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"CIRCULAR ECONOMY: LIMITS AND BENEFITS
OF ITS IMPLEMENTATION"

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LIST OF ABBREVIATIONS

CE	Circular Economy
EC	European Commission
EU	European Union
UN	United Nations
IT	Information Technology
TLM	Traditional Linear Model
SSC	Sustainable Supply Chain
SME	Small Medium Enterprise
GDP	Gross Domestic Product
WTO	World Trade Organization
IoT	Internet of Things
CPS	Cyber Physical System
TFEU	Treaty Functioning on European Union
OECD	Organisation for Economic Co-operation and Development
WCED	World Commission on Environment and Development
MDGS	Millennium Development Goals
UNEP	United Nations Environment Programme
EMAS	Eco-Management and Audit Scheme
UNCED	United Nations Commission in Environmental and Development
USITC	United States International Trade Commission
BRICS	Brazil, Russia, India, China and South Africa

INTRODUCTION

Circular economy topic is gaining increasing attention along with importance of critical forecast associated with the overemployment of natural environment. In response of these challenges, as alternative of the classic linear take-make-disposal model, Circular Economy model provides an array of solid patterns aimed at improving resource efficiency, systematically designing out any sort of material waste and disposal. The transition towards the circular economy has started in the last years, but there still are considerable steps to undertake in order to complete the transformation. In term of business opportunities, Circular Economy represent, together with Industry 4.0, one of the main developments for contemporary companies and be able to master the matter will provide an incredible advantage.

This study represents a contribution to the Circular Economy subject, analysing both theoretical framework and real case studies, highlighting limits and benefits that the actual economic context present for those companies willing to adopt these new principles.

The first part explores what the sustainability concept includes; reporting definitions, assumptions and literature on the argument. Studying the position of institutions as United Nations, as well as other documents focusing on the possibility for an effective implementation of an “ability-to-sustain”, it has been clarified in what terms businesses interact with environment and society.

The second part of the study investigate the theoretical framework on Circular Economy; introducing Circular Economy principles, comparing them with the linear system, and providing to the reader the instruments to understand the specific argument carried out.

The third part start investigating which have been the main limitations encountered by those companies that have faced the decision to adopt the circular pattern, ending with a summary of the benefits appreciated.

The fourth part analyse legal principles at European Community level, briefly mentioning legislators' tools suitable to address environmental policies, the main initiatives undertook, and the special policies launched to support SMEs.

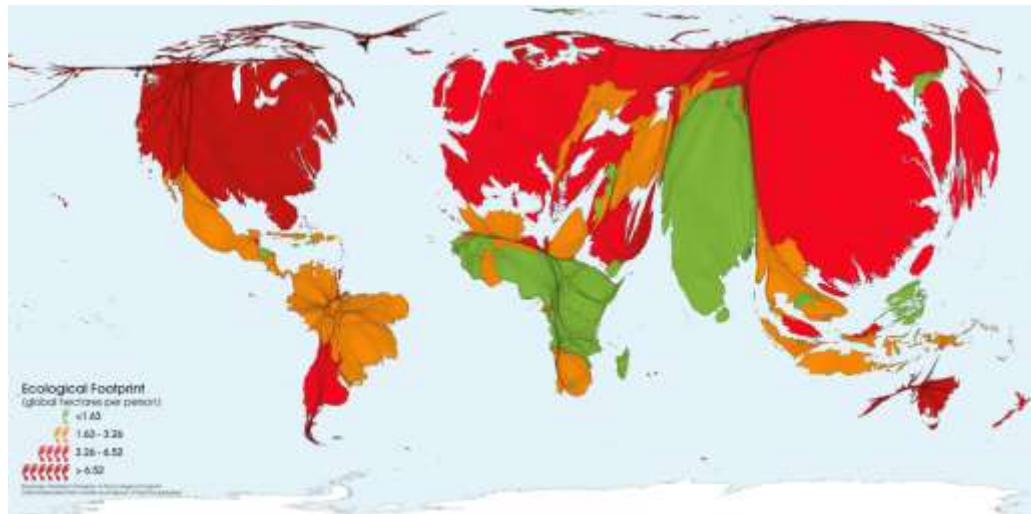
The final part of this study it is dedicated at the description of 4 case study of small-medium companies which deliberately chose, or were pushed to choose, a circular model of business. The case studies presented are crucial for understanding those criticalities that lead companies to consider the opportunity of implementing a circular business model.

CHAPTER 1 - SUSTAINABILITY

1.1 - WHAT DOES SUSTAINABILITY MEAN?

Considering the environmental aspect, the deterioration of environment, habitats, ecosystems, natural resources, have been widely discussed in literature, eventually cataloguing linear economic growth pattern as responsible. The enormous pressure imposed by population increase and growth paradigms, placed an unprecedented tension on the world's ability to secure human development. Well known are the estimates on ecological footprint and performance gap required to let the environmental regeneration offset environmental impacts. Indeed, the so-called overshoot day in 2019 was passed just the 29 of July. In order to easily explicate what is

Figure 1 – Ecological footprint for 2019. Source: WorldMapper <https://urly.it/341vr>



associated with this fact, the idea is that currently human beings are consuming resources at a 50 percent faster rate than they could be replaced by the planet regeneration (Figure 1). By 2050 in fact, is expected that human demand will require more than three planets worth of natural resources, if the planet will be able to meet it (Mark Esposito, March 13, 2018).

Clearly, the actual paradigm does not entail the ability and the possibility to sustain human population growth and development. Therefore, launched in 1992 at the World Summit

on Sustainable Development and reconfirmed later at the Rio+20 United Nations Conference, the idea of a sustainable consumption and production have been defined as “the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resource and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not jeopardize the need of further generations” (Boyd Cohen, 2015).

Historically speaking, the term “sustainable development” was firstly¹ coined in 1987 by World Commission of Environment and Development (WCED) which introduced this concept that over time has exponentially increased its significance². During the following years, with the growing importance and pressure from consumers, stakeholders, regulators, competitors, communities and nongovernmental organizations; industries and markets radically evolved integrating, innovation after innovation, more conscious practices devoted at its adoption in their business program. The first insights around sustainability concept were focused solely on nature conservation aspects. WCED definition reads in fact as follows: “development that comes across with the needs of the present. In the context of finding a balance in regard with the capability of next generations to satisfy their needs” (Commissioner Brundtland, UN, 1987). Just in these two lines, we could already appreciate two key points: first, the “needs” for future generations interest to balance an equitable human development, and second, the idea of some necessary restrictions to be enforced by states and social organization on environment exploitation in order to lead at that.

