow can create value, and how to exploit this value (Curry et al.,2014; Faroukhi et al., 2020). The last section addresses the ongoing global pandemic of Covid-19, how industry 4.0 is helping to reduce its negative effects, also which are the strength, weakness, opportunities and challenges in its implementation.

In the third chapter is addressed the issue of internationalization in the digital economy. How the digitalization is changing the internationalization process, by reducing costs (Brouthers et al.,2016) improving interactions between stakeholders (Nabistan, 2017) , accelerating knowledge creation and exchange (Foss & Pedersen, 2004) and dematerializing borders (Tiessen et al., 2001). Digitalization is also creating new streams of value based on the big data and big data analytics. (Urbinati et al., 2019). BDA (Big Data and Analytics) is a strategic asset to improve business process and outcomes (Gopalkrishnan et al., 2012).

In the last chapter are presented several attempts made by organization like UNCTAD, OECD, and Eurostat to measure the economic value of the digital economy, and the difficulties to secure the necessary data to do so.

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CHAPTER 1: INTERNATIONALIZATION PROCESS

The internationalization process is a topic that has generated much interest among researches and there is a wide literature about the drivers, entry modes and strategies during the different phases of internationalization process like: initial interest, entry, exploration and exploitation of foreign markets (Andersen, 1993). Chapter 1 presents a literature review of the internationalization process and is organized as following. In the first section we present the different drivers of internationalization process, in the following section the different modes of entry to new markets, or the models of internationalization, and in the last section we present the different strategies of internationalization.

1.1 INTERNATIONALIZATION DRIVERS

There is a wide literature regarding the drivers of internationalization, and a wide range of factors that drive the internationalization process has been identified by different authors and researchers. According to Dunning (1994) and more recently to Johnson & Turner (2003) the main driver in the internationalization process is to take advantage of resource based, market and strategy seeking, and efficiency seeking factors. To Hymer (1976) the main driver to internationalization is to take advantage of imperfections in the financial markets. Alexander (1990) and later Williams (1992) underline the importanc of factors like: market size, growth, niche opportunities and the uniqueness of the retail offer. Vida et al., (2000) argue that the most significant driving forces in internationalization are: comparative advantage of retailer, international knowledge and management attitude, experience and mindset. To Quinn (1999) the main drivers are the overseas market size, niche opportunities and the economic prosperity. According to Moore et al. (2000) and Wrigley et al. (2005) for fashion retailers, is the brand uniqueness and desirability that can drive international process. Fashion brands partially internationalize "to complement and enhance the domestic and foreign brand propositions as part of an integrated international marketing strategy" (Wrigley et al., 2005, p. 540). To Hutchinson et al. (2006, 2007) brand identity, personality of the founder and changes in ownership are the driving forces of internationalization. The personal characteristics and experience of the founder (also manager) of the firm and his global vision can be a main driving force to internationalize; but also a change in ownership followed by an injection of additional found, experience and knowledge can facilitate the internationalization (Hutchinson et al., 2006).

Authors not only have individualized the factors beyond the internationalization process, but also have made attempts to categorize them. Alexander (1997) categorizes them as push and pull, proactive and reactive motivations (Wrigley et al., 2005) and internal and external drivers (Hutchinson et al., 2007; Vida & Fairhurst, 1998).

According to Alexander (1995) forces beyond the internationalization process can be categorized as pull and push factors, Etemand (2004) suggests a new additional force that is an interaction of both push and pull factors. This classification is made based on who initiates the internationalization process. Push factors are internal drivers, or forces inside the firm, pull factors are external ore environmental drivers (outside the firm), while the interactive push and pull factors are mediating forces. A more detailed presentation of these forces is made in the table 1.

Pushing forces	**Pulling forces**	**Interactive Pushing-pulling forces**
managerial characteristics	liberation of international markets	industry characteriscits and drivers
economies of operation	advances in information and communication transportation technologies	SMEs need for financial resources
competiotin and strategy characteristics	attraction and resources of partners	the dynamics of learning organizations
D&D, innovation and technological change	attraction of serving current buyers' and suppliers' international needs	leveraging capabilities, products and resources
high-technology products and markets characteristics		internationalized needs of customers and suppliers
strategies logic of international operations		

Table 1: Push, pull and interactive push-pull forces as internationalization drivers (Etemad, 2004)

Another way to categorize the internationalization drivers is as proactive and reactive, referring respectively to the aggressive or passive behavior of firms in the internationalization process (Czinkota et al., 2002; Hollesen, 2001). A detaild presentation of these forces is made in table 2.

Authors	Proactive reasons	Reactive reasons
Hollensen, (2001)	profit and growth goals	competitive pressures
	managerial urge	small and saturated domestic market
	technology competence	overproduction capacity
	unique product	unsolicited foreign orders
	foreign market opposrtunities	extend sales of seasonal products
	market infomration	proximity to international customers
	economies of scale	psychological distance
	tax benefits	excess capacity
Czinkota et al., (2002)	managerial urge	declining domestic sales
	profit goal, growth	small home market
	economies of scale	riesk diversification
	marketing advantages	extended sales of seasonal products
	exclusive market information	
	unique product	
	advanced technology	
	foreign market opportunities	
	change agnets	

Table 2: Reasons to internationalize (Czinkota et al.,2002; Hollensen, 2001)

Internal and external classification is based on the condition inside the firm and the condition outside the firm, more precisely to the domestic and foreign market. According to the internal external classification of the driving forces of internationalization, internal factors include: company resources, available production capacity, organizational culture, managerial mindset, company comparative advantage etc., while the external factors include: economic, social, political and cultural conditions of both domestic and foreign markets, competitor activities etc. (Alexander, 1997; Alexander and Myers, 2000; Hollander, 1970; Moore et al., 2000; Quinn, 1999; Salmon and Tordjman, 1989; Treadgold, 1988; 1990; Vida and Fairhurst, 1998; Williams, 1992).

On a recent publication of OECD (2009), on the barriers and motivation of internationalization for SMEs, four main drivers are presented: growth, knowledge related, network/social ties, domestic / regional markets forces, as shortly described below. The possibility to grow in other markets and to increase profits by exploring foreign markets were identified by several studies as an important driver of internationalization. Orser et al. (2008) in a study of Canadian firm argues that owners with growth intention were likely to export more compared to those who didn't have the growth ambition. Knowledge related motives are factors that push and pull firms into the international market. Managerial accumulated experience and knowledge about the international markets, R&D investments, unique products/technology/know-how and innovation capabilities can "push" the retailers to internationalize. While the missing knowledge assets, may pull SMEs in the foreign markets to obtain it. Another motive for firm's internationalization process is the membership in a network or the "social ties" of the firm. Lopez (2007) in its study found that firms from different regions that have different conditions, incentives to export and infrastructure have significant differences in their exports.

1.2 MODELS OF INTERNATIONALIZATION

In the literature we can identify two different approaches to model of internationalization the "traditional" and the "emergent" models (Scott-Kennel, 2013). The first approach, dates back into the 1970s and argues that firms follow an evolutionary, incremental approach to internationalization, starting with exports to countries physically close, and then expanding to more distant countries as they gain more and more knowledge about international markets (Johanson & Vahlne, 1977). The Uppsala model describers step by step the activities undertaken by the firm in the internationalization process, from the initial stage which is exporting to physically close markets to the last one owing a production facilities to the foreign market (Johanson & Vahlne, 1977.)
In contrast with the "traditional" models, the "emergent" models present the phenomena of the so called global firms, which are firms that from their inception grow into the international market (Chetty and Campbell-Hunt, 2003; Knight and Cavusgil, 1996). The so called "global start-ups" (Oviatt and McDougall, 1995), "early internationalizing firms" (Rialp et al., 2005), "international new ventures" (Oviatt and McDougall, 1994; 1997), and "born globals"

(Knight and Cavusgil, 2004), are firms that “leap-frog” the sequential stages predicted by the traditional models of internationalization, and simultaneous entry into more than one, and also psychically-distant markets, from their inception they are focusen on the international rather than domestic market (Knight et al., 2003; Knight and Cavusgil, 1996).

Except the Uppsala and Born global models there also other models which try to explain the internationalization path of the firms, based on different point of views. In the following section we will shortly present some on those models.

1.2.1 The Uppsala Internationalization Model (U-M)

The Uppsala model is a progressive and dynamic model developed in Sweden in the 1970s by the researchers of the University of Uppsala (Johanson & Wiedersheim-Paul, 1975; Johansone &Vahlne, 1977) based on the observation of Swedish companies internationalization process. The model is based on the assumption that “internationalization is the product of a series of incremental decisions”, Johanson and Vahlne (1977, p. 23), based on the experiential knowledge (the knowledge acquired during their internationalization operations).

According to the Uppsala model companies first develop their domestic market , and then gradually increment their presence and expand their activities in the foreign markets, as their learn and acquire more and more information and knowledge on that market (Johansone &Vahlne, 1977).

The Uppsala internationalization Process Model is based on the assumption that the main obstacle in the internationalization process of the companies is the lack of knowledge about the foreign markets, due to both geographical and cultural distance of the markets (Johanson & Wiedersheim-Paul, 1975; Johansone &Vahlne, 1977).

The authors distinguish four different stages of entering to a foreign market:

Stage 1: No regular export activities - the company may export in sporadic way

Stage 2: Export via independent representatives – via agents

Stage 3: Establishment of an overseas sale subsidiary

Stage 4: Overseas production/manufacturing units

Figure 1, illustrates the original representation of the Uppsala Internationalization Process Model, as a dynamic model, where market knowledge leads to market commitment and market commitment leads to market knowledge, and so on.

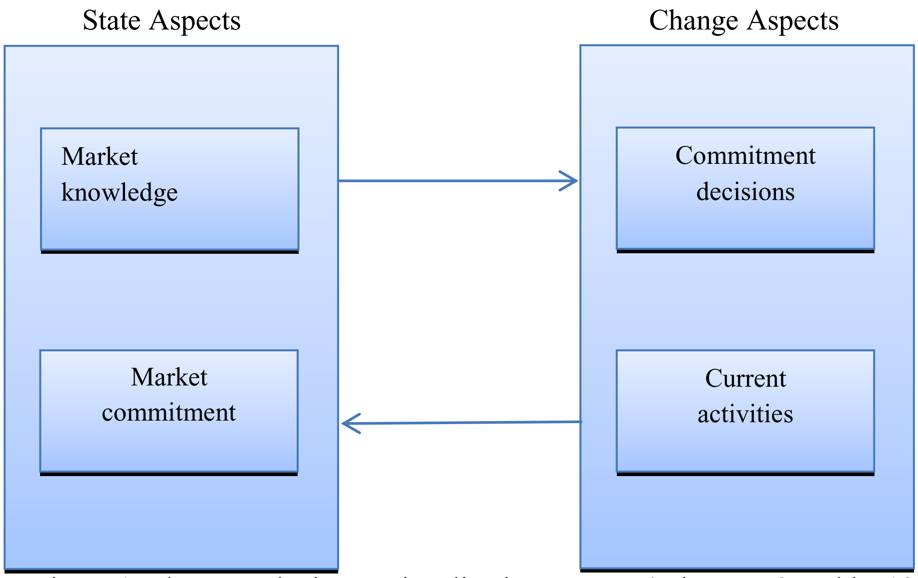


Figure 1: The Uppsala internationalization Process (Johanson & Vahle, 1977).

When a firm enters in a foreign market, it gradually will accumulate knowledge on that market, the increased experiential knowledge reduces the "the uncertainty about various aspects of the market so that some activities, previously rejected as too risky, begin to fall within acceptable levels of risk, and the firm is able to implement a change of state by progressing to a higher level of commitment" Dow et al., (2018, p.4).

Since it first was published in 1970s, the world has changed, the development of new technologies and the globalization of markets changed the timing and process of internationalization (Johansone &Vahlne, 2003), so new models of internationalization were necessary to meet those changes. In 2009 Johansone &Vahlne, introduced the network-based model of internationalization, where the main obstacle to enter a new market is no longer the physical and cultural differences between markets, but the liability of outsidership and foreignness. When a firm is connected to other units and entities, its part of a network, so it's an insider, when the firm doesn't belong to any network it's considered an outsider, and will suffer the liability out outsidership and foreignness (Johanson & Vahlne, 2009). According to the revised Uppsala model, the internationalization process depends on firm's relationships and networks (Karimibabak &Sinclair, 2011). The development of relationships based on knowledge, trust and commitment it's the foundation of the internationalization (Johanson &

Vahlne, 2009). But, as Karimibabak & Sinclair (2011) suggest insidership is a necessary but insufficient variable in the internationalization process.

1.2.2 The life cycle model

The life cycle model was introduced by Vernon (1996) to explain the product cycle on the international market. The model suggests that the internationalization process depends on the life cycle of the products; the product goes from innovation to standardization. New and innovative products are assumed to be produced in advanced countries, with high income and advanced technology, to be later exported in other high and medium income countries, where customers have similar preferences with the home country. The next step is the shift of production in countries with lower production costs. In many cases the product can be exported back in the home country where it was originally produced, while the home country may be developing a new and advanced version of it. More specifically Vernon (1996) identifies three stages in the product life cycle: new product, mature product and standardized product.

Stage 1: New product

New and innovative products are firstly are designed, developed and marketed in high income countries like the USA, which are assumed to have the advanced technology and more disposal income to use on the development of new and innovative products. Latter, as the sales increase, products are exported in other advanced countries, like Europe where customers have similar preferences.

Stage 2: Mature product

When the product and the necessary technology of production have become stable enough and the demand in other high income and middle income courtiers has grown, it is more profitable to produce the product locally, to lower the production costs. Different production agreements can be made between the innovative firm and the local producer like FDI, technology import, technology licensing trade etc.

Stage 3: Standards product

In the third stage the production process becomes routine, and involves unskilled labor and the competition intensifies the production is shifts in low- wage developing countries.

1.2.3 The transaction costs

The transaction costs theory was firstly introduced by Coase in the (1937) as a reaction to the neoclassical approach to the firm's optimal size (EnANPAD, 2010) and used it to predict when certain operations should be performed inside the firms or into the market. Specifically Coase argues that "a firm will tend to expand until the costs of organizing an extra transaction within the firm will become equal to the costs of carrying out the same transaction by means of an exchange on the open market" (Coase, 1937, p. 395). Williamson (1985) further developed the TCT and was the first author to discuss the determinants of transaction costs. To Williamson (1985) transaction costs are the costs arising from the imperfection of the markets and the lack of information, are "frictions" between the seller and the buyer. More specifically are costs of "drafting, negotiating and safeguarding ant exchange or transaction" (Williamson, 1985; p20).

Subsequently other authors have created a new trend on the transaction costs, describing the firm under e new perspective based on the organizational terms rather than production functions (neoclassical view) (Macher & Richman, 2008). The transaction cost theory has been used also to explain the entry mode on foreign markets (Brouthers & Brouthers, 2003; Delios & Beamish, 1999; Williamson, 1985) and governance structure of the supply chain from a global perspective (Bremen et al., 2010).

Firms when expanding abroad adopt a certain organizational structure- market non-equity modes or hierarchy equity mode- based on how efficient it is compared to the other (Williamson,1985) and also "select entry modes that balances the advantages of integration with the additional costs of control" (Brouthers & Nakos, 2004, p. 231).

Williamson (1985) identified three dimensions of transaction costs, related to the entry mode selection: asset specificity, uncertainty and frequency. Asset specificity refers to the asset the firm uses to complete a specific task, and that may lose value in another use (Williamson, 1985; Klein et al., 1990). Regarding the asset specificity the firm will face protection and switching costs. When the firm as a low asset specificity they will face lower costs on protection, because it involves available knowledge and/or technology, so a knowledge/technology where the competitors already have access to, and there is no need to protect it (Williamson & Ouchi, 1981; Brothers & Nakos, 2004). Also the switching costs - which are the costs arising when a firms changes its agents –are low because the knowledge and/or technology involved is commonly available (Erramilli & Rao, 1993). On contrary when uses high asset specificity when entering a new market it will face higher protection and switching costs (Erramilli & Rao, 1993). When a firm has a unique technology and know how it will face extra costs to protect his technology from competitors (Klein, 1989), and will also face higher switching costs (Klein et al., 1990) because it requires the training of the new agent but also the loss of the previous agent, who had access to the proprietary knowledge, who can become a competitor (Anderson & Gatignon 1986). So in the case of low asset specificity, firms tend to use market based, non-equity modes of entry while in the case of high asset specificity the firm tend to prefer hierarchy equity modes of entry (Anderson & Gatignon 1986; Erramilli & Rao, 1993).

Uncertainty relates to behavioral and environmental uncertainty. The behavioral uncertainty relates to the not always rational human behavior (Williamson 1985) and the opportunistic behavior involving distortion of information, cheating and other dishonest behaviors (Williamson, 1985). To control these types of uncertainty firms may use the internal control (Klein et al., 1990; Williamson 1985). Studies on this filed have concluded that firms with international experience have stronger internal control mechanisms, and use them to reduce the behavioral uncertainty and preferring the equity mode of entry (Delios & Beamish, 1999; Hennart, 1991). When a firm doesn't have such mechanisms to reduce the behavioral uncertainty it prefers the non-equity modes of entry (Gatigmom & Andesron, 1988). Enviromental uncertainty refers to the risks and cost associated with the host country, like political and legal risks (Williamson, 1985; Erramilli & Rao, 1993). In countries with high environmental uncertainty, companies tend to select non-equity entry modes, which enable the firm the necessary flexibility to adapt to those changes (Brothers & Nakos, 2004). While in countries with low environmental uncertainty firms tend to use equity entry modes (Anderson, 1988).

Another important dimension to the transactional costs is the frequency of the transactions, or the volume and the temporal spread of the transactions (Willimason, 1985). The frequency of transactions ranges from occasional to recurrent. For occasional transactions no alternative governance structures are necessary, while for frequent ones alternative governance structures may be needed (EnANPAD, 2010).

1.2.4 International business network

The network model of internationalization was firstly introduced by Johansone & Mattsson in the 1980s based on the idea that network members have a common interest to develop relationships because mutual benefits. Relationship inside the network act as a bridge that links various firms in different countries (Johansone & Vahlne, 1990). Firms part of the network depend on each other resources and based on their needs they can modify their structure by making new relationships or breaking old ones (Johanson & Mattsson, 1988).

The internationalization process, in the international business network, can be defined as the establishment, maintenance and the development of relations within the network in the foreign markets (Johanson & Mattsson, 1988; Turnbull &Valla 1986). The internationalization process starts when the firm creates relationships with another firm that is member of a network (Johanson & Mattsson, 1988) and once the firm becomes member of the network, the number of its relationships within the network increases and also the relationships get stronger, by helping the company to expand more (Johanson & Mattsson, 1988). In the international business network the cooperation is more efficient than competition; firms can save money and time by accessing each other experience (Nooshabadi & Özşahin, 2017).

According to Axelsson & Johanson (1992) there are three ways to become international in the network model:

- International extension: establishing new relationships on foreign markets
- International penetration: developing its current network position in countries where it already operates
- International integration: increasing the coordination of positions occupied in different country based networks

According to Ojala (2009) relationships in the network can be divided based on their formality as: formal, informal and intermediary; and the development of these relationships can be active or passive. It's called active networking when the relationship is initiated by the seller, and when the relationship is initiated by the customer, supplier or intermediate it's called passive networking (Johanson & Mattsson, 1988). Ties between firms in the network can be strong or weak depending on closeness of relationship and interactions between firms (Nooshabadi & Özşahin, 2017). However ties in the network are not static, and they can go from strong to weak, or otherwise (Granovetter, 1973).

Johansone and Mattsson's further contribution on the international business network, consist on the classification of four different situations of internationalization of firms: early starter, late starter, lonely international and international among others. Table 3 represents the four cases of internationalization depending on the firm's and market degree of internationalization.

Degree of internationalization of the market

Degree of internalization of the firm	Low	High
	The early starter	The late starter
	The lonely international	The international among others

Table 3: Four cases of internationalization of a firm (Johanson & Mattson, 1988)

The early starter: both the company and the market are in a low stage of internationalization. In this situation the market participants in the domestic and foreign markets have no significant relationships, this is the case of the firms in the early 20th century (Johanson & Mattsson, 1988). There is a lack of relationships between firms and lack of knowledge about the foreign markets. To enter the foreign market the company has to develop a gradual and slow presence in the foreign market(as described in the Uppsala model) via agents , sales subsidiary and then production.

The lonely international: the firm already has a position in the international market and the necessary experience and knowledge for operating in the international markets (Nooshabadi & Özşahin, 2017) but the coordination and adjustment of resources becomes harder because the other firms in the production network are not enough globalized (Daszkiewicz & Wach, 2012). The lonely international has the power to control and stimulate the internationalization activities of its production network by connecting them to each other (Hollensen, 2007).

The late starter: the market environment is highly internationalized while the firm is not. The late starter is in a disadvantageous position compared to its competitors, because of the lack of experiential knowledge (Johanson & Mattsson, 1988) and the best distributors are already linked to the competitors (Hollensen, 2007). At this point small medium enterprises can enter the international market if they are highly specialized in the production network., while the large scale enterprises which are less specialized and flexible than SMEs can enter the international market through acquisition and joint ventures (Mrozek, 2012; Nooshabadi & Özşahin, 2017).

The international among others: both the firms and the market are highly globalized. The firm has the possibility to use its position in one network to create e link with other networks in order create a stronger production network. However the additional internationalization will be marginal penetration and extension (Johanson & Mattsson, 1988).

1.2.5 Born global

Born global are "*entrepreneurial start-ups that, from or near their founding, seek superior international business performance from the application of knowledge-based resources to the sale of outputs in multiple countries* (Knight & Cavusgil ,2004, p. 124); " *new ventures, already from inception, start to allocate resources and sell products on an international arena"*" (Anderson, t al., 2015, p. 26).

The Born global companies were firstly studied by the Rennie (1993) to explain the rapid grow of Australian SMEs presence in the international markets. It was noticed that a considerable amount of Australia export was due to some small new manufacturing companies, that were having a rapid and successful grow in the international market, but hadn't a well-established presence on the domestic market (Rennie, 1993). This new model of internationalization was in contrast with all the previous models and theories, of gradual and incremental internationalization, like the Uppsala Theory (Johanson and Vahlne, 1977).

Since then a number of conceptual and empirical studies were conducted to understand and explain this new internationalization model (Gabrielsson & Kirpalani, 2004; Knight & Cavusgil, 2004; Knight et al., 2004; Madsen & Servais, 1997; Moen, 2002; Oviatt & McDougal, 1994). Many studies were conducted to explain the emergence of the Born Global. The early and accelerated path of internationalization can be attributed to both internal and external factors (Escadon et al., 2019) and firm level and market level factors. Among the external factor we can list the advanced technology and market globalization (Knight & Cavusgil, 2004). In their study Knight and Cavusgil (2004) suggest that the globalization of markets reduces the transaction costs in the internationalization process, first by simplifying the product development and positioning, and by creating alliances and networks in the global market. The authors explain that due to the globalization customer's preference are becoming, homogeneous, so developing and positioning in the market is easier. The advanced technology of information, communication, production and logistic, are also reducing costs and have made the internationalization process *"a more viable and cost-effective option"* (Knight & Cavusgil, 2004 p.125). The internal factors or firm level factors are the founder vision, managerial skills (Hagen& Zucchella, 2014), the innovative culture of the company (Knight & Cavusgil, 2004). Also the missing experience and the lack of organizational knowledge facilitates the internationalization process (Autio et al. 2000).

1.3 INTERNATIONALIZATION STRATEGIES

When a firm decides on entering in an international market, it has to choose between adapting or standardizing their marketing mix (product, price, place and promotion) to the host country. The question what strategy to choose has been an issue of debate since the beginning of 1980s.

Standartization strategy

The main argument beyond the standardization strategy of the marketing mix is the belief that costumers are becoming more and more similar all around the world as a consequence of the advances in communication and technology, they have similar preferences and needs (Levitt, 1983; Jain, 1989). The similar demands and the lowering of barriers in the global markets allow firms to sell standardized products (Zou & Cavusgli, 2002). Wei & Yazdanifard (2014) argue that market are "homogeneous and global in scope and scale" so standardization of the product is a crucial factor to survive and grow in the global market. There are some advantages from the standardization strategy: economies of scale, the presentation of a consistent brand across countries, better coordination and control of international operation (Levitt, 1983; Douglas and Craig, 1986; Yip, Loewe, & Yoshino, 1988).

Adaption strategy

On the other side some authors argue that despite the globalization and advances in communication and technology, there are still some differences between countries, so adaption is necessary to meet all the "unique dimensions" and differences in markets and customers between countries (Vrontis et al., 2009). When a firm goes abroad it has to face factors like culture, climate, law, technology and religion that sometimes can be quite different from the home country (Vrontis et al., 2009).

However the standardization and adaption of the marketing mix is contingency choice, where standardization and adaption are the ends of the same continuum (Theodosiou & Leonidou, 2003). As Keegan & Green (1999) state: "the essence of global marketing is finding the balance between a standardized (extension) approach to the marketing mix and a localized (adaption) approach that is responsive to country or regional differences."(p.28). So the fundamental decision to make when entering a foreign market is to which degree they should adapt and standardize their marketing mix. Some elements of the marketing mix are easier to adapt than others (Doole & Lowe, 2004). Place, promotion and price are easily adapted (Onkvisit & Shaw, 2004) while product is the hardest element to adapt, or the easiest to

standardize (Onkvisit & Shaw, 2004; Hollensen, 2001).
In the following section will present some insights regarding the standardization vs. adaption of all the elements of the marketing mix, product, price, place and promotion. The product is the easiest element of marketing mix to standardize (Hollensen, 2001). Product standardization means that a frim can sell their product into the international market, without making any essential change to it (Onkvisit & Shaw, 2004). Tan & Sousa (2013) argue that the standardization is used more for industrial goods than consumer goods, as less adaption is needed for the industrial ones. However when differences between home and host country are too big to overcome, modifying the product becomes necessary (Douglas & Vraige, 1995), some of the elements that have to be adapted are the name, the design, packaging etc. (Keegan & Green, 1999).
When it comes to price, there are different factors to consider regarding the standardization or adaption. Standardizing the price means to apply the same fixed price in all the targeted markets (Ansah, 2016). The adaption strategy, means to adapt the price of the products to local conditions (Onkvisit & Shaw, 2004). According to Keegan & Schlegelmich (2001) there are several factor that drive price differentiation like: costumer preferences, competitive situation, cost situation, inflation/exchange rates, tariffs and duties; and several other factors that drive the pricing standardization: reduction of trade barrier, decreasing transportation costs, active retailer/grey market/global sourcing, improved communication and information flow, increasing brand globalization/standardization.

The firm has to decide also on their promotional mix or marketing, and the decision to standardize or adapt a promotional mix needs a careful consideration (Ansah, 2016). Standardization of the promotion mix implies applying the same basic communication strategies and advertising message (Keegan & Green, 1999). When adaptation strategy is necessary due to differences in language, religion, laws and media availability (Thoedosiou & Leonidous, 2002), and adaptation of the promotion mix can be different from country to country. To Chung (2007) the adaption of the promotional approach is imperative for firms when entering a diverse cultural environment. Regarding the decision to standardize or adapt the distribution (place) channels, firm should take into account different factors like nature of the market and the product, customers characteristics, purchasing habits and distribution infrastructure (Ansah,2016). According to Onkvisit &Shaw (2004, 2009) it’s difficult to standardize the distribution channels because there different types of distribution channels from country to country and on the marketing mix the place is the element that can be more adapted.

CHAPTER 2: INDUSTRY 4.0

The second chapter addresses the issue of the digital economy, as the fourth industrial revolution taking place right now. Digitalization is entirely transforming the firms' production process, products/services, practices into data package, internet compatible, which can be created, stored and transferred in bits and bytes (Chen et al., 2018). In the first section an historical background of the industrial revolutions is presented, in the following section the concept of industry 4.0 is explained, its drivers, and the key technologies and these technologies are used to revolutionize their products, services, manufacturing process and distribution; and to co-create value with the stakeholders. Than core concepts of the industry 4.0 like smart products/services, smart factory and smart logistics are presented.

2.1 A HISTORICAL BACKGROUND OF INDUSTRIAL REVOLUTIONS

The process of industrialization began at the end of the 18^{th} century, with the first industrial revolution. The industrial revolution has continued with for several hundred years and now we are witness of the fourth industrial revolution, a new age of industrialization. However as Bartodziej (2017) underline there is a debate if industry 4.0 is a revolution or evolution, since it's a transformation that will take several decades and the main elements of the transformation process already exist and will only be further developed. Sendler (2013) argues that since industry 4.0 will cause a paradigm shift in the manufacturing the term revolution is more suitable. To Jacobi & Landherr (2011) industry 4.0 is an ongoing social change toward a post-industrialized, knowledge and information based, service oriented-digital revolution.

The first revolution began in 18th century, and was driven by the development of the stream engine that revolutionized the way good were made, by replacing the manual labor with the first manufacturing processes, mainly in the textile industry. As a result there was a transition from an agricultural society to an industrial one. The main peculiarities of the first industrial revolution were: the formation of the first industrial manufacturing process; distribution through steam transport and start of cast iron production.

The second industrial revolution began in the 20^{th} century and was driven by the transition from steam to electricity. Electricity enabled mass production, and as a result there was higher labor efficiency and new management approaches. There was a transformation of the technical and technological base of industry , a growing role of science in the production, centralization of production, more qualified workforce in the production process, increased quality of products ect.

The third industrial revolution happened on the early 21th century, or the so called the new industrial age – industry 3.0. It was based on the use of electronics and information and communication technologies, and the transition to renewable sources, the use of computers in manufacturing, automatizations and digital additive production (Kupriyanovsky et al. 2016). There was a "deep transformations of systems, structures, institutes, relations, and technologies, which change the means, mechanisms, and content of people's organizing production, exchange, consumption, training, communication, and leisure" (Popkova & Ragulina, 2019). Financial system become global, new norms and standards of production based a scientific inventions generated by both public and private organizations. It's characterized by the digitalization and increased automatization enabled by the implementation of electronics and information technology. Also the productivity of manufacturing process increased by introducing the flexible serial production lines. The third industrial revolution can also be attributed to the new class of entrepreneurs, with very specific characteristics like: global vison, well educated, with communicative skill, polyglot, apolitical. They use the achievements of science in the allocation of production till the concept of "country of origin" has been cancelled, since one product is designed, produced and supervised by people in different part of the world, both in developed and developing countries. Also they outsource services in order to minimize the tax load.

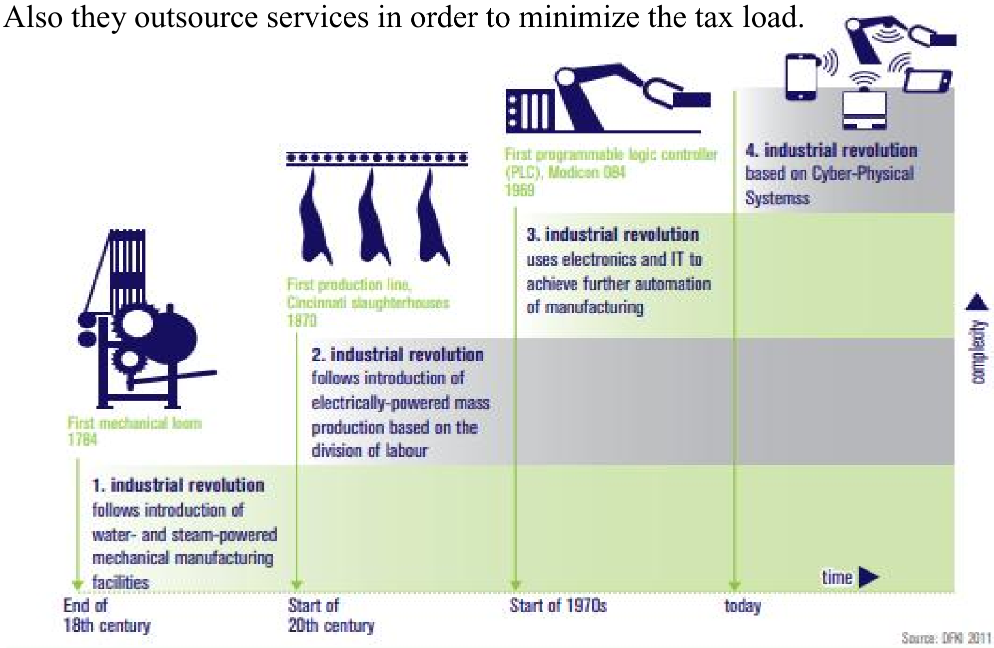


Figure 2: The four stages of industrial revolution (ACATECH, 2013)

The Fourth Industrial Revolution or Industry 4.0 is the result of integration of cyber physical systems (CPS) and Internet of Things (IoT), in the production processes. All stages of production are based in built-in digital technology that allows interacting with other objects and humans. Production capacities are adapting to new needs of customers, where the outcome is the customization, and each product will be produced for an individual costumer (ACATECH, 2013). Industry 4.0 is based on the idea that machines, assembly lines, and whole factories will work as a unified network. The purpose is to create a production system that can change production models if necessary (Popkova & Ragulina, 2019). The term of Industry 4.0 emerged in Germany in 2011, as part of a project launched to increase the competitiveness of its industry (Lu et al. 2016).

And according to the surveys, most industrial companies in Germany are involved into the development of this new business concept.

2.2 INDUSTRY 4.0

Industry 4.0 has been defined by authors based on different perspectives. According to Hermann et al., (2015) Industry 4.0 is the industrial revolution taking place now (Hermann et al., 2015), is a new manufacturing paradigm (Ghobakhloo, 2018; Kagermann et al., 2013) that is based on automation, digitization, and interconnection (Liao et al., 2017). It connects people, machines, objects, information, communication technology system (Hermann et al., 2015) to create value (Ghobakhloo, 2018; Kagermann et al., 2013). According to Lu (2017) Industry 4.0 is "an integrated, adapted, optimized, service-oriented, and interoperable manufacturing process which is correlated with algorithms, big data, and high technologies" (p.3). The term Industry 4.0 was firstly introduced by the German government in 2011, as part of a strategic plan to secure the competitive position of technological innovation of German industry and FU (Communication Promoters Group of the Industry-Science Research Alliance) and Acatech (National Academy of Science and Engineering) provided the following definition of Industry 4.0: "*the fourth industrial revolution, a new level of organization and control of whole value chains over the entire lifecycle of products. This cycle includes the fulfillment of individualized customer requirements and extents itself from idea, real order, development, and manufacturing, delivery to the customer and the recycling process with the involved services. The basis for the development is formed by the availability of all necessary information in real-time through interconnection of all instances, which are involved in value creation as well as through the ability to derive the best possible value stream based on the resulting data.*

Through the connection of people, objects and systems, dynamic, real-time optimized, self-organizing, crosscompany value networks will evolve, which can be optimized based on different criteria such as costs, availability and resource efficiency" (FU, 2011, p.1) ; "*technical integration of CPS into manufacturing and logistics and the use of the Internet of Things and Services in industrial processes. This will have implications for value creation, business models, downstream services and work organization*" (Acatech, 2013, p. 14).

Even though scholars have provided different definition for industry 4.0, so far there is not a clear and unanimous definition adopted for it. According to Lu (2017) it can be defined as " an integrated, adapted, optimized, service-oriented, and interoperable manufacturing process which is correlate with algorithms, big data, and high technologies" (p.3).

2.2.1 Drivers of Industry 4.0

The manufacturing industry is currently undergoing many changes, as a response to the changes in the market demand and the technology. We will group the drivers of industry 4.0 in three main groups: changes in the market demand, new available technologies and government policies.

- **Market changes**

Westkämper (2013) identifies mass customization, volatility and energy resources, as some of the global development influencing the market demand, and that will substantially change the manufacturing industry.

Mass customization - A recent trend is the desire of customer for highly customized products. Da Silveira et al., (2001) define customization as a system that delivers a wide range of products designed to meet specific needs of individual customers. Customized products offer to customers a more personal experience (Fenech & Perkins, 2015) with added value compared to the standard offerings (Pallant et al., 2020). Now day customization is part of many firms' strategic planes (Pallant et al., 2020) and many brands have created computer-stimulated environments where customers can customize their own products (Clark, 2015). Franke et al., (2010) recognize the "I design it myself" bias, where the customer perceives an added value for the self-design products that make the consumers feel as the creators of the product. The customer actively takes part in the development and manufacturing process. Thus is fundamental to adapt the manufacturing processes and technologies to this development (Kelker, 2011).

Nike by You

Nike by you is the new virtual design area, launched by Nike in their 20th anniversary that allows the sneakers personalization. It was the right response to the changing customer mindset, and enables a personalized and collaborative approach. Nike by you – celebrates the customers' individuality, and empowers expression through collaboration. And generally the customized product arrives in 2 up to 5 weeks.

Source: www.nike.com

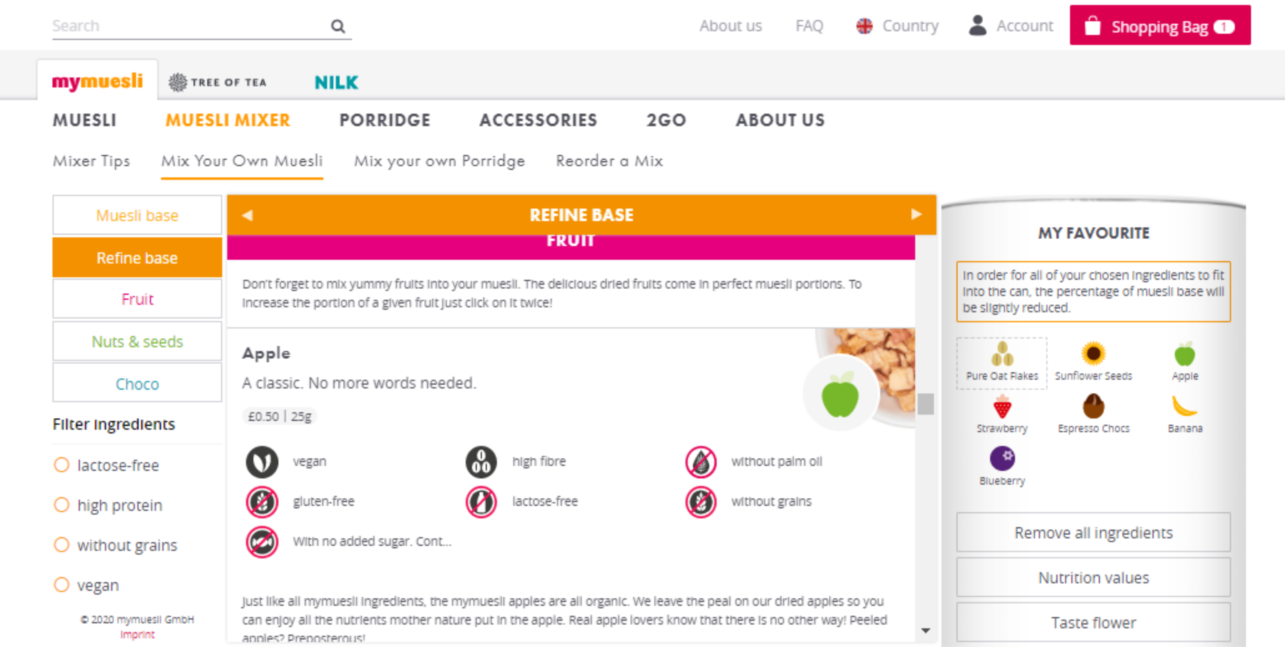
Lancôme - Le Teint Particulier

Lancôme introduced Le Teint Particulier, an innovative beauty experience that creates a unique customized formula. By using the Lancôme foundation shade finder, (a patented technology of Lancôme) you can customize the foundation by shade, coverage and skin type. A beauty expert will be there to help you on coverage, finish and hydration needs of your skin. in a few minutes your personalized foundation is ready, and you also will have a personalized bottle with your name and unique shade number on it.

(Source: https://www.lancome.co.uk/discover-lancome/le-teint-particulier/)

Mymuesli

Beside the customization of apparel products, furniture, cars, phone cases etc., you can also customize your muesli. Mymuesli is an online retailer that allows you to mix and to create a custom cereal based on your tastes and nutrition needs. There are more than 80 certified organic ingredients for you to choose!



Source: https://uk.mymuesli.com/

Volatility – sudden and unexpected changes of marketplace -From the micro and macroeconomic development volatility "describes the relative size of fluctuation of prices, share prices, and exchange rates, interest rate as well as the entire markets within a certain time horizon" (Bartodziej, 2017, p. 28). Firms have to invest in flexible structures, processes, manufacturing systems and products in order to deal with the short cycled and fluctuating markets (Bartodziej, 2017, p. 28).

Energy resources -Bauernhansl (2014) predicts that in 2050 the overall demand for energy will be doubled, so the way society is using the natural resources of energy has to change in order to preserve them. Kagermann et al., (2013) argue that the efficiency and productivity of energy resources should be included into the strategic goals of the firms. The manufacturing industry, particularly, is responsible for the conservation of energy resources since it's the main energy consumer (Bartodziej, 2017, p. 28).

- **New available technologies**

According to Jadhav & Mahadeokar (2019), Industry 4.0 is powered by technologies like internet of things (IoT), cloud computing, big data analytics, augmented reality (AR), machine-to-machine communication (M2M), robotics, additive manufacturing, and cyber security. Some of these technologies already have an industrial use, while others not. Manufactures should choose the "right mix" of technologies in order to maximize returns on investments (Jadhav & Mahadeokar , 2019). In the following we will shortly describe these technologies.