With time however the sustainable development concept has been expanded, involving other major aspects. During the Johannesburg Summit for the first time, has been denoted a significant shift towards the inclusion of social and economic issues. Indeed, according with

¹ Some German scholars date back to 18th century, to Hans Carl Von Carlowitz the first assumptions on term sustainability. His thought already at that time embraced the idea on not harvesting forests more than their ability to generate new growth.

² Sustainable development concept was introduced in the report “Our Common Future”, published by United Nations through the Oxford University Press.

UNCED *United Nations Commission in Environmental and Development*, today it is accepted a sustainability idea based on the following three “primordial” pillars: *environmental control*, *economic expansion* and *social equity*. Therefore, with the addition of economic expansion and social equity ideas have been added the two main elements that today compose the sustainability concept. If references to economics aspects are aimed at an intelligent integration between environmental aspects and economics, social equity references aim at a promotion of fair and equitable resource distribution.

In sum, the more traditional idea of a sustainability purely based on environmental challenges has been gradually replaced by a more dynamic triple-requisite ones which include very different dimensions that today contribute in sustainability concept.

1.2 - 10 PRINCIPLES OF UNITED NATIONS GLOBAL COMPACT

United Nation has expanded sustainability concept further beyond the environmental problem aspect. Indeed, in addition to what has already been introduced, today sustainable development principles just introduced could be reconducted at several and several themes as for examples: fighting against poverty, social inequality and operating against conflicts.

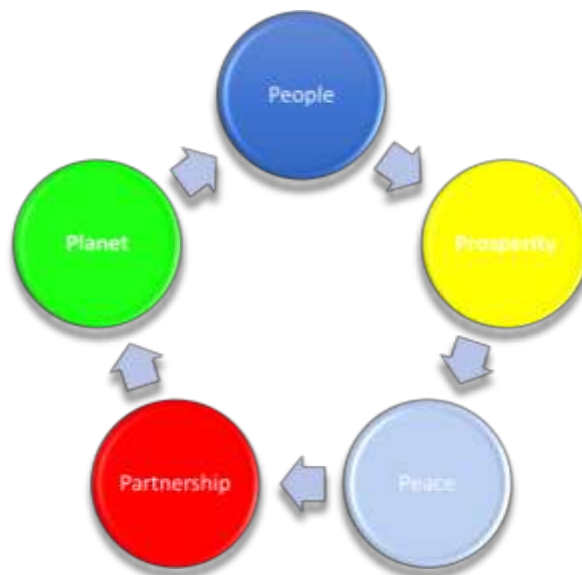
Since the later 20th century, the linear idea of economic development, with social modernization and technological progress has been challenged by those failed policies which were aimed to decouple ex-colonies economies. This failure in relaunching the third world, opened up to free-trade hypothesis, based on the assumption that international commerce would have solved stagnant economy and low productivities issues, as well as the and unbalanced balance of payments for these contries. With the arrival of the oil crisis and the ambiguous results obtained however, the moves carried out by institutions as World Bank, started to be questioned. The approach consequently adopted was being set up based on the idea that a new development, beyond the sterile domestic product growth, was necessary. The new orientation was pointing in the direction of a desirable satisfaction of fundamental needs, of a desirable occupation creation, eliminating those elements as public debt, public expenditure, waste and corruption which were subtracting financials to sanity, instructions and infrastructures (Bourguignon, 2015). From these event and ideals, new human centred development approach have been developed, entailing therefore economic, social, cultural and political aspects, which together lead to a “pro-poor” political experience, fighting inequality and promoting human welfare.

This cultural process eventually merged into the so-called development of “Millennium Development Goals”, series of 8 objectives to be reached hypothetically by 2015. Its adoption definitively decrees the evolution of international communities’ focus, now moved from economy perspective to an individual one. If we could surely define the Millennium Development Goals a milestone of sustainable development, with time, during the period between 2011 and 2015, United Nations studied and deepen these cited aspects which would have been as the plausible development of previous social objectives. Launched by the end of

2015, the Agenda 2030, was ideated in order to terminate the visionary work started with through its millennium development objectives.

Built one the hells of this human centered social revolution, the Agenda recognized in first place the 5 key concepts (Figure 2) currently at the base of United Nations strategy, indicating as well the need for a more energetic multilateral approach possibly involving as many actors as possible. The ideal condition was to involve all possible stakeholder who might have interest in a more ethical development, not just intergovernmental organization as happened for MDGs.³

Figure 2 – 5 key concepts for Sustainable Development Goals



The recognition of these 5 major pillars represent in fact, according to UN, the driving direction in order to stimulate prosperity, accounting also for economy, planet safeguard and, of course, social aspects.

³ Should be pointed out that, since MDGs were especially undertaking social dimensions aspects, they have been promoted exclusively by intergovernmental organization with no economic interest.

It is interesting notice how in response of the Agenda, in last years effectively poverty has lost ground, leaving however space to another bad issue, inequality. Indeed, inequality, in last years have been an unstoppable phenomenon. Its effect does not be expected to decline quickly at all. It is appropriate underline that inequality does not refer only at the economical aspect, but instead it covers a wide range of matters, ranging from works, to richness, gender differences and

Table 1 – Sustainable Development Goals – United Nations



- Goal 1. End poverty in all its forms everywhere.*
- Goal 2. End hunger achieve food security and improved nutrition and promote sustainable agriculture.*
- Goal 3. Ensure healthy lives and promote well-being for all at all ages.*
- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.*
- Goal 5. Achieve gender equality and empower all women and girls.*
- Goal 6. Ensure availability and sustainable management of water and sanitation for all.*
- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all.*
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.*
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.*
- Goal 10. Reduce inequality within and among countries.*
- Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable.*
- Goal 12. Ensure sustainable consumption and production patterns.*
- Goal 13. Take urgent action to combat climate change and its impacts.*
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.*
- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.*
- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.*
- Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development*

intergenerational mobility (OXFAM , 2019). Reducing inequality therefore, as well as fighting other social problems, will have the effect of improve social fairness and therefore will also have an indirect effect on the cohesion of citizen. The idea to solve these problems is that boosting education, supporting employment policies, increasing social capital⁴, there will be a medium, long-term beneficial effect on individual states' economy, and consequently on the global one. The 2030 plan was built weighting up the transformed geopolitical asset, starting from the crisis of democracies governments, to personal security fears and human rights protections. The new agenda finally identified these 17 new sustainable development goals and 169 minor targets needed to check the effective implantation.