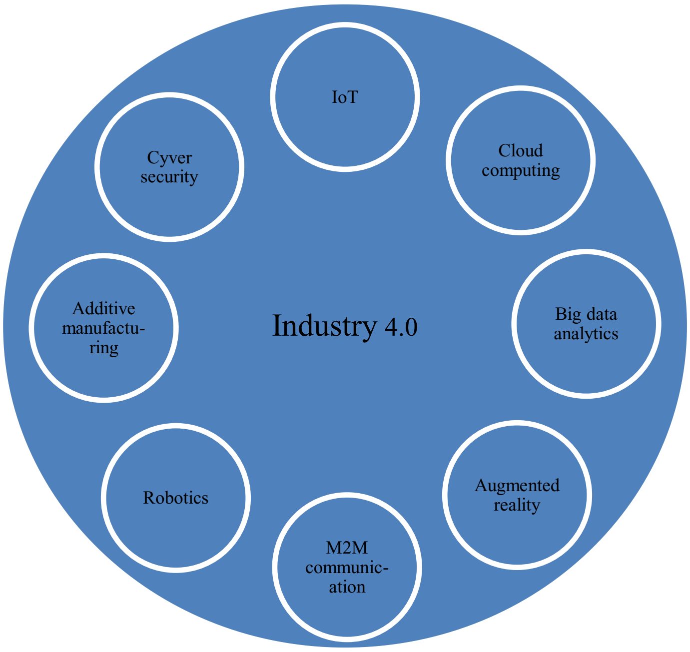


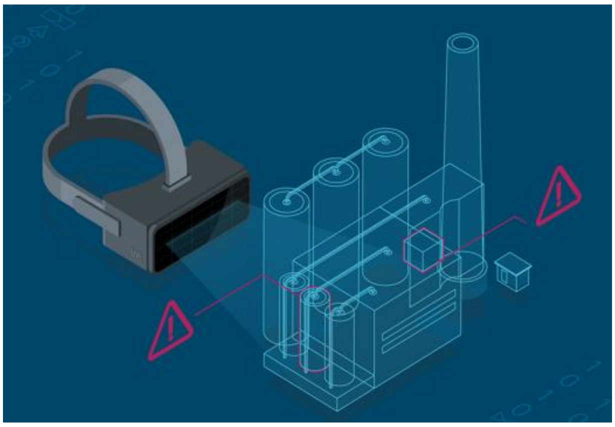
Figure 3 : Key technologies enabling industry 4.0

Internet of Things (IoT): the basic idea behind this technology is the interaction of different things/objects with each other to reach a common goal (Giusto, 2010). IoT will enables the real-time communication between machines, by connecting them over a network (Jadhav & Mahadeokar , 2019). Actually only few manufactures use the IoT in the manufacturing process, one of them is Bosh Rexroth. Products are identifies by a RIDF code, so workstations know which is the next step in the manufacturing process to be performed.

Cloud Computing: The NIST (National Institution of Standards and Technology) definition of cloud computing is "… a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources,…., that can be rapidly provisioned and released with minimal management effort or service provider interaction" (p.3). Cloud computing is being used by companies mostly for analytics application, but a more production related usage of it its expected (Rüßmann, et al., 2015).

Big Data Analytics: "consists of expansive collections of data (large volumes) that are updated quickly and frequently (high velocity) and that exhibit a huge range of different formats and content (wide variety)" (Davis, 2014) that" allow the creation of business value in terms of new products or services" (Grantz & Reinsel, 2012). Big data analytics can support real time decision making (Jadhav & Mahadeokar , 2019).

Augmented Reality (AR): is an innovative form of human-machine interaction (Friedrich et al., 2002) that complements the real world by presenting virtual objects in front of the user, and forth more allows a complete and real time interaction (Segovia et al., 2005). Siemens uses Cosmos Walkinside technology to virtual train plant personnel (Rüßmann, et al., 2015).



Source: https://new.siemens.com/

Machine-to-Machine communication (M2M): is a communication technology where "intelligent devices" communicate with each other to make decisions without being directed by humans (Chen and Li, 2012; Igarashi et al., 2012) for a better cost efficiency and time management (Verma et al., 2016).

Robotics: robots are used in many industries for complex assignment, but robots in industry 4.0 are becoming smarter, more autonomous, flexible and interconnected thanks to artificial intelligence (Rüßmann, et al., 2015). They are expected to have grater capabilities and to help in the automation of manufacturing processes, and improve efficiency (Jadhav & Mahadeokar , 2019). Adaptive robots are useful in manufacturing industry especially in design, manufacturing and assembly phases (Wittenberg 2015). Wang et al., (2016) argue a sub technology of adaptive robots, the co-evolutionary robots, energetically autonomous and have scenario based thinking and reaction focused in working principles. YmMi is a collaborative robot, used in the small parts assembly and combines "people's unique ability to adapt to change with robot's tireless endurance for precise, repetitive tasks". YuMi removes the barriers of collaboration, and enables people and robots work, side –by side on the same tasks.

Source: https://new.abb.com/products/robotics/industrial-robots/irb-14000-yumi)

Additive Manufacturing: was introduced in the 1980s with the term of rapid prototyping and was used to make models and prototypes. Now days it is a manufacturing method almost in all branches of industry like: medicine, cars, aero spacing engineering and art (Gebhardt, 2012).

Additive manufacturing is based in a set of technologies that from digital models, created by computer-aided design (CAD), produces three dimensional objects (Satoglu et al., 2018). A three dimensional object arises, as numerous layers of material are added, the layers are measures in microns and the raw materials can be plastics, polymer, metal or ceramics in a liquid or powder forme (Gabu, 2015). Additive manufacturing enables cost-and-time effective production in small-batches, and improves customization (Rüßmann, et al., 2015; Jadhav & Mahadeokar , 2019). It can design

Cyber Security: with the increasing connectivity in the manufacturing process, also increases the need to protect these communications. Cyber security enables a secure and reliable communication for industrial systems and manufacturing industry(Rüßmann, et al., 2015; Jadhav & Mahadeokar , 2019).

2.3 IMPLEMETING INDUSTRY 4.0

Industry 4.0 enables the interconnection and computerization into the traditional industry (Lu, 2017). The main goals of industry 4.0, according to Shafiq et al., (2015,2016) are IT-enabled mass customization of manufactured porducts; IoT-enabled production in smart factories; automatic and flexible production chain; interconnection of parts, products and machines; track parts and products; apply HMI (human – machine –interaction); also provide new types of services and business models in the value chain. According to Thames & Schaefer (2016) the goals of industry 4.0 are higher levels of efficiency, productivity and automatization.

The core concept of industry 4.0 is the advanced manufacturing, or Smart *Factories* (Kagermann et al., 2013) but also considers the integration of the manufacturing process with the entire product lifecycle and supply chain activities (Wang et al., 2016; Dalenogare et al., 2018).

Frank and Ayala (2019) propose a framework of industry 4.0 technologies, in two layers. The first layer of technologies, or front-end technologies, includes the technologies that enable the transformation of manufacturing activities – *smart factories*, products offering – *smart products*, delivery of raw materials and products – *smart supply chain*, and human work- *smart working*. The second layer of technologies, or base technologies, includes the technologies like IoT, clouds, and big data analytics, that provide the necessary connectivity and intelligence for the first layer (Wang et al.,2016; Frank & Ayala, 2019).

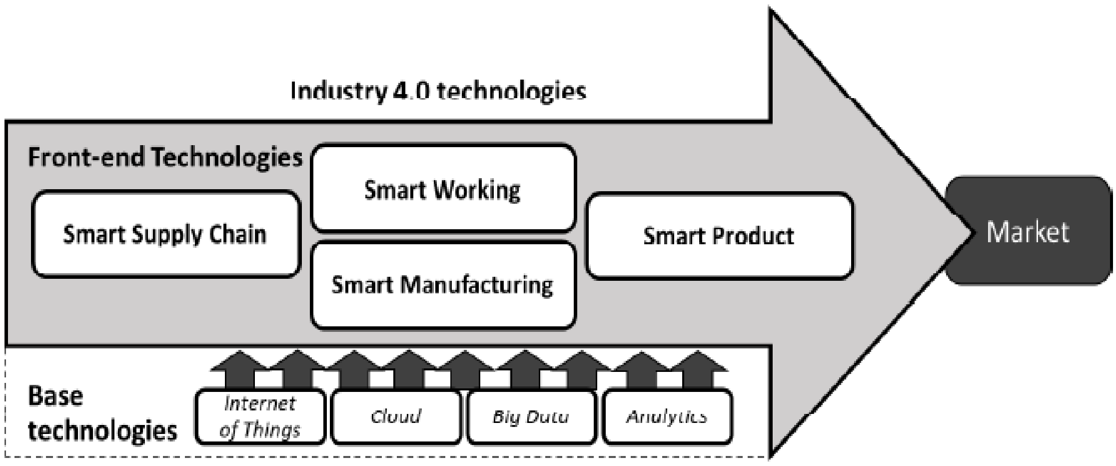


Figure 4 : Theoretical framework of industry 4.0 technologies

2.3.1 Smart factory

The smart factory is a manufacturing environment, supported by intelligent, computer based systems ensuring a continuous flow of production, by using data originating from numerous sensors, to achieve an increased performance and quality (Lucke et al.,2008). There is an autonomous cooperation between the machines needed in the production process that fulfil predefined tasks (Stock & Seliger, 2016; Suginouchi et al.,(2017). The whole system is monitored by a higher entity and its directed by a sophisticated computer program (Lucke et al., 2008; Zuehlke, 2008). The main trait of smart factory is the reconfigurable manufacturing system (Rojko, 2017) that by adapting their hardware and software components can easily adapt to changing requirements on products type and quantity (Korena &Shpitalnib, 2010; Nayak et al., 2015). Machines in smart factory are CPS (cyber-physiacl systems), systems that use physical systems integrated with ICT components, their main trait is the autonomy – the ability to make decisions based on learning algorithms, analytics of real time data, and recorded past behavior (Rojko, 2017).

Wang et al. (2016) presents the production plant as four different layers, respectively the physical, data, cloud & intelligence, and control layer as presented in the figure 5. The first layer – the physical layer- includes all the machines and activities actual taking place to manufacturing environment; the second layer - data layer- incorporates the process of data transfer from the machines to the cloud and vice versa, thought sensors, while software is controlling the type and variety of the data send and received; in the third layer – cloud & intelligent layer- data is stored in the cloud, where it can used in the to make sophisticated analytics; the fourth layer – control layer, where the necessary supervision takes palce (Wang et al., 2016; Heidel et al., 2017; Osterrieder et al., 2020). Factories in industry 4.0 are more intelligent, flexible and dynamic because the manufacturing process is completed with a vast technology (Roblek et a., 2016) that allow high levels of self-optimization and automation (Lu, 2017).

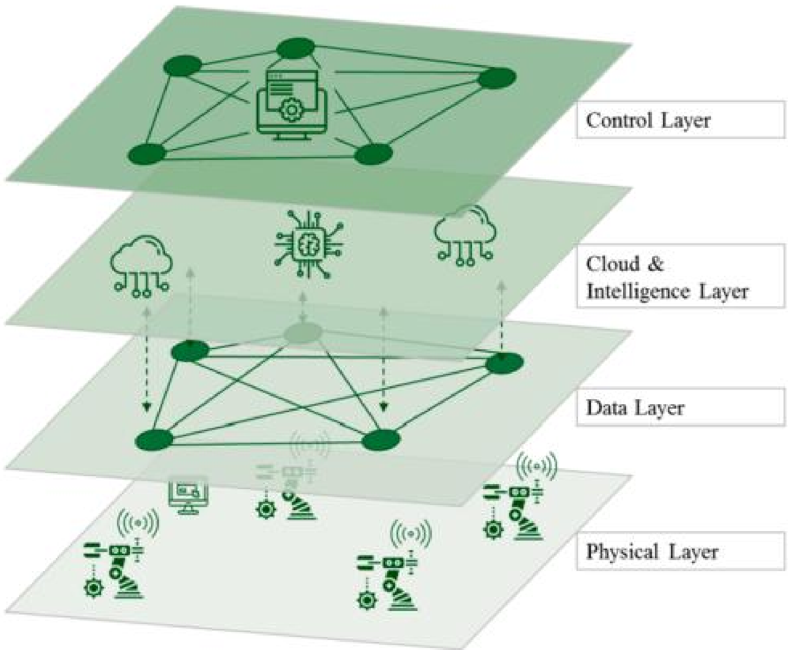


Figure 5 : The four layer smart factory concept (Wang et al., 2016; Heidel et al.,2017)

The technologies used in the smart factory can be divided in six categories, based on their main purposes: Vertical integration, virtualization, automation, traceability, flexibility and energy management (Frank & Ayala, 2019).

Advanced ICT systems are integrated in all levels of the firms to enable the vertical integration in the smart factory, and making decision making process less dependent on humans (Schuh et al., 2017). The digitalization starts from the shop using sensors, actuators and PLC (Bagher & Kao, 2014). The data gather with SCDA is used for production control (Jeschke et al., 2017). At the managerial level, MES obtains the data gathered by SCDA and transmits it to ERP system to provide the production status (Jeschke et al., 2017). So the vertical integration improves the shop floor decision-making and ensures more transaperency and control on the production process (Frank & Ayala, 2019). M2M communication is the ability of machines to communicate and "understand" each –others in the manufacturing process (Gilchrist, 2016), this capability is supported by the virtual commissioning technology (Mortensen & Madsen, 2018). In digital manufacturing, all the data and different parameters that can influence the production are used to simulates operations' processes (Jeschke et al., 2017). Smart factories are also expected to reach an enhanced level of automatization (Kagermann et al., 2013). Collaborative robots, like YuMi previously described, are robots designed to work side by side with humans, to combine the flexibility of human kind to the high precision and non-fatigue of robots (Thoben et al., 2017). Artificial intelligence supports the smart factory also with systems like ERP that predict the long term production and brakes it down to daily orders, based on the data gathered and human restriction (Gilchrist, 2016). Sensors applied in the raw materials and finished products allow the identification and traceability of raw materials and finished products in the factory's warehouse, and optimize the inventory control (Frank & Ayala, 2019) also support the adaptable systems with flexible lines in which machines can "read" through the sensors, the product requirements and perform the necessary actions to manufacture them (Ageles, 2009; Wang et al.,2016). Additive manufacturing promotes a sustainable and customized production, using the 3D printers of digital models (Frank & Ayala, 2019), it's cost effective and has a limiteted usage, since it's not ready to operate in a large-scale of manufacturing (Weller et al., 2015; Frank & Ayala, 2019). The monitoring and improvement of energy efficiency is also part of the smart factory technology (Kagermann et al., 2013) where intensive stages of production are scheduled in times with favorable electricity rates (Gilchrist, 2016; Jeschke et al., 2017).

Vertical integration	• Sensors, actuators and Programmable Logic Controllers (PLC) • Supervisory Control and Data Acquisition (SCADA) • Manufacturing Execution System (MES) • Enterprise Resource Planning (ERP) • Machine-to-machine communication (M2M)
Virtualization	• Virtual commissioning • Simulation of processes (e.g. digital manufacturing) • Artificial Intelligence for predictive maintenance • Artificial Intelligence for planning of production
Automation	• Machine-to-machine communication (M2M) • Robots (collaborative robots) • Automatic nonconformities identification in production
Treceability	• Identification and traceability of raw materials • Identification and traceability of final products
Flexibility	• Additive manufacturing • Flexible and autonomous lines
Energy management	• Energy efficiency monitoring system • Energy efficiency improving system

Table 4 : Smart manufacturing technologies

2.3.2 Smart products / services

With the support of technologies, like sensors and microchips, also products on the fourth industrial revolution are becoming smart (Cao etal., 2015). There are different definitions regarding the smart products in the literature, but a well-defined and generally accepted definition does not exist yet. According to Sabou et al. (2009) a smart product *"is an autonomous object which is designed for selforganized embedding into different environments in the course of its life-cycle and which allows for a natural product-to-human interaction. Smart products are able to proactively approach the user by using sensing, input, and output capabilities of the environment thus being self-, situational-, and context-aware. The related* *knowledge and functionality can be shared by and distributed among multiple smart products and emerges over time."(p.5).*

Key features of smart products are: knowledge, computation, data storage, autonomy, communication and interaction with their environment (Mühlhäuser et al., 2008; Miche et al., 2009; Schmid et al., 2015).

Smart products are products that provide their identity, properties, status and history (Schmid et al., 2015) . RFDI was the first technology used to enable product identity (Ashton, 2009), and since then many more improvements have been done. Now days smart products "know and can tell" which production steps they already passed through, and which are the future steps of their production process (Schmid et al., 2015). As finished goods, can provide information about their status, the parameters they should be used, maintenance and also can interact with their physical environment without human interaction (Schmid et al., 2015; Nunes et al.,2017). Furthermore, smart products have incorporated algorithms that can optimize their operations, utilization and maintenance (Porter & Heppelmann, 2015).

According to Mühlhäuser the knowledge of a smart product can be categorized as following:

- knowledge about itself: awareness about its identity, characteristics, functionalities, depencies, history etc.
- knowledge about its environment: the ability to adapt and interact with their environment and its components
- knowledge about its users : the ability to interact with their users, providing relevant information about their status, and maintenance .

Smart products knowledge, is integrated and supports the whole manufacturing process (Nunes et al.,2017) and can optimize the whole value chain (Kagermann, 2013).

Smart products can acquire storage and compute, huge and even real-time data in their memory regarding themselves and their environment and accordingly to that data adapt their action (Beverungen et al., 2017). This ability results also on a high degree of autonomy, making smart products able to operate in autonomous way, to self-coordinate and self-diagnose (Dorst, 2012; Porter & Heppelmann, 2015).

Smart products can also be described as Cyber Physical Systems, that enable the connection between the operations in the physical world and the computing infrastructure, eliminating the boundaries between physical and virtual world (Kagermann, 2013). Also can interact with their physical environment (Dorst, 2012) and can influence other actors in the physical or digital world (Beverungen et al., 2017).

According to Maass and Janzen (2007), smart products core requirements are three: adaption to situational contexts, to actors that interact with the product and to underlying business constraints. They also list the major characteristics of smart products as below listed:

- Situatedness - recognition of situational and community contexts;
- Personalization - tailoring of products according to buyer's and consumer's needs;
- Adaptiveness - change product behavior according to buyer's and consumer's responses to tasks;
- Pro-activity - anticipation of user's plans and intentions;
- Business-awareness - consideration of business and legal constraints;
- Network ability - ability to communicate and bundle with other products

Several authors argue that smart products with their core properties are also crating the so called "smart servies" (Allmendinger &Lombreglia, 2005; Ostrom et al.,2015; Beverungen et al., 2017). According to Ostrom et al., (2015) smart products gives rise to an "*ubiquitous, always on, always connected, smart, and global world, leading to profound changes in customer experience and value co-creation; front-stage and back-stage service provision; and service organizations, networks and service ecosystems*" (p.145). In table 5 are listed the properties of smart products and the implications they have for smart services.

Properties of smart products	**Implications for smart service**
Unique Identification	Smart products become identifiable resources in service systems that ca be distinguished from other resources of the same type, so data can be stored with reference to a unique product. Smart products provide an additional channel through which to design offer, and deliver service.
Localizing	Service can be configured and delivered based on the locations of individual or groups of smart products.
Connectivity	Through information technology, smart products can be integrated with resources at remote locations. Mediated by smart products' technology, service can be co-created by integrating knowledge, skills, resources, activities, and information systems that are at the disposal of different stakeholders.

Sensors	Based on contextual data, usage data, and condition data, service can be tailored to the context-sensitive surroundings in which a smart product is operated.
Storage and Computation	Smart products offer service locally and autonomously, beyond the full control of a central system. Data from single or groups of products is available for analysis in (near) real-time.
Actuators	Service can be manifested in physical locations by the actions of smart products. With remote control, external actors can have an effect on the physical manifestation of service at the customer's service system.
Interfaces	Service is co-created in local interactions between smart products and customers.
Invisible computers	Service can be offered and delivered while generating little (if any) user attention. Data in the proximity of the product can be collected without users' knowledge, which raises issues of data protection and the ethics of using data in smart service systems.

Table 5: Core properties of smart products and their implications for smart service (Beverungen et al., 2017, p.10)

Following this logic, smart services are considered as the top layer of a smart product (Paukstadt et al., 2019). Smart services, are a new type of services, that are delivered by an intelligent object, able to gather, process, store and communicate updated information, in order to generate the necessary information at the basis of the service (Allmendinger & Lombreglia, 2005). Smart services are tailored to specific customer used cases (Hermann, 2016). According to Mittag et al. (2018) smart services are an integral part of smart products and go beyond usual product related services.

Several authors have provided different definitions, smart services are are service systems, which enable value co-creation between a service provider and beneficiary through the joint performance of service activities (Anke, 2019) ; e individual, highly dynamic and quality-based service solutions that are convenient for the customer, realized with field intelligence and analyses of technology, environment and social context data (partially in real-time), resulting in co-creating value between the customer and the provider in all phases from the strategic development to the improvement of a smart service (Beverungen et al., 2019); a combination of physical and digital value-added services based on smart products like wearables (Wiegard and Breitner,2019); systems that are designed for self-management and self-reconfiguration to ensure the provision of a satisfactory service to the participants(Laubis et al.,(2019).

According to Mittag et al., 2018 "*Smart services are a combination of physical and digital services that are based on the data of a physical product. As a result smart services are also called data-driven services. Physical services are an optional part of a smart service and also a source for product related data*." (p.103). Where physical products, are the manufactured good, that creates value by fulfilling a specific function; physical services are intangible goods provided by a person in the physical environment; digital services are services by IT systems (Mittag et al., 2018, p.103). Figure 6 gives an example of Mittag et al. (2018) definition of smart services.

Figure 6: Definition of smart services (Mittag et al., 2018, p.103).

2.3.2 Smart logistic

Smart logistic is the necessary evolution of the logistic system in order to keep pace with the evolution that is taking place in the manufacturing process. There is an increasing demand for highly individualized products/services, and also the rise of smart factories is totally changing the manufacturing landscape, so inbound and outbound logistics have to adapt to those changes, by becoming more flexible, dynamic and customer-driven (Kache & Seuring, 2017). From the technological point of view, smart logistic refers to the combination of logistics activities with the advanced technology (Barreto et al., 2017).

Gregor et al., (2017) uses the term of Smart Connected Logistics as "*a system of Smart Connected Products, orchestrated via cloud, whereas the cloud based solution is also accessing information from other factory data sources, such as production planning and control systems, external logistics, etc*." (p.267). According to Uckelmann (2008) smart logistics is constituted by employing technical components to gather and process data for monitoring and further proposes. The key technologies behind the smart logistics enable identification (RFID), location (GPS) and sensing (temperature/humidity etc.).

Smart logistic is a practical application of advanced technologies in order to improve the effectiveness of transport and warehouse processes (Blecker et al., 2012) consisting in intelligent resources, products, services and shipments (Hribernik et al., 2010) that replaces human labor to intelligent devices able to communicate and cooperate with the whole environment, by gathering processing and sharing data (Uckelmann, 2008). From a spatial dimeson it consists in

people (employees), single objects (goods/freight), mobile resources and infrastructure (Singh P.M. et al., 2017), in order to predict problems and to minimize their impact; to coordinate resources and to eliminate communication barriers between the involved elements of supply chains(Korczak& Kijewska, 2018).

According to Barreto et al. (2017) an efficient smart logistic system must use five technological application:

- Resource planning – to enhance productivity and flexibility
- Warehouse management systems – to coordinate and align activities in all value chain phases
- Transportation management systems – enable the real time monitoring of the physical objects movement across the entire supply chain, and also offers a better end-to –end supply chain visibility
- Intelligent transportation systems – to support and enhance the logistic process economically and in sustainability
- Information security – to protect information assets and IT infrastructure

2.4 BIG DATA VALUE CHAIN

Porter (1998) in his value chain theory stressed the importance the chain activities that deliver valuable products and services to the market, as a source for firm's long-term competitive advantage. Today's value chain has evolved, technologies of industry 4.0 allow to identify and trace every single product during the entire life-cycle (Bauer et al. 2014). The first authors to link the value chain and IT system were Rayport and Sviokla (1995) when introducing the concept of Virtual Value Chain. There is a shift form the traditional value chain into the big data value chain, where information flows can be used to create value. According to the Europian Commision data value chain is the center of future knowledge economy (DG Connect 2013). Organization using big data value chain, can achieve higher benefits, comparted to traditional organizations, because the generated data can be used multiple times and for different needs (6), also can be exploited by others users in different forms and exploited many times over (Faroukhi et al., 2020).

Curry et al.(2014) identify five key activities in the Big Data Value Chain, as illustrated in figure 6.

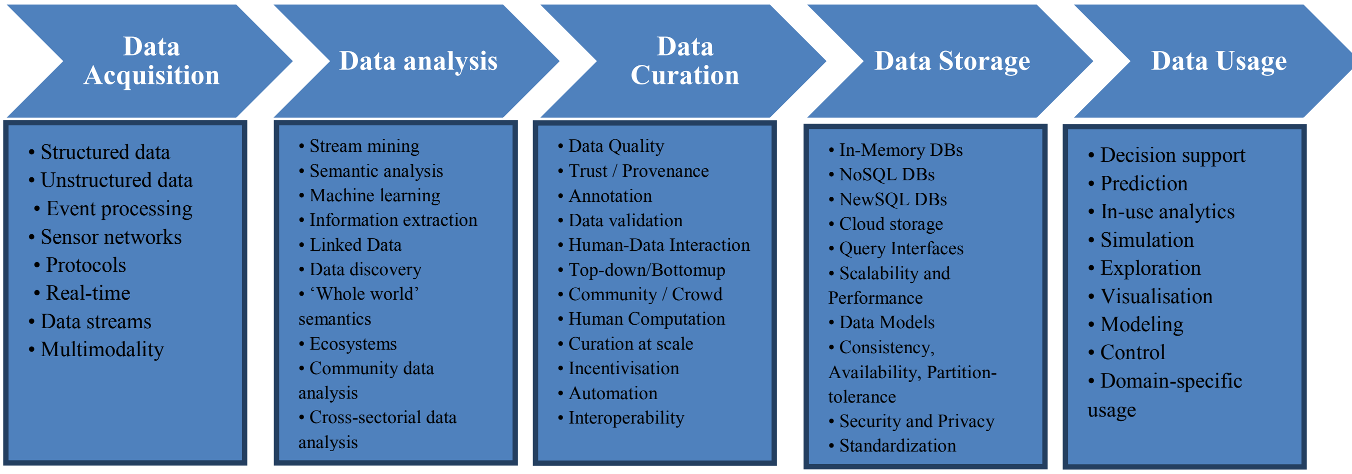


Figure 7: The Big Data Value Chain (Curry et al. 2014)

Data Acquisition is the process of gathering and filtering the data, this process can be challenging since the necessary infrastructure to acquire big data must deliver low, predictable latency for capturing data and in executing queries, and also must be able to handle huge volumes, even in a distributed environment; and support flexible and dynamic data structures.

Data Analysis is the process that transforms the raw data acquired in valuable information that can be used in decision-making process and in domain-specific usage. The process involves exploring, transforming, and modelling, synthesising and extracting useful information, with high potential from a business point of view.

Data Curation includes different activities like content creation, selection, classification, transformation, validation, and preservation. This process is performed by expert curators that are responsible for improving the accessibility and quality of data. The result of data curation is a trustworthy, discoverable, accessible, reusable data that fits their purpose.

Data Storage is the persistence and management of data in a scalable way that satisfies the needs of applications that require fast access to the data. NoSQL is e technology designed with the scalability goal in mind and present a wide range of solutions based on alternative data models.

Data Usage implies business activities driven by data usage. Enhances competitiveness through cost reduction and increased added value.

UNCTAD (United Nations Conference on Trade and Development) in the digital economy report (2019) presents a new economic model, that works in a circular manner, where data and interaction are the main sources of value, as presented in the figure 7.

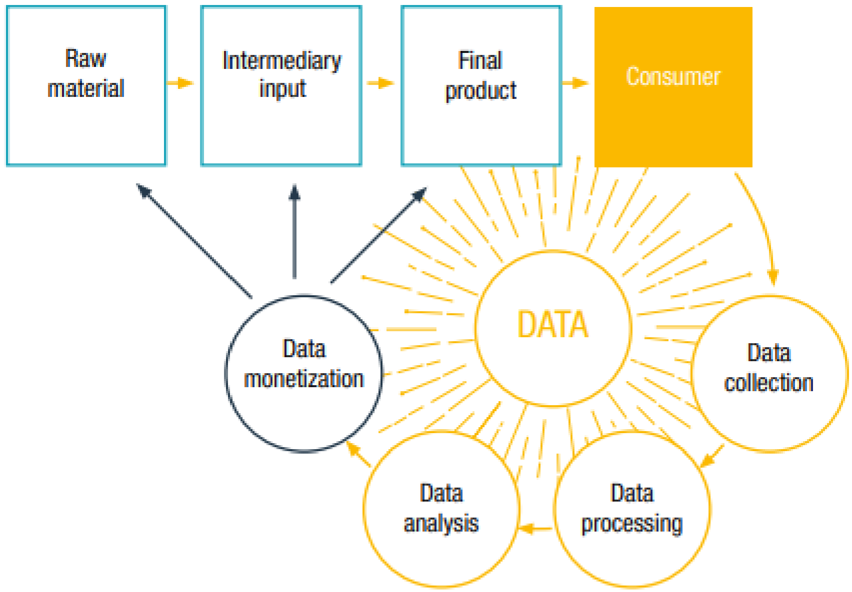


Figure 8: From linear production to feedback loops in the digital economy (UNCTAD, 2019)

The lower part of the picture represent the big data value, chain, while the upper part represents the traditional linear production, the whole represents the digital economy.

CHAPTER 3: THE DIGITAL ECONOMY

Digitalization has a disruptive nature (Tulder et al., 2019) and digital technologies can be applied in all levels of the firm to support in the creation, production, selling and delivering of the product/service (Porter & Heppelman, 2014). They can optimize not only the manufacturing and logistics systems, but also improve flexibility, knowledge creation and exchange, inter organizational collaboration, and support decision makers in international business (Tulder et al., 2019; Schmitt & Baldegger, 2020). According to Holand et al. (2019) digitalization implies the application of digital technologies to create new options for revenue and vale creation. Digitalization has created new possibilities to internationalize, reducing the average penetration time from multiple years to few weeks (Shaheer & Li, 2020). Digitalization enhances both customer interaction and customization, and creates the possibility for an accelerated growth (Autio & Zander, 2016).

The internationalization process has been wildly analyzed and explained in the pre-digital world, and there are only few attempts to explain the internationalization process in the new digital area (Hervé et al.,2020). However it seems that all those studies agree on the fact that digital internationalization is easier, faster and cheaper for the digital companies (Wittkop et al., 2018). According to Hervé et al. (2020) the use of technologies impacts firms "*by enabling a transformation of not only their operations, offerings and value propositions, but also by enhancing their interactions with customers*" (p.35). Digital technologies are leading firms to consider their production decisions based on proximity to the customer rather than on costs (Hannibal & Knight, 2018; Strange & Zucchela, 2017).

3.1 THE IMPACT OF DIGITALIZATION IN INTERNATIONALIZATION PROCCES

According to Coviello et al. (2017) the digitalization "*has the potential to impact the internationalization process in terms of the timing, pace, and rhythm of internationalization, location and entry mode choice, foreign market learning and knowledge recombination, accessibility of requisite resources and capabilities in home and host markets, and the firms' ability to manage the liabilities of foreignness and outsidership*" (p.1153).

The digital internationalization has begun since the late 1990s, with the e-commerce as a new internationalization model that dematerialized national borders and reduced costs

(Tiessen et al., 2001) creating a competitive strategy for the SMEs to export in foreign markets (Gabrielsson & Gabrielsson, 2011). SMEs internationalize usually by targeting niche markets and offering inovvative and high quality products (Hervé et al., 2020). The digitalization has several impacts on the internationalization process, specifically on costs, accessibility, resources, knowledge, distance/location, partnerships and value creation (Hervé et al.,2020). Digitalization has created a global market that involves both economic and social transactions, where tangible and intangible goods are traded. And digital firms are more exchange – oriented than production oriented (Vahlne & Johanson, 2017).

3.1.1 Digitalization impact on costs

According to Bothers et al. (2018, 2016) digitalization helps firms to reduce the additional costs associated with liabilities of foreignness, when operating abroad. Let recall that from chapter 2 that in the traditional models of innovation the liability of outsider ship and foreignness, is considered to be the main obstacle to enter a new market (Johanson & Vahlne, 1977, 2009). Digitalization has increased the firm's ability to acquire knowledge for foreign markets and also has improved the communication and information exchange (Coviello et al., 2017) so it can quickly overcome the liability of outsider ship and foreignness. Digitalization allows firms to quickly create an online reputation, so they can quickly overcome also the liability of newness (Reuber & Fischer, 2011).

Digital firms through the use of digital tools can reduce the quantity of assets needed to operate in foreign markets (Zander, 2016) and can generate revenues without making important investments (Hervé et al., 2020). These revenues are generated by the digital generated data used to identify attractive markets and to build interactive, widespread users base (Coviello et al., 2017). Digitalization also reduces location specificity in both home and host countries by enabling a greater transferability of firm's specific assets (Zander, 2016).

According to Brouthers et al. (2018, 2016) digitalization has led to a dematerialized distribution and production channel.

Thus digital technologies by reducing operating costs and improving communications and interactions create new opportunities for open innovation, co-creation and partnerships (Coviello et al., 2017).

3.1.2 Digitalization impact on market knowledge

Digitalization provides direct interaction with the customers, and firms can capture and diffuse huge amounts of data (Neubert, 2018), to better understand customers' needs and desire, and to consequently adapt their offers. Furth more technologies supporting M2M communication, human –machine communication have increased the customers possibility to customize their own products, through the use of 3D printers customers are influencing products design, and manufacturing origin (Strange & Zucchella, 2017). User community platforms and social media are in important resource of information for the firms, based on the feedback and comments on these platforms firms can improve their position in the market by quickly responding to customers need (Hervé et al., 2020).

The technologies of Industry 4.0, like Big Data Analytics, Cloud Computing etc. enable the collection and processing and through the use of predictive algorithms can predict market attractiveness (Neubert, 2018). They also reduce the cross-bored information asymmetry (Autio & Zander, 2016). Also the decision making process is influenced by the acquired knowledge through the digital technologies. Based on the artificial intelligence firms can interpret the collected data to make strategic decision (Hervé et al., 2020).

According to Autio &Zander (2016) digital technologies combined with the principles of lean entrepreneurship, allow firms to conduct experiments in more countries in short periods of time. So products and services are directly tested on the potential customers, all around the world and firms through these experiments gain market knowledge, and learn how to adapt and customize their offers (Strange & Zucchella, 2017). This allows firms to frequently introduce new advanced and enhanced version of the products and services can be introduced with frequency (Brouthers et al., 2018, 2016).

3.1.3 Digitalization impact on relationship networks

From the perspective of International business network, the internationalization process of the firms can be supported by creating and maintaining relationship within a network. In the digital market the customer is principal information provider and the foundation of the network theory are challenged, so it becomes necessary to totally rethink the understanding of relationships across international trade (Autio & Zander, 2016).

The relationship of firms with customer has changed, customer are active actors on the market place, thus firms tend to integrate them in their ecosystem and to develop direct relationships with them (Hervé et al., 2020). Customers have become the main source of information for the firm (Strange & Zucchella, 2017) and online exchanges allow to better understand needs and to consequently adapt (Hervé et al., 2020). Customers have an increasing influence not only in the product design, but also in the manufacturing process (Strange & Zucchella, 2017). Furth more digital technology is also changing the marketplace, as a place that involves both economic and social transactions, and where tangible and intangible goods are trade (Coviello et al., 2017). So global markets have a broaden market scope, and allows better access to market actors and partners (Hervé et al., 2020).

Digital technologies are also creating an increased number of "*instantaneous, brief and interrelated interactions*" (Hervé et al., 2020, p. 33-34) and markets are becoming momentous and dedicated to specific transactions (Strange & Zucchella, 2017), thus creating long term relationships is more difficult.

Thanks to the big data digital firms are now more exchange – oriented than production oriented (Coviello et al., 2017). These exchanges create new opportunities in the international trade, and enhance the reliability of relationships (Hervé et al., 2020). SMEs should create and develop relationships through the use of mass media, social network , user communities and collaborating with opinion leaders to quickly internationalize and create brand identity (Brouthers et al., 2018, 2016).

3.1.4 Digitalization impact on distance and location

Digital technologies has dematerialized nations border and has accelerated the internationalization process. Firms can manage online their international activities worldwide and reduce cultural and psychological distance (Hervé et al., 2020). Digitalization reduces the asset specificity (Autio & Zander, 2016) and SMEs can benefit from a reduced location – bound assets in both home and host countries (Coviello et al., 2017). Digital technologies are leading firms to consider their production decisions based on proximity to the customer rather than on costs (Hannibal & Knight, 2018; Strange & Zucchela, 2017).

Brouthers et al (2018, 2016) argue that digital technologies can also help firms to manage another problem of distance, like the liability of outsidership, by creating and coordinating users network in digital platforms.

3.1.5 Digitalization impact on business models

Digital technologies like big data, 3D printing, cloud technologies etc. create new possibilities and offer the potential to create new products/services and business models (Matzler et al., 2016) and are leading to new form of cooperation with customers, employees and other firms (Kiel et al., 2016). Digitalization of firms, and the perceived opportunities, have motivated firms to experiment new business models (Baines et al., 2017) to create and capture value (Visnjic et al., 2018). In order to exploit the opportunities presented by digitalization, companies need to innovate their business model, by implementing digital technologies such as artificial intelligence, digital platforms and big data analytics in their business model (Parida et al., 2019).

According to Osterwalder et al. (2005, p.10) “A business model is a description of the value that a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value to generate profitable and sustainable revenue streams.” For Bouwman et al. (2018, p.105) the business model “refers to the way a single organization or a network of firms collaborates at strategic and operational levels to bring products and/or services (bundles) to the market……. to create and capture value for both (networked) organization and the customer”. As a conceptual tool, BM is the theoretical layer between the business strategy and the business processes (Wittkop et al., 2018), an architectural level between the business processes on the bottom and the strategic planning level on the top (Osterwalder and Pigneur, 2002).

According to Baden-Fuller & Mangematin (2013) business models can be explained by three main domains: value proposition, value creation, and value capture. Value proposition explains which solutions firms offer to whom and how (Morris et al. 2005). Value creation refers to how the firm creates value along the value chain based on available resources and organizational processes (Achtenhagen et al. 2013). Value capture refers to how the firm captures value in the form of revenue to cover costs, allow sustainable performance, and provide profit. From this point of view digitalization impact business models because it enables new ways to create value (Wittkop et al., 2018).

Among the authors that studies the impact of digitalization in the value proposition are Hazarbassanova (2016) and Wittkop et al.(2018).The impact of digitalization on value proposition is made using the value creation logic that differentiates internet-based companies in three categories: to develop a structured understanding (Hazarbassanova, 2016 ; Wittkop et al.,2018) as following: *Value chain logic* – includes internet based firms that create value through standardization of value chains, and are similar with the traditional manufacturing firms in terms of value creation (Wittkop et al., 2018). Characteristics of these firms are optimized and standardized value chain and scale efficiency and indirect communication with customers an; and their internationalization is incremental. *Mediating network logic* – includes internet based firms that co-create value with the customer and the digital platform itself represents a value (Wittkop et al., 2018). For these firms internationalization process depends on the liability of outsidership (Brouthers et al.,2015) an the firms will internationalize if it’s able to transfer its competitive advantage to new markets (Wittkop et al., 2018). *Value shop logic* – includes firms that create value by developing customized solutions for customers adapted to local markets and that generate value through the specific knowledge or reputation (Mahnke & Venzin, 2003). Their competitive advantage is based on tacit, internal knowledge, so it's difficult to transfer it to external third parties (Hazarbassanova, 2016).

Based on the ways in which companies use data to create and capture economic value, four categories of data-related business models can be distinguished:

- Selling raw or aggregated data
- Developing and selling data-related products
- Using data to improve existing products
- Using data to improve production process

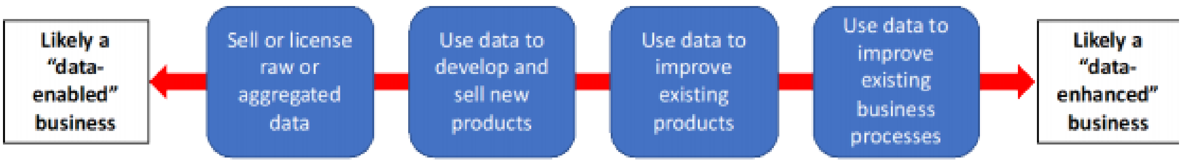


Figure 9: Data-enabled vs. data-enhanced business models (OECD, 2020)

In Data enhanced business models, Data is used to enhance performance of companies by facilitating decision-making, coordinating existing business operations, introducing new services/products, and facilitates value creation within an existing business model; while in Data enabled data business model, it's their most valuable asset and the core of their business model (OECD,2015, 2020).

3.2 VALUE CREATION IN THE DIGITAL ECONOMY

"The world's most valuable resource is no longer oil, but data" was the headline of The economist (2017) based on the fact that the most valuable companies of nowadays include companies like Alphabet, Amazon, Apple, Microsoft and Facebook, or the so-called the giants of internet. In the digital economy the scope and the scale of data usage has changed fundamental (OECD, 2020). Data is used as a tool to enhance performance of companies by facilitating decision-making, coordinating existing business operations, introducing new services/products, and facilitates value creation within an existing business model (OECD, 2015). For other companies data is more than this, it's their most valuable asset and the core of their business model (OECD, 2020).
This section is organized as following. Firstly is presented a literature review of the economic value of big data, followed by the process of data monetization; and the drivers of big data value.