All these considerations just mentioned have posed the ground for United Nations sustainable development goals. Minimum desirable requirements or responsibilities when speaking of human rights, labour, environment, anti-corruption, forced works, poverty, inequality and climate change, are all different intermediate steps in chasing the main specific objective of UN, which is eradicate inequality. Not coincidence is in fact that the motto of the 2030 Agenda is exactly “Leaving no one behind” (United Nations, 2015).

Signed by more than 1200 business and non-business participants, UN has developed a portfolio of Action Platforms to advance responsible business activities and help those companies facing gaps in meeting the Global Goals.

⁴ Social capital is defined by professor Carlo Cottarelli as the capacity of bearing consequences when evaluating the course of action of our actions. The idea is that internalizing the consequences human beings might change behaviour in doing an action (Cottarelli, 2018)

1.1.1 - ESCALATION OF THE CONCEPT. TONY FRY POINT OF VIEW

Even if majority of academics are positive when looking at sustainable evolution aspects and at the ability of human being to stemming the unsustainable exploitation of Earth, in literature exists others, less known and less studied authors, whose philosophy of thought significantly differ. An unusual, but sobering discordant voice for example, is given by professor Tony Fry. It is interesting observe the view of this theorist, professor of design and philosopher. In his opinion, the current environmental situation appears way worse than what we are used to think. In his papers, he exposed how the difficulties human beings are facing during this particular historical moment, are in reality insurmountable obstacles, unless a radical and exhaustive turnaround. Indeed, the most critical argument he is sustaining, is that still exist an enormous gap between what *we are doing* to tackle problems, and what *we should do* in order to sincerely eradicate difficulties encountered. Only when we eventually will become fully aware of the criticality of this moment, we will act coherently in order to face and overcome the unsustainability of human development.

The linear economic system, based on the notion of a perpetual economic growth where production drive consumption, is correctly translated into a consumption-centred paradigm, which currently is driving both renewable and finite resources at a faster rate than they can be replenished. Exactly the concept of temporality and short horizon are intended as the biggest concerns for the author. He accuses humanity to lack the sense of the time and timing, making human being lethargic about actions which instead should be undertaken quickly. The main bias he exposes when speaking of humanity, it is in fact our inability to see more than 40 or 50 years above. Another aspect often raised by professor Fry is that humans tend to see unsustainability as an empirical problem (climate change, resource pressure, population growth, increasing demand of goods) which consequently may be solved looking at a combination of classical economics, new tech and humans becoming smarter.

In his view however, short-term solutions we are adopting will not work at all. Arguing also that greater projects not only would be unlikely, but also that they would eventually be useless because of the degree of deceleration will not be sufficient, if they would be consistent.

Thus, the critique moved is that current practices, based on the notion of *sustainable* development, are instead, in reality, “*sustaining the un-sustainable*”. Something today is generally exposed as a *green idea*, is on the contrary, according with professor Fry, masking the urgency and perpetuating unsustainable practices. Continuing with uncomfortable truths, another is that we continuously repeat ourselves that is possible solve these environmental, political, socio-economical and psycho-cultural crises just through simple technology application. More likely however, if technology will play a part of the solution, it is very likely that this part will be a much smaller than what we generally expect. The author also has a very specific point of view on education. Indeed, he supports the thesis according to which, governments should invest in education, since nowadays people are educating to behave in an unsustainable way. By doing these countries will be generously repaid of the efforts accumulating higher social capital. Thus, in order to achieve the intellectual elevation of populations, new compulsory subjects about sustainability, ecology, philosophy must be introduced in every singular course and in every level of education. New courses should not just teach people notions and sustainable paradigm, but also teach people to challenge actual paradigms and helping them in thinking outside the box focusing on the above mentioned fundamental question for human beings, passing therefore to a new society where the “*sustain-ability*” is assured by the past non sustainable philosophy.

Concluding this brief window on the critical Tony Fry’s point of view, the rejected paradigm is the one of sustainable development with the means has brought so far. On the contrary, he emphasises the urgency of solving years and years of bad choices pretending not to face the problem, by finding formal ways to reform the actual situation, creating a model where the *ability to sustain* is the cornerstone upon which regulate commonalities. The author, therefore, being very critic, sustains the urgent necessity to frame a revolutionary new development paradigm where world population convert themselves to a new way of thinking and developing the society.

1.3 - CORPORATE SOCIAL RESPONSIBILITY

Since the realization of companies' pervasiveness in everyday aspects, many studies started to address to companies a genuine *social responsibility* towards all critical aspects of the current geopolitical situation.

Exists different pragmatic reasons according to which corporate governance is considered as a winning strategy in today markets. Several scholars have demonstrated that corporate sustainability is imperative for ensuring long-term corporate success and for ensuring the deliverability of market value across the society, returning to the company. Companies, therefore, must align its operations, operating responsibly in accordance with universal acclaimed principles, taking actions and supporting the development of societies around them. Well-being of the environment surrounding the company or of their workers and communities with which they enter in contact, is essential lifeblood for the health of the entire system. Sustained by confidence in the future, the economical and social stability always have created opportunities for business allowing for successful experience (Gayle Allarda, 2010). No coincidence in fact, that what we hear of countries facing problem, cause or caused, by social, economic or political crisis, the result is alarmed and scared investors driven by risk aversion which drive their investment and capital over different markets (Rothaermel F., 2015). In other words, instability, as well as unpredictability and uncertainty, have the effect of driving capital towards less riskiness and enjoyable results. This reasoning to say that, most of scholars indeed agree on the fact that exist an unavoidable connection between business results and the society in which business is developed. And exactly on this assumption, it now largely accepted, in first person place by the same companies, the importance that working condition (inside the firms and on the surrounding environment) have on the performances of the reality referred. In accordance with previous assumptions, it is inevitable admit also that exists other different (and probably most strongly felt by business) reasons in support of an accurate corporate governance policy.