3.2.1 The role of Big Data in creating value in the digital economy

Following the huge impact of big data on society, BDA (big data analytics) has been described as the new frontier of innovation (Shollo & Galliers, 2016). And more and more firms are engaged on digital innovation of products and service offerings, where value is created from the interactions with the stakeholders (Suseno et al.,2018). These interactions are enabled by the adoption of mobile devices, social media platforms and IoT. These communication channels create a huge amount of data, or the so called big data.

Big data can be explained by the concept of the 5Vs: *Volume* - large amount of data ; *Velocity* - the frequency of data generation and/or frequency of data delivery; *Variety* - the large variety of sources and formats, generating structured and unstructured data (Russom, 2011); *Veracity* – refers to uncertainty, unreliability or inaccurany of data; *Value* – the economic benefits from the available big data (Oracle, 2012; Forrester, 2012). These datasets, large in volume, are created quickly by different sources, so collecting, processing and managing them in order to gain an advantage, is become more and more challenging (Chandy et al., 2017; Johanson et al., 2014; Storey and Song, 2017). In order to benefit from big data firms need to have access to these data bases and should be able to diagnose and integrate it, to meets existing and emerging customer's needs (Chen et al., 2012).

Companies can create and capture value using big data by identifying customer needs, creating data driven knowledge, design product/service, quality and risk management, recognizing and creating opportunities (Urbinati et al., 2019). BDA (Big Data and Analytics) is a strategic asset to improve business process and outcomes (Gopalkrishnan et al., 2012) and is becoming more and more important to address customer needs (Urbinati et al., 2019) and requirements (Nicola et al., 2014). BDA is useful tool in identifying origins of emerging trends, potential idea launchers and implications for new value proposition of product/service design (Urbinati et al., 2019). Also higher customer satisfaction can be achieved because big data help designers understand customer needs and desires through customer reviews and accordingly they can improve functionalities of their products/services (Yu and Wang, 2010; Liao et al., 2009). According to Grover et al. (2018) firms engage in BDA to predict customers' propensity to buy their products in order to create personalized offer discounts, to understand customers' experience with their product/service, to predict and fix potential problems before they happen. BDA can be used to transform customer complaints and requirements into new products and services concepts (Liao et al., 2008, 2009; Urbinati et al., 2019). Digital platforms more and more are becoming the place where customers look for assistance, so firms can exploit these dynamic databases, by using data mining techniques, to collect knowledge in order to improve their processes (Johanson et al., 2014), to investigate problems related to design in different stages of product development (Lee at al., 2015), to discover the relationship between product features and customer purchasing behavior (Larose, 2014), and to develop new products (Han et al., 2011).Companies in the design of new product/services are engaging in collaborative design (Lin et al., 2013) using crowdsourcing technique (Chang &Chen, 2014), data mining (Yan et al., 2009), business intelligence and advanced analytics (Byrum et al., 2016). According to Chang & Chen (2014) based on Big Data, companies can identify promising design candidates, in order to improve the efficiency of crowdsourcing technique in the collaborative design. The data mining approach can be used to product conceptualization in web based architecture (Yan et al., 2009). Byrum et al, (2016) argue that business intelligence and advanced analytics can be used in the agricultural industry to identify the development of a cost effective variety of soybean.

According to Yang (2015) Big Data helps firms in risk management, by reducing the uncertainty in real time decision making. Ricondo et al. (2019) specifically show how the implementation of BDA can be used in decision making and risk management for development of e new products. While Relich and Bzdyra (2015) argue that Big Data, data mining, data selection and preprocessing can be used also te forecast the success of a new product. Another important aspect of the digital economy is the importance of technologies in recognizing and creating new opportunities for innovation, in order to create and capture value (Maine et al., 2015). For example Big Data, is a technology that supports innovation activities and business models, to recognize and create opportunities for disruptive innovations (Wan et al., 2015), including the creation of new capabilities, competences or a re-engineering of it (Best, 2015; Urbinati et al., 2019)

3.2.2 Big Data monetization

Data monetization is a recent phenomenon created by the trends of digitalization. A successful use of data can create a competitive advantage (Spijker, 2014) and can create value for customers (Wixom & Ross, 2017). Big Data monetization has been defiend by several authors. According to Najjar &Kettinger (2013) data monetization is converting into real value, the intangible value of data, usually by selling it, but also by avoiding costs. To Fred (2017) data monetization is "the revenue generation with and out of data and data-derived and information-based products and services" (p.24). To Wixom (2014) data monetization, "is the act of exchanging information based products and services for legal tender or something of perceived equivalent value".

To Najjar & Kettinger (2013) the main idea behind the data monetization is the generation of revenue that can be achieved by both increasing incomes or by avoiding costs. To Fred (2017) , Woerner & Wixom (2015) and Wixom (2014) data monetization can be achieved not only by data, but also from its derivatives, or "information-based products or services" that can be , raw data, enhanced data, a derivative or result of analytics, process design or even process execution.

Gartner (2015) has identified two ways of generating revenue from data: direct and indirect. The direct way of generating revenue implies the trade of data, where a monetary value is produced by an economic transaction; while the indirect way of generating revenue implies the utilization of data to produce new products/services or information, thus by refining data into something else valuable, and trade it (Gartner, 2015). Woerner & Wixom (2015) make the distinction of data monetization as the core and non-core business operation. Data monetization is a core operation business when the firm trades data and its derivatives, and is a non-core business operation when the firm uses the data to "wrap" it around its core product/service to differentiate it from the competitors, to make it more attractive, thus to generate greater value and revenue (Woerner & Wixom, 2015). Firms can use data and generate value from it by: improving the organization internal process as and decision-making; structuring and wrapping information around the organization core products and services; selling information/data to new and existing markets (Wixom and Ross 2015, 2017).

Data monetization can be achieved by the following activites:

Selling data - Organizations can act as data supplier, by selling the collected data to others in a raw form (Thomas and Leiponen, 2016) or in analyzed, packed and anonymous form (Spijker, 2014). When firms sell refined data, they act as data manager and increase the data value thought the transformation process, including analyzing, cleaning and cataloging. When a company sells raw data, it generates the smallest potential monetization of data, since raw data is rarely further refined (Thomas & Leiponen, 2016). Authors like Spijker (2014) argue that data selling is the easiest way to draw vale form data; others like Wixom & Ross (2017) argue that it's the hardest way to monetize it, due to unique business model that isn't directly linked to the core products/services where the data is gathered. Often the data sold to current customers/suppliers is an additional feature to a current relationship and offering (Angulo, 2004), but it can also be sold as a distinctive service aiming new customers.

Providing insights or analyses of big data -Companies usually provide data –based analyzes, carrying information about the customers, like habits, interests advertisement targeting and payment analysis (Thomas and Leiponen, 2016) and rarely just sell their original data to third parties because it can compromise company's business (Spijker, 2014). Companies can add value to its customers and business by providing customers data-driven analyze, to chosen buyers, in order to control the delivered vale and to unknown reuse of data (Spijker, 2014).

Creating a scalable service or a product - By adding services and platforms to scalable delivery of data, firms can create new value (Thomas and Leiponen, 2016; Spijker, 2014; Najjar and Kettinger, 2013)by implementing dashboards or similar interfaces (Whitmore, 2016). Complex models, which are harder to execute, normaly create the highest revenue (Thomas and Leiponen, 2016). Those monetization solutions can firstly be tested to few actors, but scalinig is necessary to generate sufficient revenue (Najjar and Kettinger, 2013). "Commodity swap" as a monetization way, includes the transformation from commodity services into added value services; where the sale/usage of a commodity product is used to generate data, in order to create new offerings, highly specific services and advertisement (Spijker ,2014). By creating platforms, companies can add value to their services, by increasing the number of users and data sources, exploiting the capabilities of different actors on the platform (Najjar and Kettinger, 2013). This kind of platform creates a data flywheel effect, where the increased amount of data creates more and more data (Yousif, 2015; Spijker, 2014; Rossman, 2016). For example Andara, is a software company that connects different data providers and offers refined information to its partners, such as airlines, hotels, and travel agents in order to create specific services and advertising campaigns (Spijker, 2014). Adara refines the data more accurately as more and more partners start using the service, thus, benefiting from the increasing amount of users.

It should be noted that individual data, has a little or no value at all; the value is created when huge amounts of data are processed to enable data driven decision making. So "*the capacity of digital platforms to aggregate, process, transmit, store, analyze and make sense of data that allows them to generate value. Digital data and digital platforms can therefore be viewed as two sides of the same coin for much of the value creation that takes place in the digital economy*" (UNCTAD, 2019, p.30). A digital platform is "*…a business based on enabling value creating interactions between external producers and consumers. The platform provides an open, participative infrastructure for these interactions and sets governance conditions to them*" (Parker et al., 2016, p.11). The transaction platforms are multi side platforms that support the exchange between different parties (Gawer, 2014).

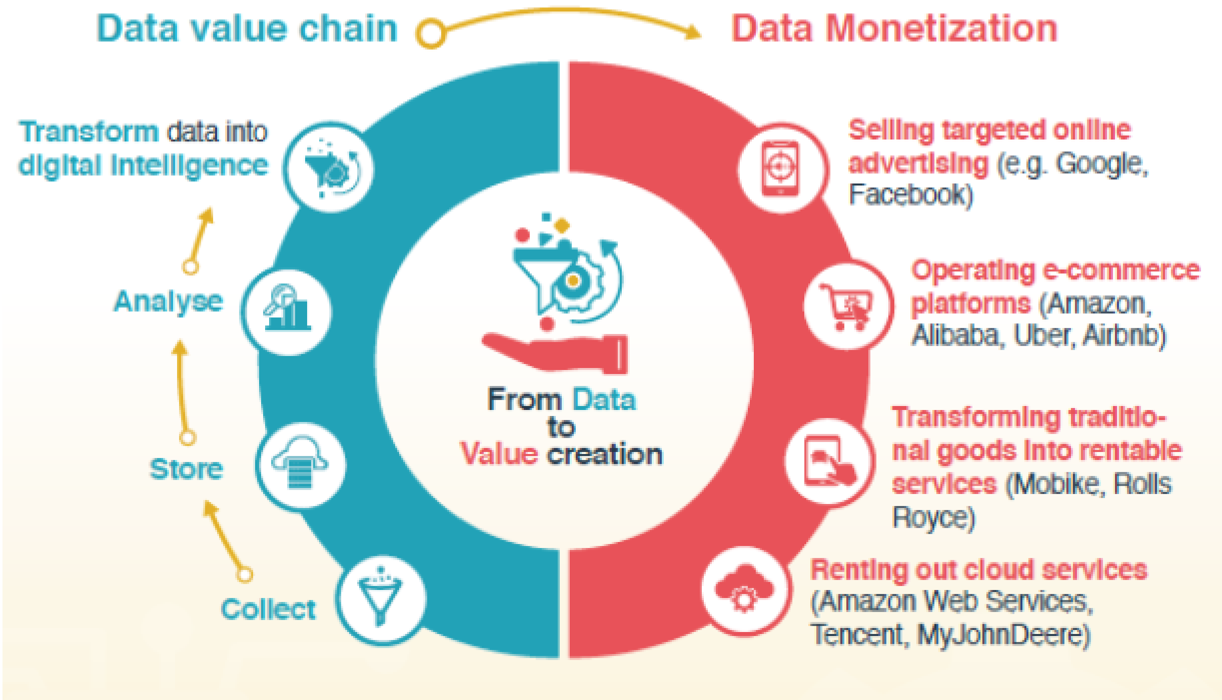


Figure 10: Value in the digital economy (UNCTAD, 2019, p.24)

Based on UNCTAD annual report (2019) there are four types of transactional platforms that monetize data and generate value:

Advertising platforms: are platforms that generate revenues from advertising. These platforms extract, store and use personal data, in order to offer a targeted advertising. Some examples of advertising platforms include Facebook, Google, Twitter and Snapchat.

E-commerce platforms: are platforms that create an online marketplace where sellers and buyers can meet, it generates revenue from charging a commission for each transaction. Some examples include Amazon, Alibaba, Booking.com, Uber etc. The value of commission varies in a considerable way. For example iTunes fee is 30 per cent for transaction, while Etsy fee is only 5 per cent. These platforms use the collected data to offer a better service. Lean platforms, or the so called sharing economy is u subset of this category – where sharing is preferred over the traditional ownership of goods. Uber is the largest taxi driver company, but it doesn't own any car.

Products platforms: transform traditional goods into rentable services. With the growth of IoT the company can gather and control the data generated form products use. Like Mobike that offers bike sharing service.

Cloud platforms: provide different hardware, software and development tools as a service. Include specialized platforms in manufacturing and agriculture. Cloud computing offers cheaper, safer and more flexible services. Cloud platforms include Microsoft Azure, Google CloudPlatform etc.

3.2.3 Drivers of value creation in firms in the digital economy

As previously argued, in the digital economy, big data, big data analytics and digital platforms are enabling organizations to create value. However firms, in order to benefit from it, should be able to diagnose and integrate it, to improve their business processes (Chau &Xu,2012) and customer experience and satisfaction (Chen et al., 2012).

In a survey conducted by Côrte-Real et al. (2019) in 175 European firms, using the Delphi method provides an insight to the antecedents affecting the BDA value in firm level. The authors developed a BDA business value framework identifying three clusters of BDA value: sustained, real and potential value. Where dynamic capabilities, firm agility, strategic alignment between IT and business, strategic role of BDA, BDA use and environmental volatility are considered crucial factors to achieve a sustained business value, and consequently a competitive advantage.

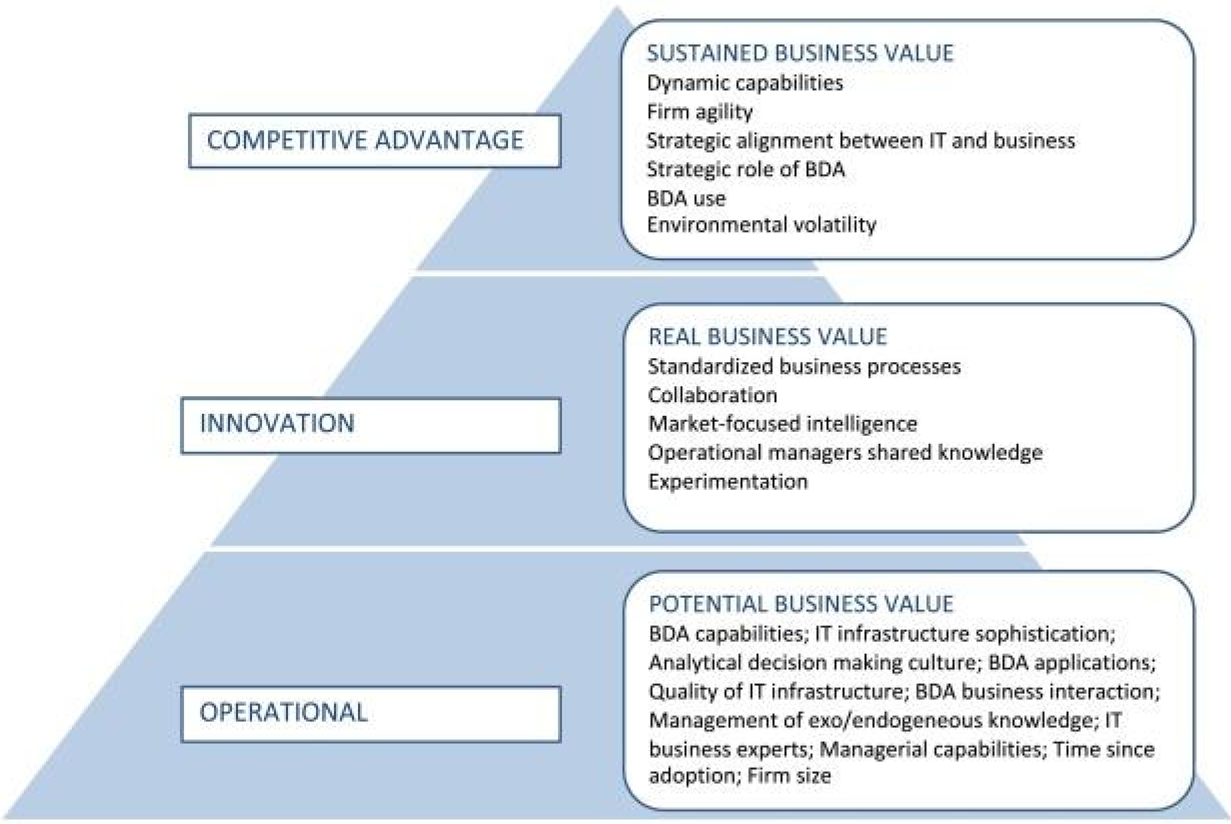


Figure 11: BDA business value framework (Côrte-Real et al., 2019)

A strategic implementation of these elements enables the firms to extract business value based on BDA, but it's possible only if supported by an effective intermediate management, and creating real business value through the implementation of innovative practices and management knowledge arising from experimentation, collaboration, market-focused intelligence, operational managers shared knowledge. This is possible only if supported by operational conditions, technical skills, and managerial skills, cultural conditions, and the characteristics of the firm

CHAPTER 4: MEASURING THE IMPACT OF DIGITAL ECONOMY

4.1 GENERAL OVERVIEW OF INTERNET USAGE AND ACTIVITIES

The number of internet users around the world has significantly grown in the last years and based on the report of DATAREPORTAL on January 2020 the total number of internet users accounts for 4.54 billion people, compared to only 2.83 billion people in 2015. In 2020 almost 59% of the total world population is internet users, and each of them spends on average 7 hours on day on internet.

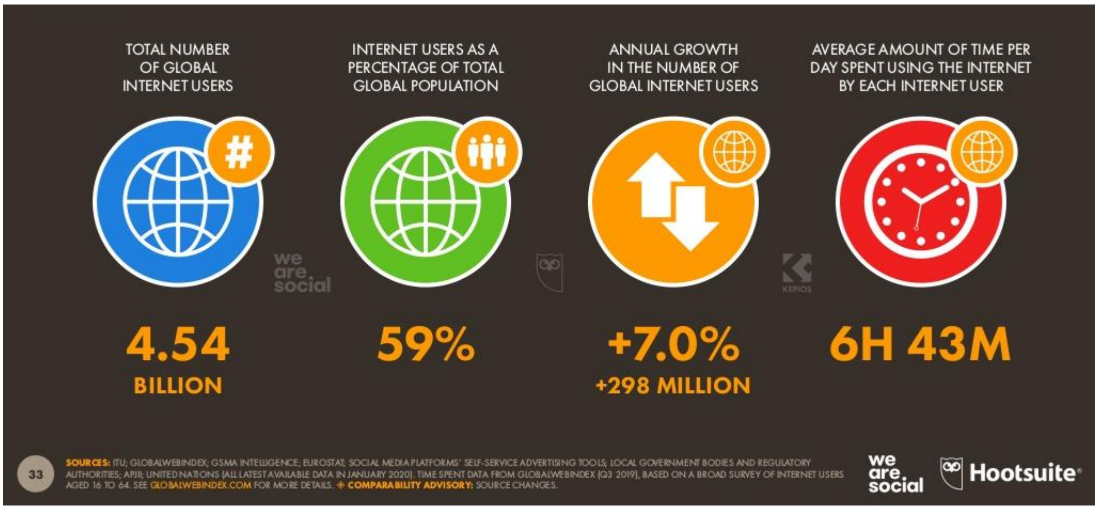
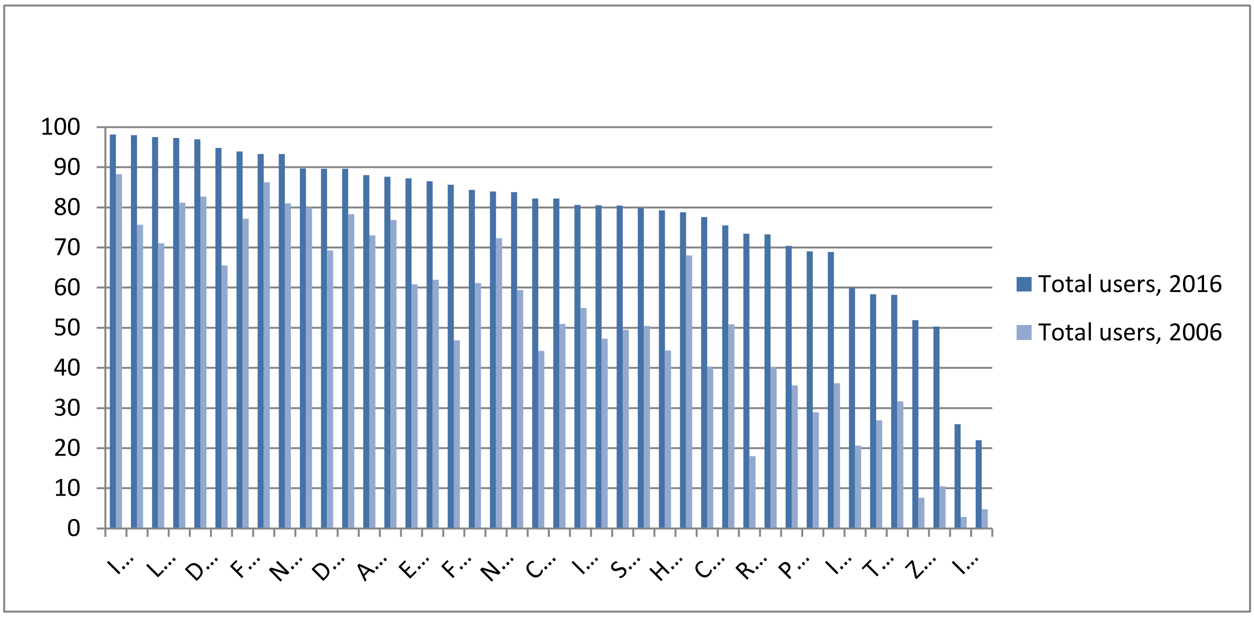


Figure 13: Overview of global internet use (DATAREPORTAL, 2020)

The average usage rate of internet has increased by 25% form 2006 to 2016 (OECD, 2017).