Deep rooted back in nineteenth century, during the so-called industrialization era, when working condition were very poor, we could extrapolate the first seed of this new feeling beyond

the economic aspects. First time in history indeed, in that moment companies, businessmen, started to realize the effective dramatic situation in which workers were stuck. Consequently, started evaluating the and conceptualizing what today we would call *welfare*. Subsequently defined paternalism, it was the reflection of a not sacred “social justice” needed in the society, so-called as well as today speaking of the famous figure of speech “noblesse oblige” (Aurélien Acquier, 2011). In this “epoque” in fact, coming from the end of the century and quickly projected towards the beginning of twentieth century, we assisted at a wide improvement in some companies’ welfare condition. Some historian suggest was sir Henry Ford the first entrepreneur who started acting in these directions, introducing for his worker no economic benefit as for example; accommodation districts, sport opportunities, library and medical provisions (Snow, 2013). Moving to modern era, since the second world war, with the signing of “Universal declaration of human rights”, a sort of first formalization of this new general focus on human rights happened. In an era where economist of the calibre of Milton Friedman and Michael C. Jensen focused on individual rights and liberal market theories, pointing at shareholder as the only concern for corporations, for the first time ever, everyone was considered first-hand responsible, for human rights enjoyment. After oil crisis in 1973, riding these sentiments, OECD published first version of “OECD Guidelines for Multinational Enterprises”, a document with the aim of providing principles and recommendations for conducting responsible business. The major thematic addresses by these guidelines were for the first time, only from corporation point of view. With the introduction of employment, human right, information disclosure, bribery, competition, taxation and industrial relation suggested lines, we actually saw an important real step forward in the direction of creating form a idea of the *Social Corporate Responsibility* (European Commission, 2011), that sentiment which will surround constantly the development of businesses and especially globalization in the coming years. Since Globalization in fact, companies started to source their need worldwide, first buying cheap material importing it from the opposite side of the world, then buying finished products in another different countries, taking advantages of no controls on labour, cheaper production, and generous investment policies. In other words, within this globalized situation, thanks to functions like purchasing and supply chain management optimizations, multinational corporations were absolutely able to outsource those

strategic (but typically very costly) operations, in less protected hubs, being able to purchase directly the final product at price which weight around 70% of the end price.

With the recognition of way of working of multinational corporations, in the market, became also more difficult for consumers recognize the key actors of possible misconduct perpetrated in those counties where corporations were not may be were physically present. The understanding on who should be addressed the responsibility for ensuring the observance of social duties and human right in countries where a multinational company purchased finished product from locals has been one of the fundamental triggers which unleash the rise for company accountability for social matters.

After all these considerations discussed, in 2000 United Nations published the *Global Compact*, encouraging business all over the world to become more accountable for their practices and adopt consequently a socially responsible policies in operating the market. With *Global Compact*, United Nations identified 5 corporate purpose regarded as the ones with major importance in doing businesses. Measures for businesses development plans, weighting respect for human right, attention to environmental policies and procedures against corruption will lead the identification of how businessese are performing in terms of Global compact.

These are the corporate roots upon which the 17 Social Development Goals (SDGs) previously introduced have been generated:

1. Principled business
2. Strengthening society
3. Leadership commitment
4. Reporting progress
5. Local Action⁵

⁵ In order to push into the corporate DNA sustainability, European Commission suggest that for those companies involved in international presence or not, companies must implement and report annually, local efforts where they are present.

These 5 pillars have been chosen in order to drive companies towards a more socially responsive business values and sustainable practices in which they operate.

Going towards the conclusion on the paragraph, *Corporate Social Responsibility* may be defined as “the voluntary integration of social and environment issues into business activities and relations with stakeholder, combined with a readiness to sacrifice profit for the sake of certain social interest” (Witkowska, 2016). The definition clearly outlined its main elements: the voluntary aspects, the stakeholder-oriented or external views, the integrated social aspects, the environmental in decision making, and the economical one. After this the definition is associated with the idea of a due profits sacrifice in exchange of these claimed social interest. As previously stated however, the “sacrifice” companies have to undertake, will in the end, assure the maximisation of the possibility to embrace the market and attract consumers.

Corporate social responsibility concept has been developed in different models, according with the possible strategies that manager may undertake towards societies (Gonzalez-Perez, 2013):

- Companies have obligations some towards society. Enterprises therefore have fundamental role in supporting every economical, legal, ethical and philanthropic aspects in the society, but only after having secured the correct profit at the business.
- Companies according with this second model have obligation to act independently from the constitution of a positive profit. In this case, the ethical and philanthropic themes should be satisfied at any stage, not only when the business is collecting a positive return. Only once every stakeholder will be equally satisfied, business will be free to decide how to generate and allocate profits.
- Third model, previously already introduced, provide that business have a very clear and simple mission on the market, maximization of profit for their shareholder without which company would not exist.

-
- Finally, last model covers the idea that every possible stakeholder of a companies, ranging from supplier to governments, have an interest inside the company, but only primary stakeholder, who has a direct impact on the company, deserve company attention. Consequently, companies should address their attentions just towards shareholder, manager, clients, supplier and employee since they are legally represented against the firm. Others interest obviously should not be taken into account since they are not indispensable for reform businesses.

Concluding, business practice have highlighted how, of course, companies voluntary included these social and environmental issues into their business project, the same time we need to realize there is actually no institution or index able to generate a honest report on this selected aspects (Witkowska, 2016), and therefore CSR practices should be evaluated company by company, scanning in depth inside the firm.

CHAPTER 2 - LITERATURE REVIEW ON CIRCULAR ECONOMY

2.1- CIRCULAR ECONOMY CONCEPT

The origins of circular economy concept are not easy to track. It is generally acknowledged that in 1990, the works of two British researchers, Pearce and Turner, setted the first stone for the development of the conceptual framework of circular economy. Pearce and Turner in fact, among firsts proposed the evolution from the “linear pollution pattern”, to the “resource-products-regenerated” one. A second major advancement comes from McDonough, creator of Cradle to Cradle concept, which similarly with Circular Economy theories, promoted the regeneration paradigm. Became later very popular as development of these 2 concepts, circular economy has been seen as the most likely and doable new framework for the coming years.

Within the theoretical debate on the sustainability issue, many and many solutions has been first proposed and then criticized. Sustainable development for example, is a very broad and intangible concept, which may lose meaning if not observed from the right perspective. Circular economy, on the contrary, is deemed as the most effective and tangible way to rethink, organize and develop the society and economy. Its concepts, applied according with physical theories in the proper ways, provide technical and innovative guidance, prompting more ecological processes in the economic framework.

Historically, *Circular Economy* framework heavily relied on the 3Rs principle. The 3Rs principle had been essentially the fundament of both green manufacturing first, and lean manufacturing later. *Ellen Macarthur Foundation*, an institute committed in studying CE, recognises however as also other theories as regenerative design, performance economy, cradle to cradle, biomimicry and blue economy, were important contributions to the further refinement of the concept of circularity today embraced. The “Reduce, Reuse and Recycle” principle, aim at

cleaner production-consumption pattern, utilizing, where possible, regenerable natural resources and a consequent minimum level of pollutions, emissions and especially wastes.

In order to achieve the circularity studied, looking at eco-efficiency and eco-effectiveness in a circular perspective, the major requirement needed is a concrete and solid shift of the overall approach to economy. Since the very proper first phase, the processes required and the material used, should be re-thought and disrupted, twisting already implemented production line looking for newer and environmentally positive features. In this sense, for companies the goal to reach may therefore be; or, creating products that could be exploited as much as possible during their lifespan, or, implementing products that independently from their life cycle length, could be reintroduced into the cycle. In this second hypothesis in other words, products are studied in order to perform beyond one cycle, virtually going into multiple lives on the consideration that materials used should be no longer landfilled in the environment.

Mainly referred to physical and material aspects, circular economy is also defined as a most tangible way for interpreting sustainability in everyday life view. Therefore, circular economy today represents a plausible way for human being reaching of the *ability-to-survive* and to thrive in a world where population is expected to reach up to 9 billion people by 2050. There is no doubt that the evolution to a circular model requires a radical change in framing environmental problems. Theorist indicate that what is actually required represent a significant challenge for human knowledge, truly requiring advanced new technologies, as well as, substantial innovations (if we look at sustainability issues from the technical state of art perspective). The efforts asked to human being, considering new products, new processes and new frameworks, do not leave in fact any possibility for an underestimation of the commitment required. The importance of awareness when thinking at the shift required is fundamental and essential, especially if considering previously introduced critics, allegations and scepticism about the chance of survival of human being on the planet.

Based on the European Commission report on the implementation of circular economy, already in 2016 circular activities employed 4 million workers, generating almost 150 billion in value added activities. According with “Greenitaly 2019” furthermore, the conversion towards a

circular model, dropped into the actual economic system would create more than 2 million new jobs, empowering reuse, repairment and recycle of goods.

In this field, European Institution are among the most Active and involved organisms. European institutions vigorously prompted this doctrine as a central theme of their policies with the aim of decrease impacts on the planet. But not just Europe is directing its efforts towards circular economy. In response to a series of changes happened, as extreme industrial growth (from mid-20th century) and growing importance of pollution problems, also China started to push in the direction of a healthier economy system, ideally focusing on the elimination of non-productive materials. Enforcing five-years plan, China is trying to forecast future needs integrating the needed policies in order to obtain a better planification on long terms. The fact that also countries like China are acting in response of environmental problematics is definitively positive. Indeed, it is not a secret that implementing ecological and environmental control policies in the developing countries will be enormously beneficial for the whole ecosystem. Adopting the correct preventive policies in countries like BRICS⁶, Mexico and Indonesia in fact, where most of world populations already resides, but also where the expected growth would be exponential, will have enormous advantages. In these countries more than in others in fact, clear regulations are absolutely needed in order to support an environmental healthier future. A more conscious control on resource productivity and efficiency, may therefore be key in manage their development in a greener way.

In a critical optic, however, should be said that the circularity concept, exactly because of it very wide definition, it is ultimately associated with every daily state-of-art green development. Main objective of this chapter is therefore summarizing definitions and concepts useful to comprehend reasoning behind the CE wide press coverage

⁶ BRICS is a term used in international politics which entail 5 countries; Brazil, Russia, India, China and South Africa. These countries all have same characteristics as, a developing economy, an increasing population, large territories and abundant strategic natural resources. All these factors usually flow into a consistent GDP growth, foster by international commerce.

2.2- COMPARATION BETWEEN CIRCULAR AND LINEAR ECONOMY

The blurriness on the circular economy concept just depicted however, does not highlights enough the sense of urgency and need for discontinuity from the current economic vision of the models based on make-use-disposal paradigms. Since the aim of circular economy is prosperity, environmental attention and social equity, it is therefore fundamental extract the whole rationale at the base of this circular doctrine.

The linear model of resource consumption, based on the take-make-consume-dispose pattern, drive the consumerist model on the notion of a (plausible) perpetual economic growth. This approach, however, does not appears to be still sustainable in light of new millennium economic, demographic and climatic development. Extraction of resources from the ground, for making needed products, consume it, and eventually throwing them away before they will be landfilled or burned, represent nowadays an unsustainable practice that harm life survival of the Earth. First time scarcity of resources was proposed and discussed is dated back in 1966, by Boulding, in his work “The Economics of the Coming Spaceship Earth”. In his work the idea pointed out was the one of an inevitable transition that human will have to go through, moving from an unlimited resource supplies mindset, to a closed one, with just limited possibilities resource supplies. Earth, in this vision is seen as a spaceship on a long journey, with just a limited amount of supplies that could not in any way be generated. The economical success of this view is given by the parallel idea of a limited amount of Earth’ stock, which therefore force businesses in effectively manufacturing, imposing the idea of closing the loop through reusing, repairing, reconditioning and recycling (Boulding, 1966). This line of though, persisted for years and years, and it went fortifying evolving then in new product-service systems as: performance economy⁷, circular economy, cradle-to-cradle and blue economy.