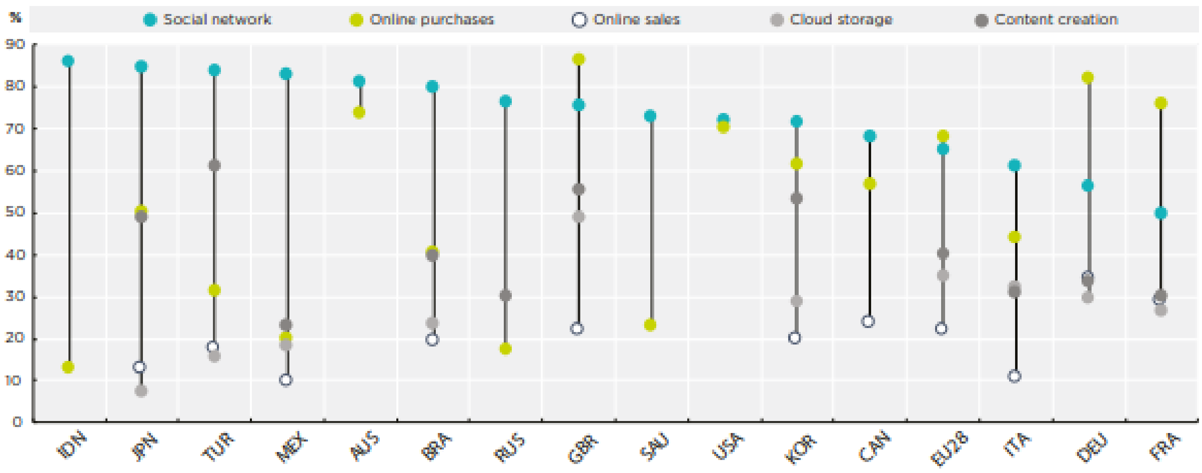
Country	Users, 2016 (%)	Users, 2006 (%)	Country	Users, 2016 (%)	Users, 2006 (%)	Country	Users, 2016 (%)	Users, 2006 (%)
ISL	98,1582	88,2612	AUT	84,3237	61,1224	ITA	68,8802	36,1548
JPN	98	75,7	NZL	84	72,3	MEX	60,0413938	20,6355163
LUX	97,4939	71,0056	OECD	83,786941	59,3944662	TUR	58,3477	26,914
NOR	97,2982	81,1627	CZE	82,1722	44,2532	BRA	58,2	31,6
DNK	96,9678	82,7236	IRL	82,1697	50,9462	ZAF	51,9191157	7,60713967
GBR	94,7758	65,5651	ISR	80,6	54,9	CHN	50,3	10,5231526
FIN	93,9168	77,2105	ESP	80,5613	47,3039	IND	26	2,80549987
SWE	93,3057	86,2472	SVK	80,4759	49,5184	IDN	21,9760677	4,76481313
NLD	93,2773	80,9928	LVA	79,8421	50,4555	PRT	70,4236	35,6014
CHE	89,7268	80	HUN	79,2594	44,3364	GRC	69,0879	28,8938
DEU	89,6471	69,2615	USA	78,81	68,05	BEL	86,5165	61,9819
KOR	89,6	78,3	CHL	77,5502408	40,35	FRA	85,6222	46,8685
AUS	88,05	73	SVN	75,4985	50,8856	EST	87,2421	60,8227
CAN	87,6	76,9	RUS	73,41	18,0232775	POL	73,3007	40,1819

Table 7: The usage rate of internet (OECD, 2017)



Graphic 1: Total users of internet in 2006-2016 (G20, 2018)

In countries like Japan, Denmark, Norway and Iceland the usage of internet accounts for 97% and more, while in countries like Turkey, Brazil and Indonesia usage rates are substantially low only, respectively 58% and 22%. The main activities carried online by internet users include: social networks, online purchaces, cloud storage, content creation and online selling. They differ from country to country because of the cultural, instiutional and economic factores. But it looks like using social media and social networks is the main activity of users, except internet users in France, and Germany where online purchases excess the usage of social networks. Generaly internet users are more likely to buy than sell online, on average only 20% of online users are engaed on selling online, compared to 55% of interent users buying online.



Graphic 2: Internet users, G20, 2006 and 2016 (G20, 2018)

4.2 CHALLENGES IN MEASURING THE VALUE OF DIGITAL ECONOMY

While the increased number of internet users is easliy measured the added value of the digital economy isn't that easy and present a number of challenges. The first challenge to measure the value of the digital economy is the lack of an universally accepted definition of the digital economy. In the digital economy we can identifay its core, narrow and broad scope, as displayed in the figure 13.

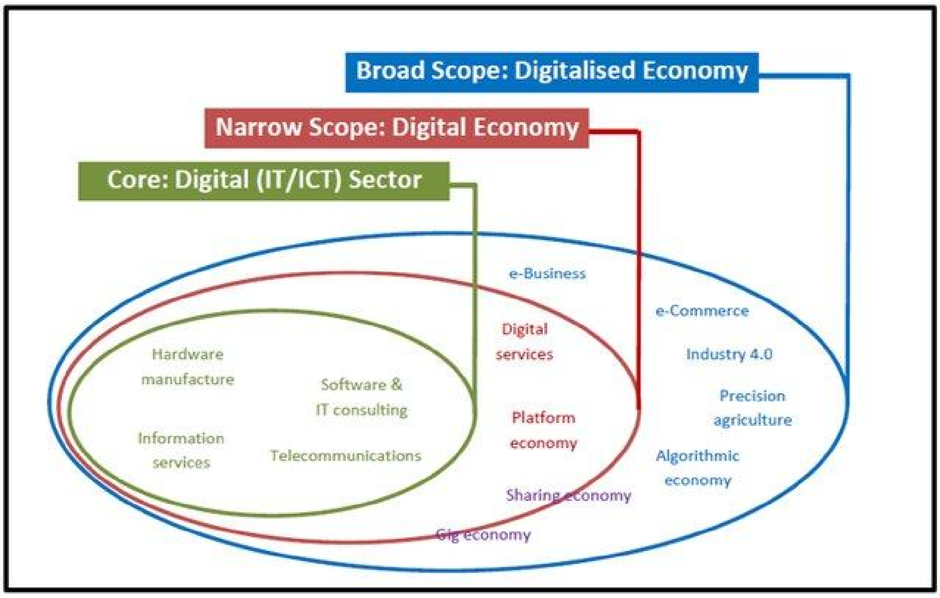


Figure 14: The scope of digital economy (Bukht & Heeks, 2017)

The core scope includes the ICT infrastructure and ICT production sector, the narrow scope includes the digital and platforme based services, while the broader scope refers to the usage of different digital technologies in other economic activites (Bukhat & Heeks, 2017, p.13). The value of the digital economy should be measured in all the three levels, in terms of value addes, wages, incomes, employmet rate ect., but there is aviable and comparable statistical data manilny for the core level, and even in this level can be lack of data especially in the developing countries. Another challenge is the difficulty to actually capture in a sttisitcal ways the impact of digitalization outside the boundarise of the production in the digital sector. Also identifaying the place where the economic transaction happens is a challenge due to the transatioanl nature of the digitel platformes. A pltaforme located in one country enables a trasaction between the seller and the buyer who are also loceted in other countries. Another challenge rises from the fact that some activites in the digitel economy monetoze indireclty, like content creation and data exchange.

4.3 MEASURING THE ADDED VALUE ON THE ICT SECTOR

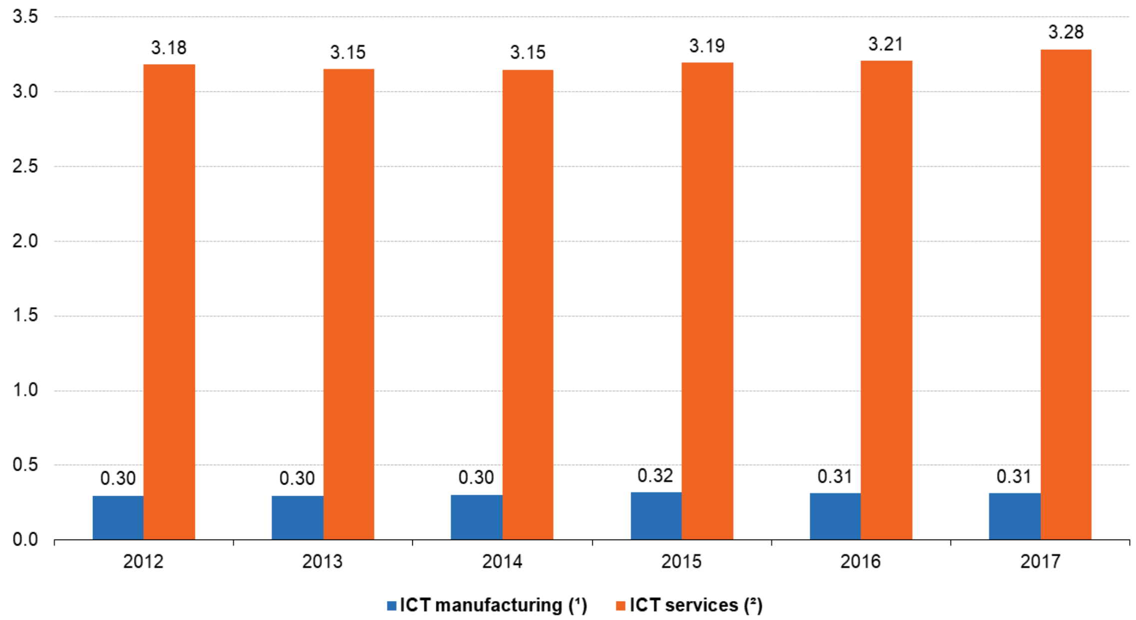
For measuring the value added by the ICT sector we consider the ICT Manufacturing and ICT Services according to the OEDC (2011) definition: "The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" and includes the following activities.

ICT sector -Total	ICT Manufacturing	26.1	Manufacture of electronic components and boards
		26.2	Manufacture of computers and peripheral equipment
		26.3	Manufacture of communication equipment
		26.4	Manufacture of consumer electronics
		26.8	Manufacture of magnetic and optical media
	ICT Services	46.5	Wholesale of information and communication equipment
		58.2	Software publishing
		61	Telecommunications
		62	Computer programming, consultancy and related activities
		63.1	Data processing, hosting and related activities; web portals
		95.1	Repair of computers and communication equipment

Table 8: Activities included in ICT sector (EUROSTAT)

Different measures are made for the added value of ICT sector, on this thesis we will shortly present data collected by EUROSTAT, OECD, UNCATD and the U.S. Bureau of Economic Analysis.

In the European Union the total value added for the ICT sector was around EUR 475 billion in 2017, equivalent to 3.6% of GDP, where ICT services accounted for the majority of the ICT sector respectively with 3.28% compared to 0.31 % of ICT Manufacturing. The value added on ICT sector by ICT manufacturing has been stable through the years with e peak on 2015.



Graphic 3: Development of value added ICT sector, EU, 2012 -2017 (EUROSTAT, 2020)

Graphic 3 breaks down the value added in ICT manufacturing in the 2017 for each activity, as a % relative to GDP, it was dominated by the manufacture of electronic components and boards which accounted for more than half, respectively 57.2%, followed by the manufacture of communication equipment, which accounted 25.9 %, the manufacture of computers and peripheral equipment 10.9 %, the manufacture of consumer electronics 6.0 %, while the smallest share of only 0.1 % the manufacture of magnetic and optical media.

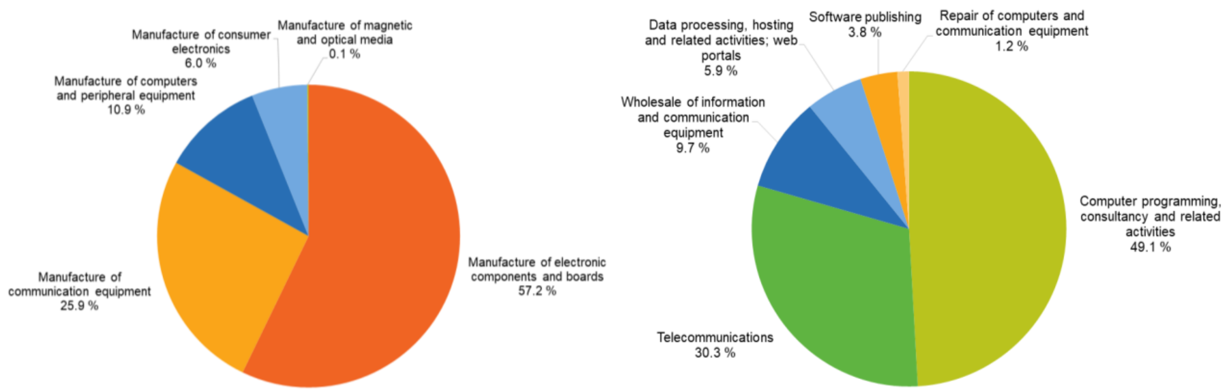


Figure 15: Distribution of value added within ICT manufacturing and services, EU, 2017 (EUROSTAT, 2020)

The value added on ICT services in 2017 was dominated by computer programming, consultancy and related activities accounting for 49.1 % of the value added and telecommunications accounting 30.3 % of the value added by ICT services. These are the largest activities on ICT service, followed by other activities that account for less than 20% of the value added. UNCATD (2019) report on digital economy points out that the ICT added value in world GDP is around 4.5 % and has been stable on the last decade. Taiwan is ranked on the first place in the growth of ICT sector value adds in GDP followed by other countries like Cyprus, Iceland, India, Serbia, Poland, Malaysia and Germany. In terms of value added, the USA is the country that has the world’s largest ICT sector, large almost the twice of Chine, the second largest ICT sector, followed by other Asian countries Japan, the Republic of Korea, India and Taiwan. In terms of the share of the ICT (figure 17) sector’s value added in GDP Taiwan is ranked on the first place with a ICT sector’s value added accounting for 16% of GDP , where more than 80% of its ICT sector’s added value comes from ICT manufacturing, followed by Ireland with its ICT sector’s value added accounting for 10% of GDP, mainly for computer services. India ranks tenth with a ICT sector value added for 5% of GDP, with computer services constituting more than 70 % of its ICT sector’s value added.

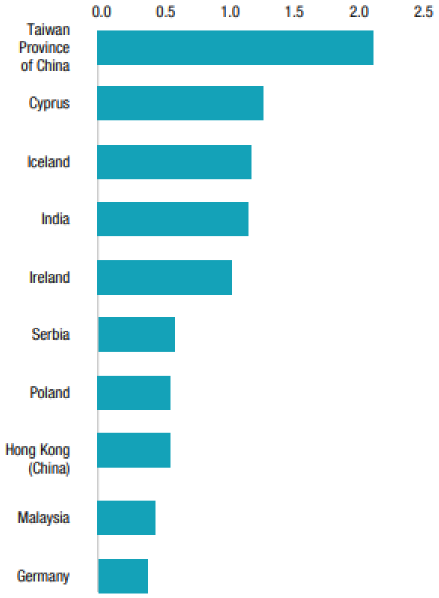


Figure 16: Growth in the share of the ICT sector's value added in GDP: Top 10 economies 2010- 2017 (in percentage points) (UNCAT, 2019)

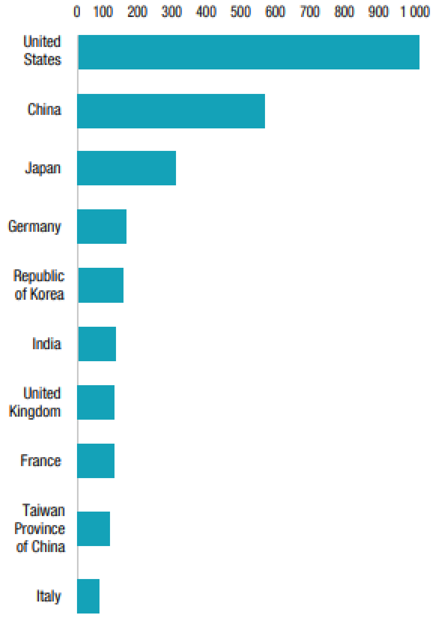


Figure 17: Value added in the ICT sector: Top 10 economies 2010- 2017 (in billion dollars) (UNCAT, 2019)

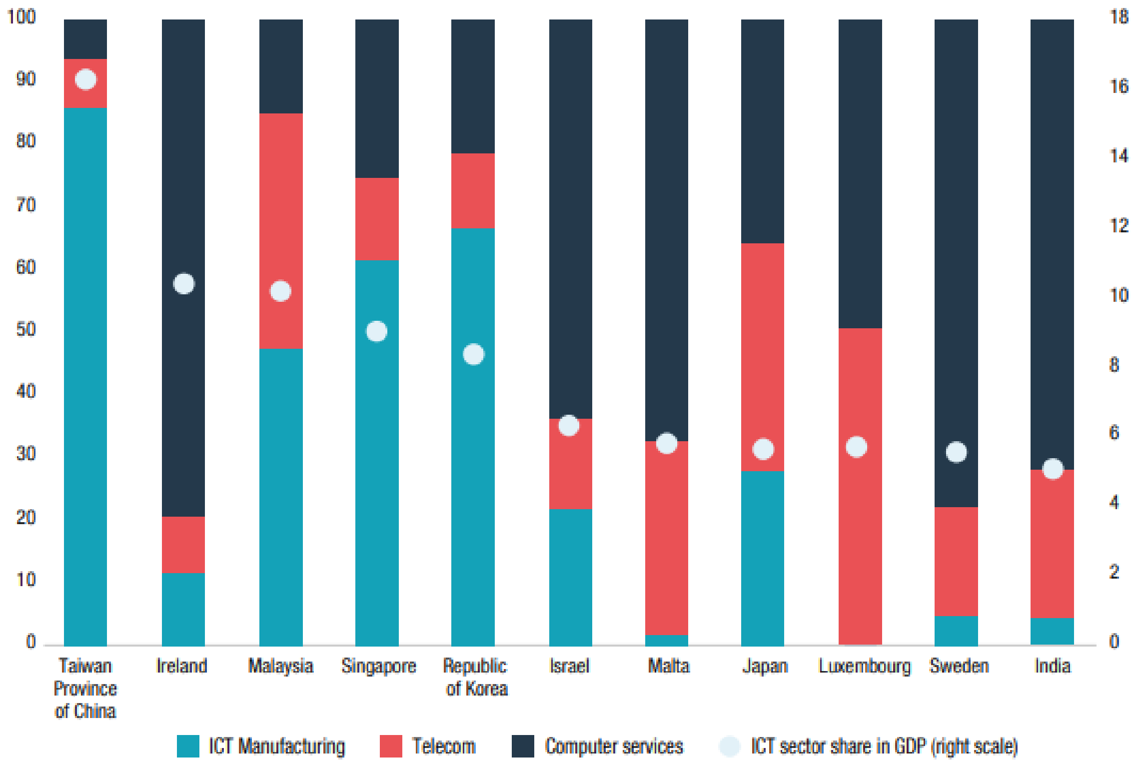


Figure 18: Share of the ICT sector's value added in GDP and its distribution by subsectors: Top 10 economies, 2017 (as %) (UNCAT, 2019)

The ICT manufacturing is highly concentrated, and in 2017 Asia, leaded by China accounted 70 % of the global ICT manufacturing, USA accounted 19% of the global ICT manufacturing, Korea 11 % of the global ICT manufacturing and Japan 10% of the global ICT manufacturing. The only European country is Germany with only 2% of the global ICT manufacturing. Ten economies account for 93% of the global ICT manufacturing and the rest of the world only 7%.