⁷ Will be discussed in one of the next sections

Circularity is a systemic approach toward economic development, designed to let benefit businesses, society, and the environment. The decision-making process for environmentally sustainable operations provides:

- a. Design for environment
- b. Cleaner production
- c. Green supply chain management

Quickly proving an overview, sustainability-oriented firms redesign their products considering environmental consequences of their productions, uses and disposals, taking into account relations between ecological systems and socio-economical mechanisms. Focusing on a better input selection, process requirement, reducing product impact, or pondering with extreme attentions reuse, remanufacture and recycle of products (with the aim of save as much waste as possible), they are looking for extend lifetime and improve the overall efficiency of the business. With circular regenerative practices, companies have the opportunity to gradually decouple growth in markets and consumption associated with resources. Just looking at design and materials introduced in the cycle, they may have the opportunity to manage environmentally zero-impact operations. The development of the economy in fact, should assure that human beings, not just meet present goals, but most importantly, will have the possibility of meeting future ones, assuring the presence of energy and resources. Another important factor to carefully evaluate, is related with the type of production performed. Productions may be or, aimed at a reduction of the quantity which flow into production-consumption pattern, or instead, at an extension of the lifespan of product and services, lowering the level of waste generation.

Finally, it is important to remark that, when comparing a linear model with a circular one, should be pointed out that to a greener supply chain management, correspond an overall reduction in terms of environmental impacts generated. Transportation of goods along the global value chain create in fact important emissions, while at the same time a circular chain encourages a more responsible conducts of the flow of materials.

2.3- DEFINITION OF CIRCULAR ECONOMY

Since sustainable development is a concept to which we are not able to provide a solid and unique definition, we will try to introduce a definition of Circular Economy concept analysing different papers which main intent were exactly to scan main arguments associated with its definition.

According with Julian Kirchherr, Denise Reike and Marko Hekkert, Circular Economy represents for majority of scholars the most tangible way to organize society and economy in light of most recent sustainability fin. The concept is today associated with a wide range of its applications and with different ways of understanding it. Industrial ecology, performance economy, regenerative design, cradle-to-cradle represent in fact different shadows we can appreciate under what the big umbrella of circularity frameworks. All these different models in fact, share the aim of circularity; “ economic prosperity, environmental quality, its impact on social equity and future generations” (Julian Kirchherr, 2017). Looking at literature, following a quantitative and qualitative analysis of the data founded in previous articles, trying to extrapolate the main concepts associated with circularity, scholars extrapolated 3 terms mainly associated with circularity were in order: recycling, reuse followed by, reducing. What is interesting to observe however is the fact that, if these definitions were widely used before 2012, later, they become less and less mentioned, as the framework was going to result as a rethought of whole production-consumption system we embrace today. In fact, the number of papers in which the definition is associated with the concept of a system designed to be restorative and regenerative have almost doubled since 2012.

The complete definition to which researchers arrived at the end of this systematic work, eventually is: “an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future

generations” (Julian Kirchherr, 2017). Should be said that, because of the complexity of the arguments, some other definitions might be more appropriate according with the occasion. Therefore, here following others generally accepted definition introduced.

The most significant:

Table 2 - Circular Economy definitions

Author	Definition
(Geissdoerfer, 2017)	“a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling”
(Charonis, 2020)	“circular economy is understood as a system that is designed to be restorative and regenerative; restoration replaces the ‘end-of-life’ concept for products, energy systems are shifted towards renewable technologies, toxic chemicals that impair reuse are eliminated and waste is eliminated to the greatest extent possible through improved materials, products and systems design (Ellen MacArthur Foundation 2012)”
(Nicky Gregson, 2015)	“circular economy seeks to stretch the economic life of goods and materials by retrieving them from post-production consumer phases. This approach too valorises closing loops but does so by imagining object ends in their design and by seeing ends as beginnings for new objects. Unlike industrial symbiosis, the aim is to re-use or repurpose products at a later date after their consumption”
(Willi Haas, 2015)	“The circular economy (CE) is a simple, but convincing, strategy, which aims at reducing both input of virgin materials and output of wastes by closing economic and ecological loops of resource flows”
(Republic of China, 2008)	“a generic term for the reducing, reusing and recycling activities conducted in the process of production, circulation and consumption”

2.3.1 - ELLEN MACARTHUR PILLAR

According with Ellen MacArthur foundation⁸, an organization whose slogan is “our mission is to accelerate the transition to a circular economy”, the economical framework provided for actual linear forward economy system encompass all the elements of the unsustainable take-make-waste system. As discussed before, also the foundation stated clearly that this linear forward framework is no longer sustainable by the planet, and that, only overtaking it, will be possible to create a new thriving economy aware of environmental limits.

In a circular economy model, basically all the activities are builds and rebuilds without harming the system health. The first conceptual message of these models is in fact that they are based on reducing those wasteful resources through the effective design and implementation of high-level efficiency processes and resources. Circular frameworks in second place recognises the importance of the surrounding of the economy systems. According with the environment needs in fact, Ellen MacArthur suggest that should be kept in mind the necessity for working in a greener direction, either for individuals, big and small businesses, public organisations, and both globally and locally speaking.

Circular economy, according with MacArthur foundation school of thought, is based on 3 principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural system

With these 3 main points Ellen MacArthur Institute support the aim of a plausible and desirable reduction of those negative environmental impacts, designing out those negative

⁸ Ellen MacArthur Foundation collaborate with organization, government and academia trying to achieve zero waste ecosystem, where products and material are keeping in use, regenerating natural system, since industrial revolution, human being founded the basis of today consumeristic economy.

emissions which cause damages to human life and environment in a timeless perspective. Thus, circular principles typically simply aim at a minimization of energy input, raw materials and waste creation, through the improvement of efficiency obtained from design creation of the products, production processes, and finally, to everyday usage of the same products. From pollution of air, to water to waste, when implementing a circular pattern the whole idea of possible waste is completely eliminated for every not re-thinkable elements. By doing so, companies are favouring activities that preserve energy, material and labour, and are also re-approaching the whole life of an object. Designing it for durability, reusability, manufacturability and recyclability, the impact of human processes on the environment may be, in a sustain-ability perspective, drastically limited.

Taking in consideration all these aspects, a more aware usage of resources, favouring renewable ones, looking for new regenerative processes and aiming for more conscious usage of process, will therefore allow to circular companies an overall alignment not only towards the environment, but also towards the same society and populations.

2.3.2 - BIOLOGICAL VS TECHNICAL LOOP

When defining what a circular economy actually is, it is worth to spend some time in deepen one of the more often recalled aspects in Ellen MacArthur foundation analysis. Before introducing the infographic idea of *biological loops and technical loops*, lets analyse quickly those predecessor concepts which have led to its development.

The first approach developed, chronologically speaking, was eco-efficiency. Eco-efficiencies strategies were focused on the idea of retain as much as possible the output economic value, while, increase efforts towards neutralization of the impact that economic activity has on the ecological system (Michael Braungart, 2006). This concept was created starting from the assumption that in a linear forward flow, the minimization of materials incorporated into products may alter the quality of these, causing therefore downcycling⁹. The proper definition play: “achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle to a level at least in line with the earth’s carrying capacity” (World business council for sustainable development, 2006). In the same years also the eco-effectiveness concept was proposed. The rationale in this case was on the contrary, based on the idea of a “transformation of material flow in a way such they form a supportive relationship with ecological systems and economic growth....with the aim of generate cyclical, candle to candle metabolism that enable materials to maintain their status as resources and accumulate intelligence over time” (Michael Braungart, 2006).

Exposed by Michael Braungart and Bill McDonough, cradle-to-cradle philosophy, assume that, all materials involved in any particular technological or biological cycle remain in that particular cycle in a perpetual optics. The assumption of the concept proposed, is that trying to

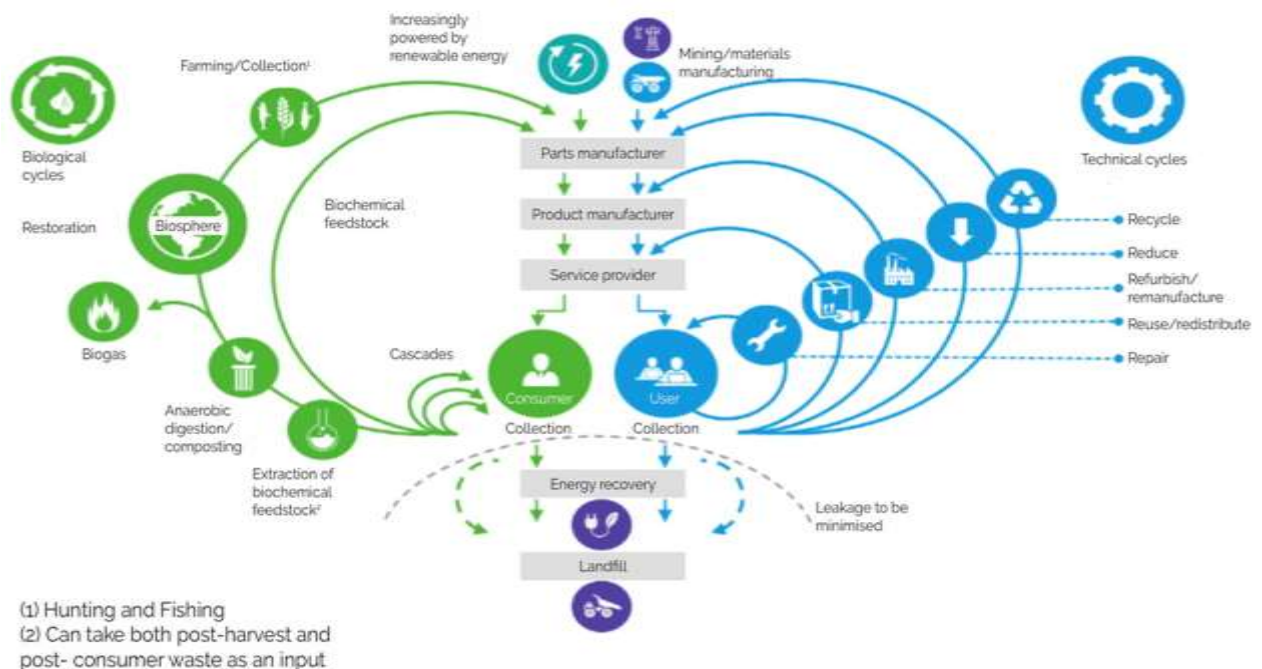
⁹ “Downcycling is a recycling practice that involves breaking an item down into its component elements or materials. Once the constituent elements or materials are recovered, they are reused if possible but usually as a lower-value product. Ideally, only elements that cannot be reused are discarded. The goal of downcycling is reducing waste and improving the efficiency of resource use” (Rouse, s.d.).

maintain those physical and chemical features of products introduced into commercial and industrial processes, turning them into nutrients and therefore enabling a perpetual coordination of biological and technical flow. Cradle-to cradle in other words, simply assume nature processes as models for human ones.

Since biological nutrients may be natural and plant derived, they are called *products of consumption*, exactly because of the possibility for them to be effectively consumed throughout their lifespan. On the other side, technical nutrients are defined as those “material, frequently synthetic or mineral, that has the potential to remain safely in a closed-loop system of manufacture, recovery, and reuse (the technical metabolism), maintaining its highest value through many product life cycles” (Michael Braungart, 2006). Developing the same comparison (as just done for the biological cycle), technical products are defined as *product of services*, because of the possibility for consumers to service it while manufacturer retain the property.

Ifco-effectiveness already goes well beyond concept like reductions of emission, or new resource or a short term visions, cradle to cradle strategies provides that material flow of

Figure 3 – Conceptualization of Biological-Technical loops in CE



resources, support the relationship with biological and technical loops (Figure 3), aiming at a long term economic prosperity, increasing value over time, in a manner that reconcile ecology and economy for the health of the natural system.

This division between commercial processes and nutrients offer the first opportunity for keeping materials value and as well as materials and products in use¹⁰.

2.3.3 - 6R PRINCIPLES

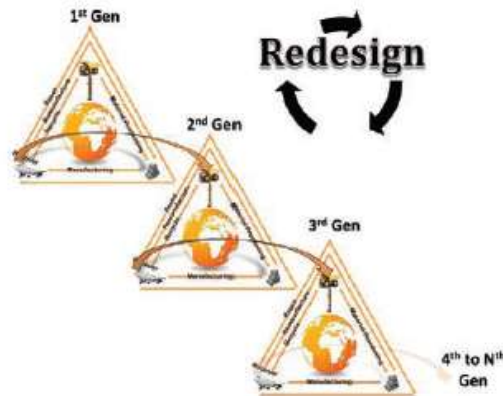
What initially was called the “*3R MacArthur framework*”, with time have evolved and have been implemented, becoming a completely new framework made of newer R-words rich of deeper meanings. (Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing, 2016). Even considering that in practice new terms may turn out to have generated a partial overlapping, today is generally accepted the “6R-based framework”. As in the case of the first 3R, also with the six R declination in fact, the idea is simply acting towards a major support for multiple lifecycle, carefully considering not just the 6R, but also their interconnectivity.