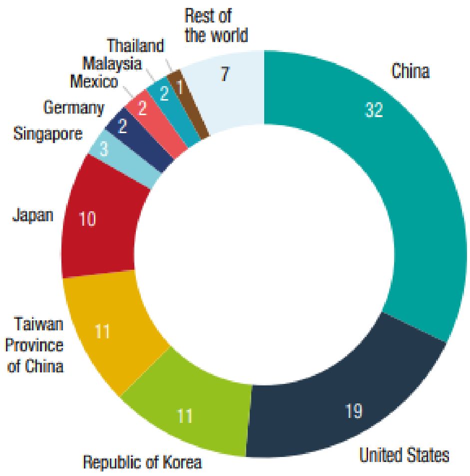


Figure 19: Geographical distribution of value added in ICT manufacturing 2017 (as %) (UNCAT, 2019)

In the following figure are presented the top ten countries in the ICT services, specifically in telecommunications services.

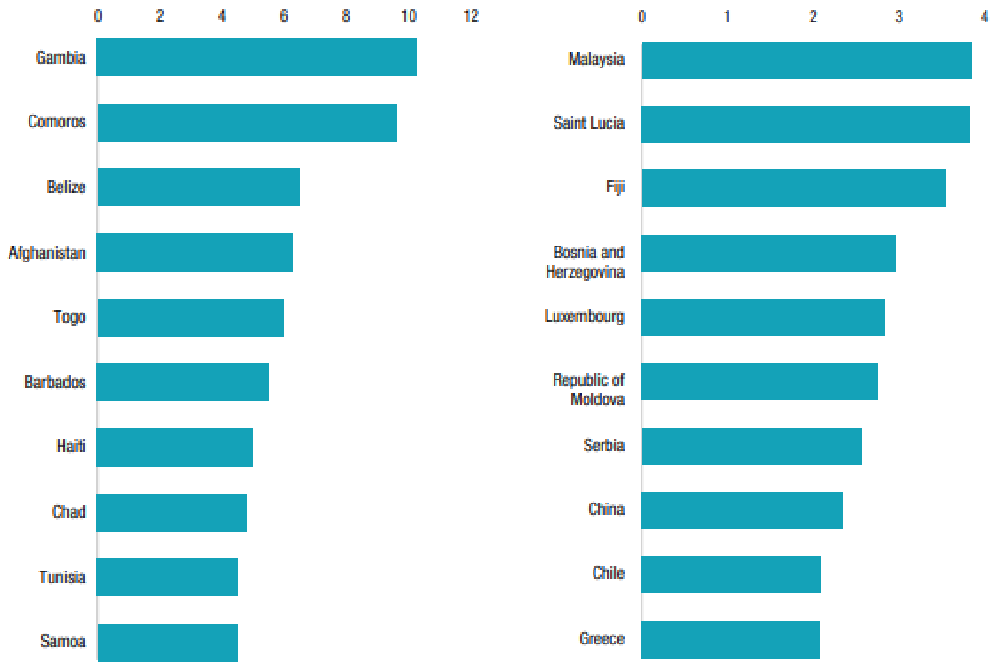


Figure 20: Value added in telecommunications as a share of GDP: Top 10 economies2015, 2017, (as %) (UNCAT, 2019)

U.S. Bureau of Economic Analysis on a publication (Defining and Measuring the Digital Economy, Barefoot et al, 2018) estimates the value added by digital economy , on a current GDP $18.62 trillion in 2016, or 6.5 % of GDP.

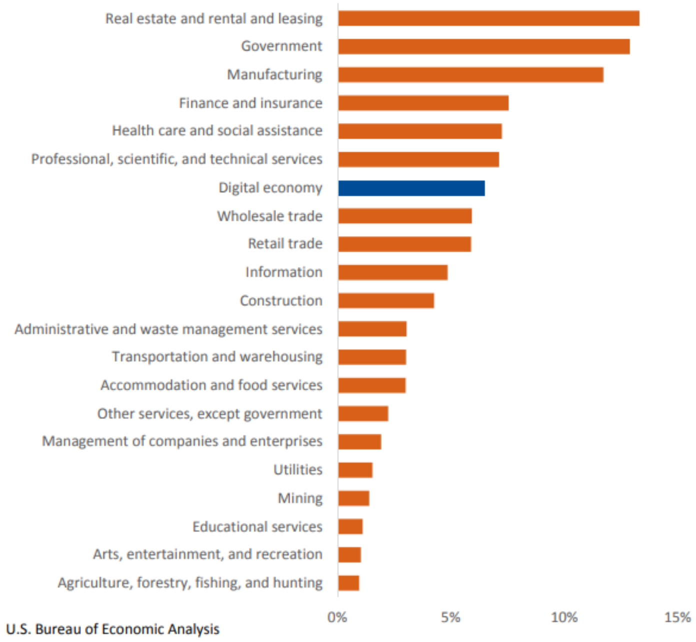


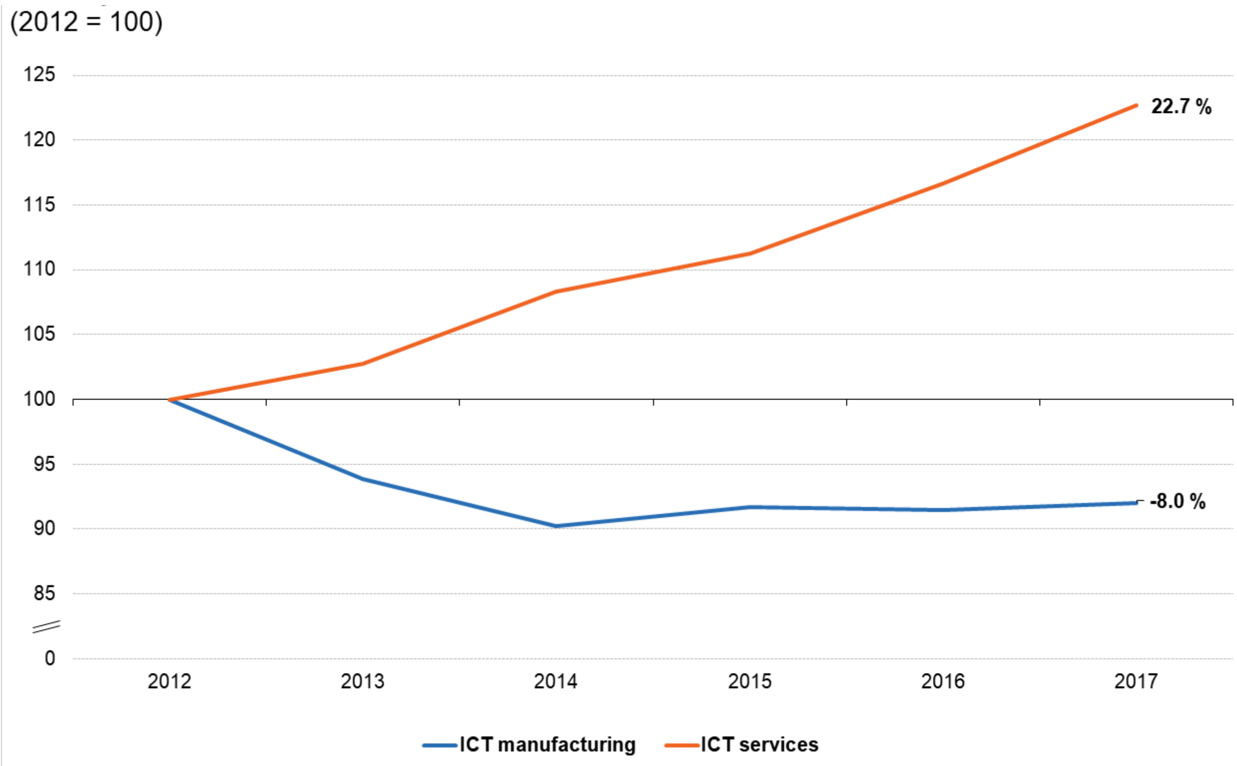
Figure 21: Digital economy and industry share on GDP, 2016 (Barefoot et al, 2018)

4.4 MEASURING EMPLOYMENT ON DIGITAL ECONOMY

Employment is another dimension of the added value of the digital economy, and its refers to the employment on the core and narrow dimension of the digital economy, or employment in ICT sector itself; and to the employment on the wide dimension of digital economy, or employment in ICT occupations in the economy. As previously mentioned there is a shortage of statistics regarding the employment in digital economy. This section uses data a viable from Eurostat, OECD and Bureau of Economic Analyze.

4.4.1 Employment on ICT sector

Approximately 5.4 million people where employed in the ICT sector of the European Union in 2017. There was an increase of the employment for the period 2012-2017. In 2017 the employment in the ICT services increased by 22.7% compared to 2017, while in ICT manufacturing there was a decrease on the employment by 8% compared to 2012.



Graphic 4: Employment in the ICT sector, EU, 2012-2017 (EUROSTAT,2020)

The global employment on the ICT sector increased on the period 2010 to 2015 by 16%, respectively from raising from 34 million to 39.3 million employees, and as a result, its share in total employment also increased from 1.8% to 2%.

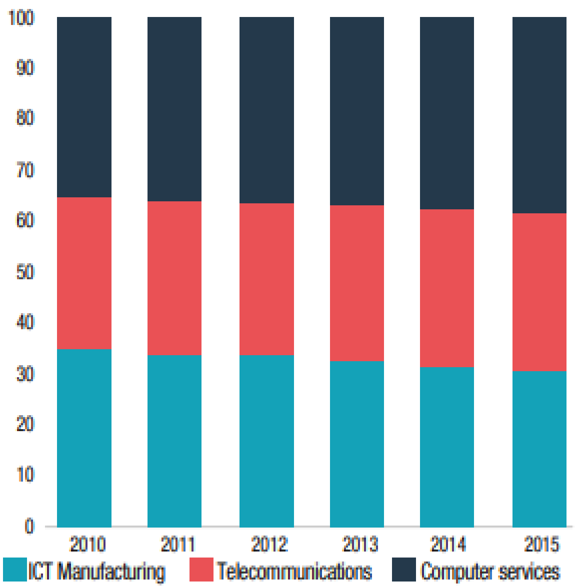


Figure 22: Distribution of global ICT sector employment, by subsectors, 2010 -2015 (as %) (UNCATD, 2019)

In figure 21 we can see the distribution of the ICT global employment divided by subsectors. The employment in computer services has grown more compared to other subsectors. It account for 38% in 2015, compared to 31% of telecommunication and ICT manufacturing employment in the same period.

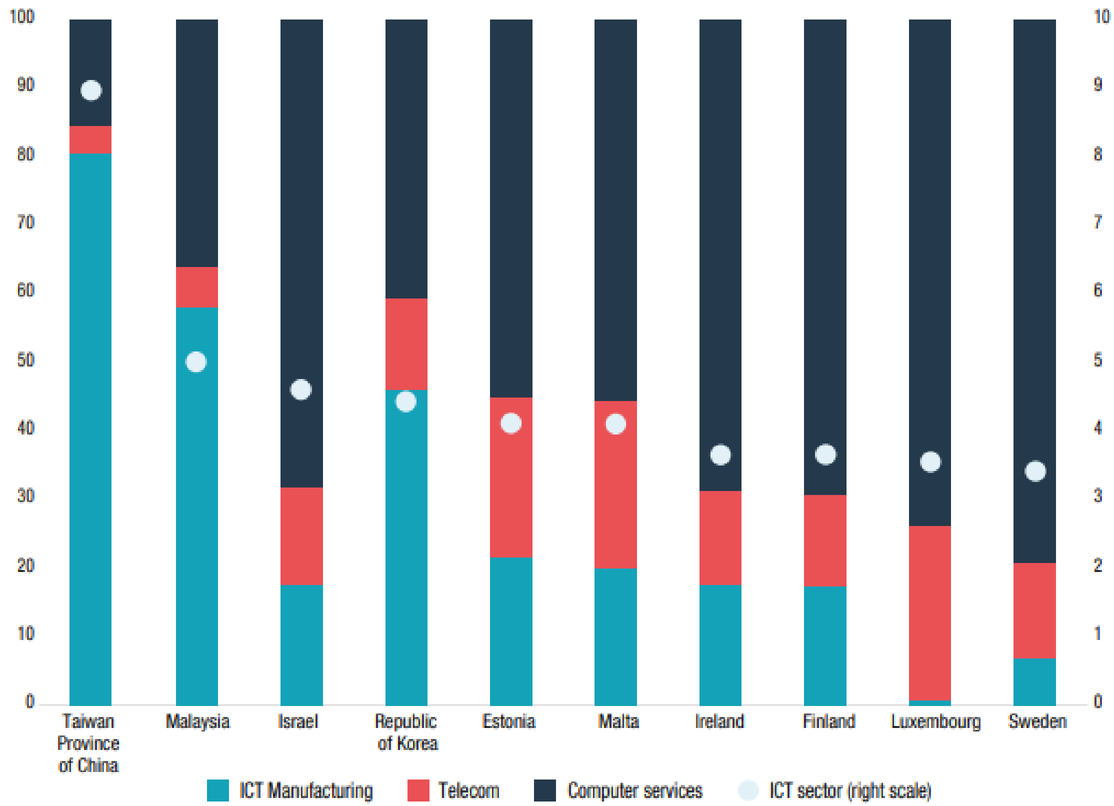


Figure 23: ICT sector employment as a share of total employment and distribution by subsector: Top 10 economies, 2015 (as%) (UNCATD, 2019)

In the ICT sector, the subsector with the higher rate of employment compared to others is computer services. Actually seven countries of the top ten economies, have the largest share of employment in computer services, Israel, Sweden, Luxemburg, Finland, Ireland, Malta and Estonia. Expectations include countries like Taiwan, Malaysia and Republic of Korea where the ICT manufacturing employment rate is higher in the total ICT sector employment rate.

4.4.1 Employment on ICT occupations

Almost in all sectors of the economy there are ICT occupations, ILO 2008 International Standard Classification of Occupations (ISCO-08) identifies over 600 types of jobs, related to digital occupations. However there is very little data available regarding employment on ICT occupations, one of the few countries who have data on the number of employed ICT specialist is Serbia. As we could expect the enterprises that have the highest share of ICT specialist is the ICT sector itself. There are also employed ICT specialists on other sectors of the economy depending on the degree of the digitalization of the sector. The share of ICT specialist increased 0.9% for the period 2013 to 2017, increasing to 3.2 % from 2.1 % of the total employment increase rate.

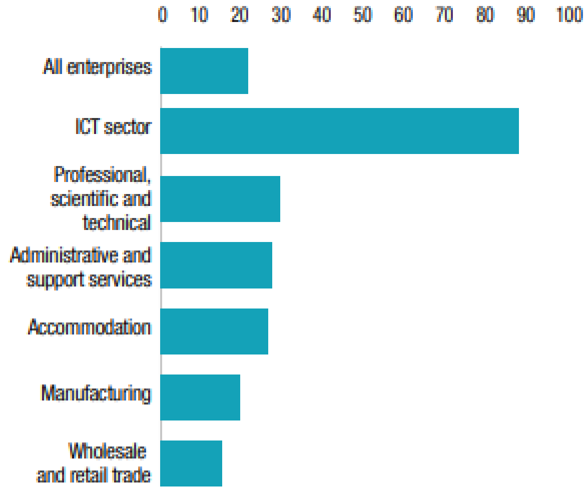


Figure 24: Serbia: Share of enterprises that employ ICT specialists, all enterprises by selected industries, 2018 (as %) (UNCATD, 2019)

In USA the employment on ICT sector accounted for 5.9 million people or 3.9 % of the total employment of the USA.

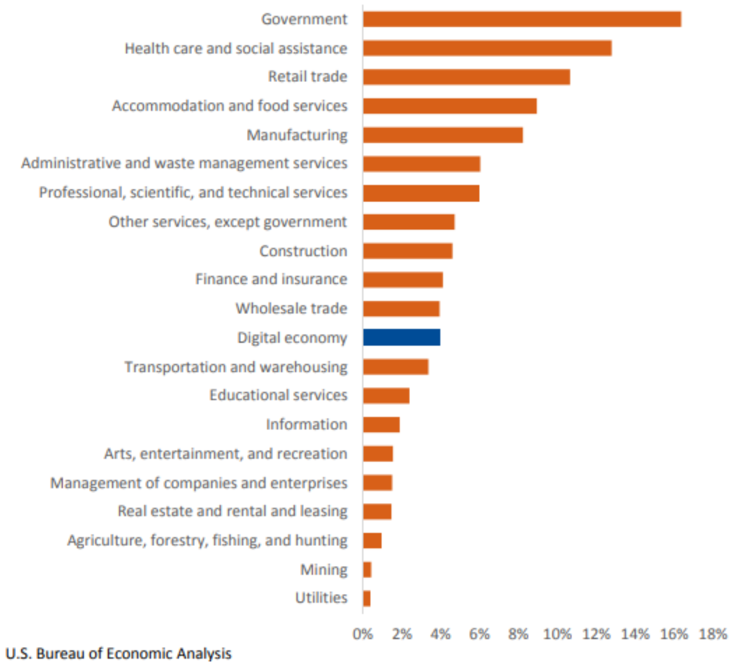


Figure 25: Digital economy and industry share of total employment, 2016 (Barefoot et al, 2018)

4. 5 ADDED VALUE FROM THE TRADE RELATED TO THE DIGITAL ECONOMY

The trade of ICT goods and services creates added value for the economy, creates new employment opportunities and generate revenues from international exchange.

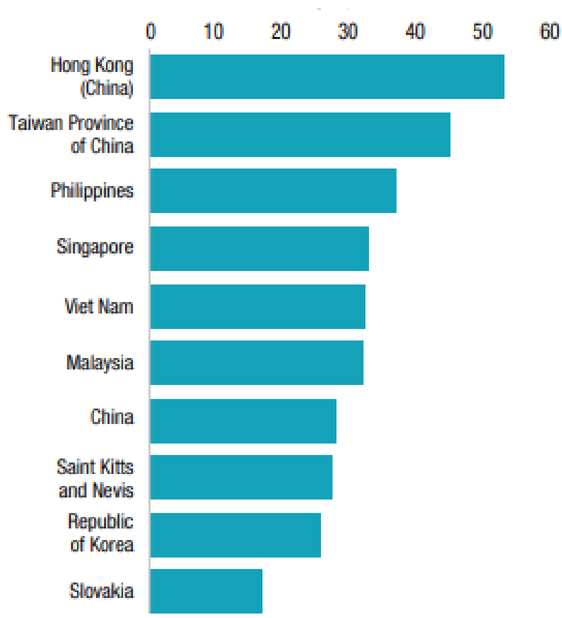


Figure 26: Share of ICT goods trade in total merchandise trade Top 10 economies, 2017 (as %) (UNCATD, 2019)

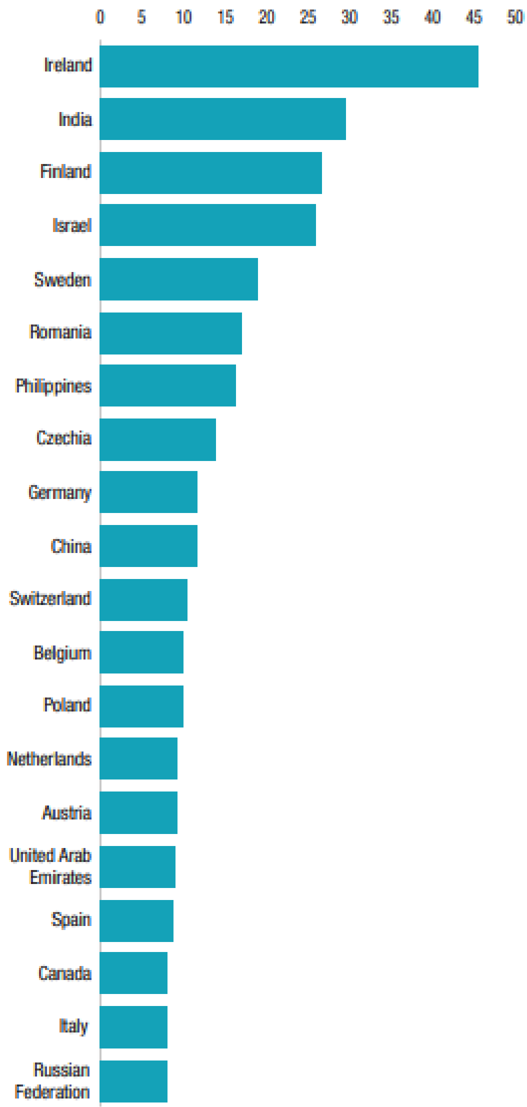


Figure 27: Share of ICT services trade in total exports of services: Top 10 economies, 2017 (as %) (UNCATD, 2019)

As it can be seen from figure 25 and figure 26 only few countires have been successful at exporting both ICT goods and services, like Philippines. Trade in ICT goods globally accounts the value of $1.9 trillion in exports in 2017, while the trade in ICT services accounts the value of $568 billion in exports in 2018. Hong Kong, Taiwan and Philippines have the largest share of export of ICT goods in total exports, while Ireland and India have largest share of export of ICT service in total exports. Due to digitalization more and more services are now delivered over ICT networks. In 2018 the value of services delivered digitally accounted to $2.9 trillion.

ICT-enabled services are services delivered remotely over ICT networks (UNCTAD, 2015), the size and composition of these services is hard to measure and their estimation is made on official statistics of exports of those services that could potentially be delivered digitally, like financial services, insurance and pension services, charges for the use of intellectual property, computer and information services telecommunications, , other business services, and audiovisual and related services. In 2018, exports of digitally deliverable services amounted to 50 % of global services exports. They had an annual increase of 7% annually for the period 2005–2018. This significant growth of digitally delivered services is explained by the increasing digitalization of the economy.

The trade of ICT goods is highly concentrated in a few economies; ten big exporter economies account 99.6 % of the total value of ICT goods exported in 2017. The largest exporter is China with a share of 38%, followed by the European Union with 18% share. Mexico has 4% share on the total value of IVT goods exported in 2017, and approximately 83% of it was to United States of America.

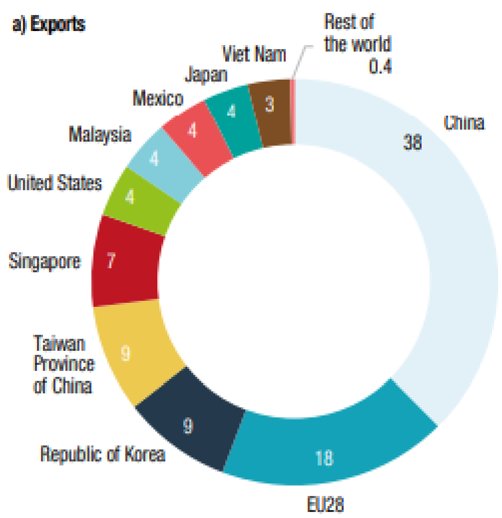


Figure 28: Geographical distribution of trade in ICT goods, 2017 (as %) (UNCATD, 2019)

4. 6 DIGITAL PLATFORMS - DIGITAL MNEs

Multinational enterprises on the digital economy are classified in two groups by UNCTAD: Digital MNEs and ICT MNEs. Digital MNEs differ from other multinationals in several aspects: internet has a central role on their operating model; they can reach foreign markets with less commitment on assets; are headquartered in few countries, etc. Digital MNEs include purely digital players: providers of digital platforms and digital content; also mixed players: e-commerce and digital solutions. ICT MNEs include IT companies that enable the infrastructure that makes internet accessible to individuals and other business, specifically hardware, software and telecom firms.

As previously discussed, in the digital economy data is the new oil, and nowadays highest ranked companies are focused on data and data intelligence. The platform based economy is growing fast moving from a combine market value of $4,304 billion in 2015 to $7,176 billion in 2017, 67 % higher (UNCTAD ,2019). There is a high geographical concentration of the platform economy, where the USA accounts for 72% of the total market capitalization, followed by China with 25% and Europe only 2% and the rest of the world 1% (Dutch Transformation Forum, 2018; UNCATD, 2019). When considering the number of platforms there is less concentration, however USA is ranked again in the first place with 46%, followed by China accounting for 35%, Europe accounting 18% and the rest of the world 1%. Microsoft, Apple, Amazon, Google, Facebook, Tencent and Alibaba accounted

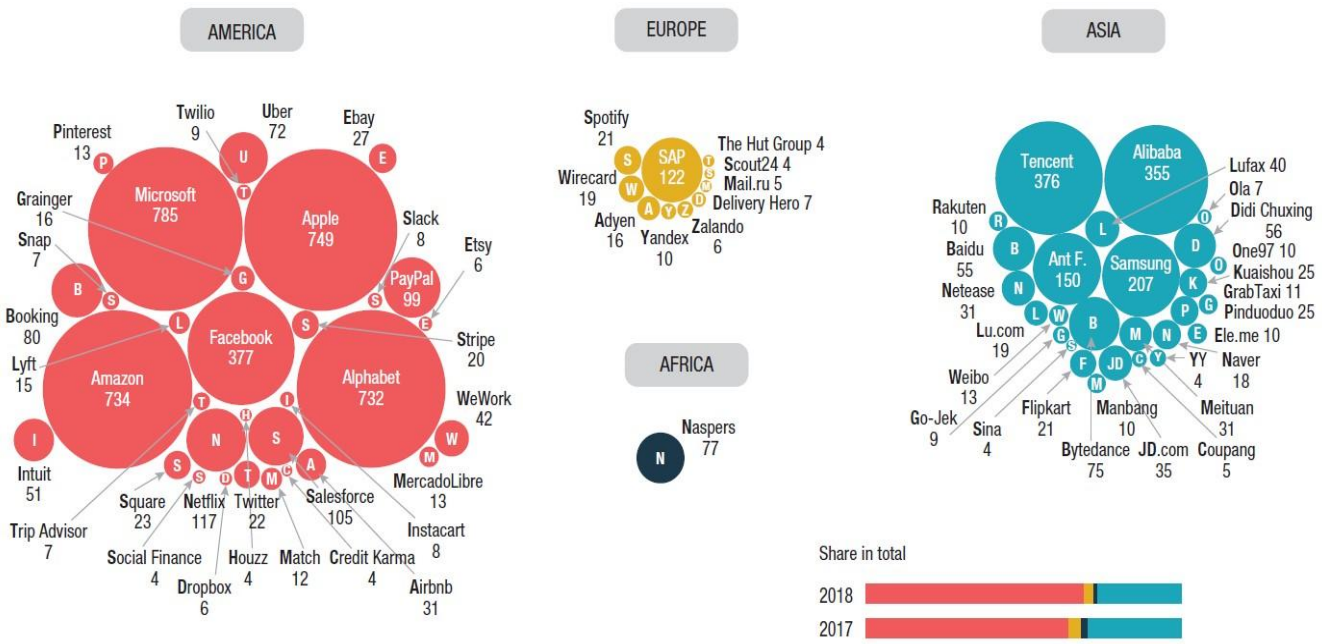


Figure 29: Geographical distribution of the main global platforms in the world (Market capitalization in billion dollars) (UNCATD, 2019)

for 2/3 of the total value of market capitalization in 2017, with each having a market value bigger than $250 billion. In 2018 and 2019 only Microsoft, Apple and Amazon exceeded a $1 trillion market valuation each.

Regarding the profits USA companies in 2015 earned 80% of the profits of the world's largest platforms, compared to only 5% earned by European companies. Google is the global leader in the searching engines, and holds about 90% of the market share; Facebook is the global leader of social media platforms and holds about 66% of the market share. For both companies digital advertising is the main source of revenue, in 2017 65% of digital advertising was made by these two companies. Amazon is the bigger online retailer, with a global market share of 37%, while Alibaba is estimated to have 60% of the Chines e-commerce. Their main source of revenue is commissions or fees for each transaction.

Data related companies have attained high capitalization and market valuations, even when they are running considerable losses. These "unprecedented" investments are made on the base of an expected disruption and re organization of the whole economic sectors that will enable the generation of high profits on the future. For example Walmart in 2018 bought 77 % control of the Flipkart, a new company with few tangible assets, for $22 billion despite the considerable losses of this company. The same happened to Uber which had the first public offering in 2019, despite a long history of losses.

Digital MNEs are becoming factors of disruption in economic sectors, such as retail, transport and accommodation, or health, education and agriculture, banking, media etc. The priority of digital global platforms is to secure a string market position by getting control of data.

4.7 INDUSTRY 4.0 FACING THE PANDEMIC COVID -19

Considering the actual situation and the ongoing Covid-19 pandemic in the last section is shortly presented how industry 4.0 is helping to reduce its negative effects, also which are the strength, weakness, opportunities and challenges in its implementation.

The coronavirus appeared initially in China, and grow into a global pandemic leading to a big economic downturn, even bigger to the economic downturn in the 2009 (Czifra & Molnar, 2020). The confirmed cases of Covid-19, from the World Health Organization, until September 2nd 2020, are 25.602.665 including 852.758 deaths, globally.

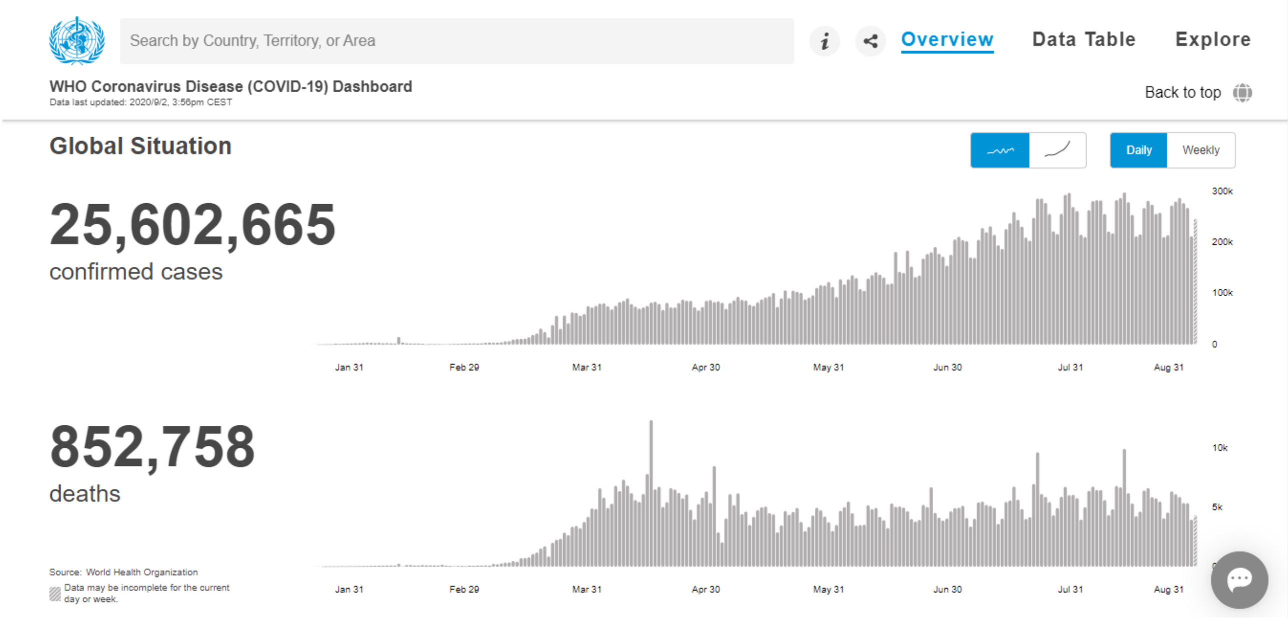


Figure 12: Covid-19 dashboard (https://covid19.who.int/)

Many people become infected and ill and were forced to quarantine, and as a result in many factories the production, at least partially, stopped causing a disruption in the supply chain. Others, to safeguard personal and public health are remotely working from home; many congresses conferences and exhibitions of technology planned in 2020, were canceled or rescheduled. The covid-19 emergency brought a whole new level of uncertainty in the market, without precedents in the modern history of manufacturing (Czifra & Molnar, 2020).

As previously discussed the volatility of markets is one of the driving forces of the fourth industrial revolution, and firms are investing in flexible structures, processes, manufacturing systems to deal with those sudden and unexpected changes (Bartodziej, 2017). The Covid-19 pandemic is one of those unexpected changes that have taken the world as a surprise. In this section we will try to understand if the actual level of implementation of industry 4.0 has somehow helped firms and global economy to deal with the ongoing global pandemic. It's important to underline that the there is a little literature on this subject, since the covid-19 pandemic has begun just a few months ago.

According to Czifra & Molnar (2020), thanks to the technological advancement of the fourth industrial revolution, huge steps were made in a short time for digitalization of companies, education and even in the field of medicine; but industry 4.0 wasn't that helpful regarding the manufacturing and logistics firms, which resulted to be the most vulnerable and inflexible. Different parts of the supply chain were affected simultaneously paralyzing the markets (Ivanov & Das, 2020).

The pandemic highlighted the need for rapid and secure remote interactions, communication and the transfer of huge amount of data. Accordingly to those needs tele health and teleconferences were further developed and exploited. Telehealth allows doctors to diagnose, treat and care for patients remotely, ZTE and China Telecome designed a 5G-system to diagnose and make consults of the covid-19, also many mobile tracing apps were introduced. And since many employees are working from home, teleconference platforms like Zoom were developed; while Google is holding a 9 weeks on-air conferences, the Google Cloud Next '*20*, to replace *Google Cloud's* annual conference.

Kamal et al. (2020) conduct a SWOT analyze of IoT in the perspective of the Covid-19 pandemic, with the following results. Strengths and weakness are internal factors limited to the organization trying to implement IoT in any area,opportunities and threats are external factors that depend on the market. The implementation of Internet of Things to fight the Covid-19 offers much strength; sensor perceive real time data and store it into the clouds, that in turns can be used to timely diagnose and treat patients; also it can help to spread information about the pandemic and improve forecasting; and as e result there is and will be a high demand for IoT systems. Since there is a large number of working IoT devices all the system has to adapt to process and secure the data, starting from higher processing power, increased security, high bandwidth and efficient use of limited spectrum. Implementing IoT to combat Covid-19 pandemic offers a lot of opportunities like increased awareness and new job opportunities, also the possibility to further develop technologies of mmWave and 5G, cognitive radio networks and cooperative communications. The major threats are the use of non-licensed bands and compatibility of devices.

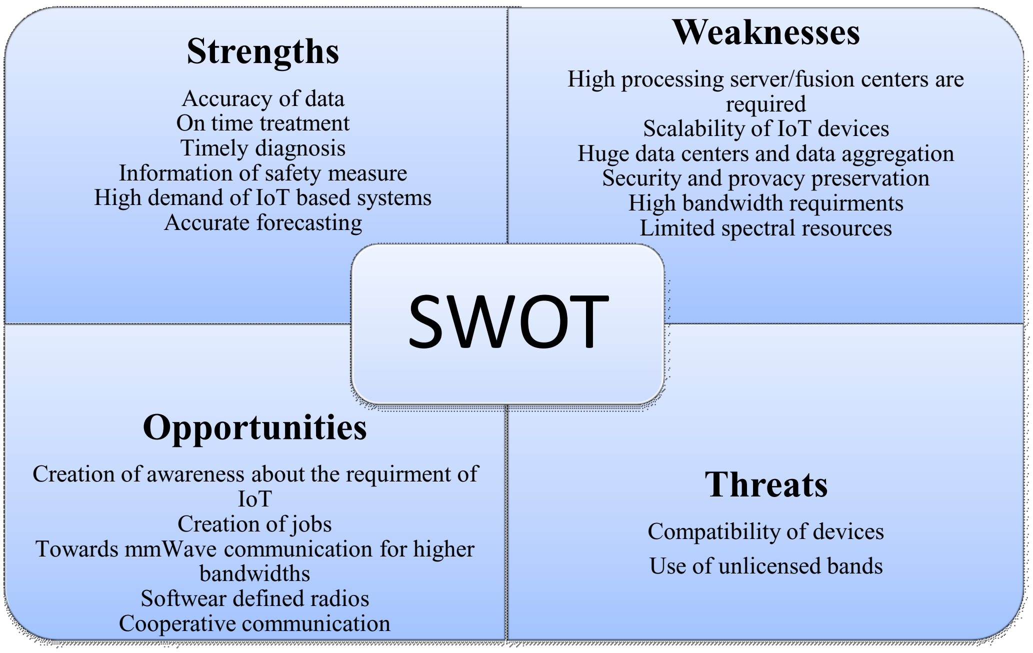


Table 6: SWOT analyze (Kamal et al., 2020)

Vaisha et al. (2020) also analyze how the key technologies of industry 4.0 can be used to combat the covid-19 pandemics. For example artificial intelligence integrated with thermal imagining and computer vision can help to detect the virus, by finding individuals with fever; cloud computing allows to store and make available all the necessary information to make real time decisions; big data provides the storage for extensive data that can be used to analyze and take the necessary actions to prevent the disease transmission and health monitoring; IoT and connected devices enable the communication with the medical staff for real time diagnose and treatment; robotics can make high precision repetitive jobs in hospitals, and with the help of Ai can make intelligent decisions; additive manufacturing can create personalized devices for healthcare workers and patients (Vaisha et al.,2020). And some of these technologies are already in use, like the robot with thermal sensors used in Chine used to identify people with fever in public spaces; or smartphone applications used to keep in touch patients with healthcare personnel.

Schröder et al., (2020) argue that robotics technology can be used also to also to create supportive relationships, since social distancing/isolation have led to loneliness.

Industry 4.0 has partially helped to cope with the ongoing global pandemic helping businesses to survive, will also help to shorten the recovery phase of damaged businesses. In the future industry 4.0 will have a major role to provide a platform necessary to create more flexible and resilient business (Czifra & Molnar, 2020).

Conclusions

The fourth industrial revolution, or the so called industry 4.0, is powered by technologies like internet of things (IoT), cloud computing, big data analytics, augmented reality (AR), machine-to-machine communication (M2M), robotics, additive manufacturing, and cyber security. The digital technologies have a disruptive nature and optimize manufacturing process and logistics systems, but also improve flexibility, knowledge creation and exchange, inter organizational collaboration, and support decision makers; they create new options for revenue and vale creation in the economy. Digitalization enhances both customer interaction and customization, and creates the possibility for an accelerated growth.

The use of these technologies, in the industry and the whole economy is changing the path, timing, pace and rhythm of internationalization process. Is affecting the entry mode choice, the learning ability of firms and consequently their ability to manage the liabilities of foreignness and outsidership.

Internationalization process in the digital economy is cheaper, faster; the average penetration time has been reduced from multiple years to just few weeks. The born global firms are an example how the internationalization process is completely different. Digitalization has also an impact of the accessibility, resources and distance/location and national borders are dematerialized. Digitalization has created a global market that involves both economic and social transactions. Digital firms are more exchange – oriented than production oriented.

Digitalization has also changed the way value is created and captured, where data is the most valuable assets. The scope and scale of data usage has fundamentally changed. Data is used as a tool to enhance performance of companies by facilitating decision-making, coordinating existing business operations, introducing new services/products, and facilitates value creation. Companies create and capture value using big data by identifying customer needs, creating data driven knowledge, design product/service, quality and risk management, recognizing and creating opportunities;

Data is the "*new oil*" and the ability of the firms to monetize the big data can create a competitive advantage. Big Data monetization is converting into real value, the intangible value of data. Data monetization is related the generation of revenue that can be achieved by both increasing incomes or by avoiding costs. Firms can use data and generate value from it by: improving the organization internal process as and decision-making; structuring and wrapping information around the organization core products and services; selling information/data to new and existing markets.

Digital platforms or the so called "giants of internet" have the capacity and aggregate, process, store and analyze data in order to create value, and "*digital data and digital platforms can therefore be viewed as two sides of the same coin for much of the value creation that takes place in the digital economy*" (UNCTAD, 2019, p.30). Despite the challenges in measuring the economic value of the digital economy given it broad scope, OECD, EUROSTAT and UNCATD have periodically attempted to measure the economic value of the ICT sector. In the European Union the total value added for the ICT sector was around EUR 475 billion in 2017, equivalent to 3.6% of GDP. The value added in ICT manufacturing in the 2017 was dominated by the manufacture of electronic components and boards which accounted for more than half, while the value added on ICT services in 2017 was dominated by computer programming, consultancy and related activities accounting.The platform based economy is growing fast moving from a combined market value of $4,304 billion in 2015 to $7,176 billion in 2017, 67 % higher.

Another important features of the digital and platform based economy is its geographical concentration. ICT manufacturing is highly concentrated in Asia, specifically in China, which accounts for accounted 70 % of the global ICT manufacturing in 2017, followed by USA accounting for 19% of the global ICT manufacturing, Korea 11 % of the global ICT manufacturing and Japan 10% of the global ICT manufacturing. The only European country is Germany with only 2% of the global ICT manufacturing.

The trade of ICT goods is also highly concentrated. The largest exporter is China with a share of 38%, followed by the European Union with 18% share. Mexico has 4% share on the total value of ICT goods exported in 2017.

There is a high geographical concentration also on the platform economy, where the USA accounts for 72% of the total market capitalization, followed by China with 25% and Europe only 2% and the rest of the world 1%.

Considering the actual situation and the ongoing Covid-19 pandemic the last section of this thesis is focused on the ways industry 4.0 and its technologies are helping to reduce the negative effects caused by the pandemic. Huge steps were made in a short time for digitalization of companies, education and even in the field of medicine; but manufacturing and logistics firms, resulted to be the most vulnerable and inflexible. Technologies like telehealth and teleconferences were further developed and exploited. Telehealth allows doctors to diagnose, treat and care for patients remotely, ZTE and China Telecome designed a 5G-system to diagnose and make consults of the covid-19, also many mobile tracing apps were introduced. And since many employees are working from home, teleconference platforms like Zoom were developed.

Implementing IoT to combat Covid-19 pandemic offers a lot of opportunities like increased awareness and new job opportunities, also the possibility to further develop technologies of mmWave and 5G, cognitive radio networks and cooperative communications. The major threats are the use of non-licensed bands and compatibility of devices.

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