The 6 R cited by the model are:

- Reduce
- Recovery
- Reuse
- Recycling
- Remanufacturing
- Redesign

¹⁰ Figure find: Economia Circolare Veneto. Foresight Manageriale (Fondirigenti G. Taliercio,, 2019)

Figure 4 – Redesign functioning in several cycles



When we look at a simplified closed/loop material flow, all these six elements represent the backbone of circularity, which can ultimately lead to the end goal of sustainable value creation in the economy. If reduce, recovery¹¹, reuse, recycling¹² and remanufacturing are common terms, it is worth spending some words explaining the concept of redesigning. Redesign involves the “trespassing of a product through different generation life-cycles” (Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing, 2016). Indeed, the term is valuable because, by doing this, it is possible to conclude an almost-perpetual materials flow, from one generation to the next one, implementing efficiencies exponentially as well (Fig 4).

But what is also innovative about studying this argument, is that different authors stress, in different papers, the fact that the path by which it is possible to reach a correct implementation of CE, is *not* just made of 6R principle, *but* also of *product innovation*, of *training* and of *education*.

¹¹ Any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy (European Parliament, DIRECTIVE 2008/98/EC).

¹² Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations (European Parliament, DIRECTIVE 2008/98/EC).

All these just mentioned factors are in fact crucial when speaking of the need to trigger a sustainable development. Furthermore, not only formal university education is fundamental, but also, and maybe more important, the general educating of new generations it is. Training newcomers at a sustainable approach is therefore a prerequisite for entering in contact with a new life style model and for the understanding of new methodologies that will combine creativity and technical basis creating helpful human development (Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing, 2016).

2.4 - CIRCULAR ECONOMY FRAMEWORK

Such concept, as described, infers the idea of an “economic perpetuum” that cannot be found in real life, being based on a mechanistic vision which simplifies a complex reality. But scholars agree on the fact that there is room for improvement in the circularity direction if appropriately accompanied by proactive enablers.

2.4.1 - BUSINESS MODEL

For a company, having a business model that fit in the CE context is crucial, therefore, most of the efforts that organizations will undertake in approaching circularity, will be directed at defining this aspect inside the company.

Literature circular business models is generally very rich. In many papers we find associated the concept of product design with the one of business model, and many scholars analyse both in order to assess how is possible integrate the best product design methods with most innovative business models for those companies willing to adopt circular model (Nancy M.P. Bocken, 2016). Literature suggest in fact that in order to facilitate cohesion of design and clarity of business models, both features should be implemented co-ordinately to get a clear

vision of how the green project will flow through the firm. First of all, key is understanding how the main cycling of resources are thought to be. Having an idea of this distinction it is helpful since differently from linear one, circular business model provides mechanism through which resources get back into the system endlessly. To be extremely precise, when speaking of circular economy, any effective disposal is not taken in consideration and (eventually) only a final disposal would be possibly mentioned for those products which are chemically and physically exhausted. This is coherent with the cradle-to-cradle vision¹³ of 2 fundamental cyclical system, in fact the reuse of goods is defined “an extension of the utilization period of goods through the design of long-life goods; the introduction of service loops to extend an existing product’s life, including reuse of the product itself, repair, reconditioning, and technical upgrading, and a combination of these. The result of the reuse of goods is a slowdown of the flow of materials from production to recycling” (STAHEL, 1994).

Business model explain how the firms is making money, it is view of the fundamental aspects of the business, as well as company’s innovations approach. Since business models are deeply rooter inside firms, once they are established, companies often encounter important difficulty trying to modify it. Undertake the directions of a circular business model therefore require a deep “introspective journey inside firms’ character in order to lead peacefully at the new way of thinking and intending value creation” (Rothaermel F. , 2015). Analysing product design and business model strategies in literature for a circular economy implementation, we can appreciate clear examples of studies conducted in order to where explore what business models are resulting in *slowing resource* loop, leading to a *product life extension*, and what business model result in *closing the loop of resource*.

¹³ See: “CHAPTER 2.4.2 – BIOLOGICAL VS TECHNOCAL LOOP”,

Figure 5 – Environmental efficiency associated with different approaches



Model that slow the resource loop are:

- *Performance model*: The main idea in delivering value with this business model is provide to consumers the ability to meet those that required needs without the need to transfer the ownership of physical products. The value proposition is therefore, ensure the ability to satisfy users just trough the performance sold. For companies which are undertaking this approach, a big advantage is given in fact by the ability of internalize consumers financial outlays, which before they were not able to obtain in a linear model. Should be borne in mind that the lower initial cash flows will be entirely offset by more lasting diluted ones in the future.
- *Extending product value model*: In this case the rationale of the business model result in exploiting till (the very) end of its life, a product's value. Ideally, the idea in this case is recovering discarded products without introduce (not even) any additional resource for increasing product functionality. The rationale of this model is focused on is given by the ability of a material to be reassembled and exploited in making other perfectly working products. Usually in this case the

presence of affordable new products is guaranteed by take back system of collaboration arranged by manufactures.

- *Long life models*: Durability aspects are the base for long life products. Value proposition of long-life product is also built on a high service level and also on the possibility for repairing it. Typically, these products are sold at a premium price which embed the overall superior value that will be delivered over time.
- *Encourage sufficiency model*: with this model the main importance is attributed at the stability of the product, usually made with a good quality and als an efficient level of service (which is therefore again key in provide the value delivered at the client). Also, in this case products are usually sold at a premium price.

Business model developed to for closing the loops¹⁴ are:

- *Extending resource value*: The rationale of this model is about sourcing from those wasted materials and resources which will be transformed into new objects and form of value. The value delivered therefore is provided exactly by green and no-impacts resource. This business model is valuable especially for those consumers which address great importance to second-hand materials, considering them green materials.
- *Industrial symbiosis*: it is intended as a process solution oriented towards using those waste produced by manufacturer as input collateral manufacturing line. Hence, this involve that geographically position advantage plays a great importance in these relations, a concept remarked speaking of industrial districts¹⁵.

When discussing of material effectiveness, practices like redesign of production systems, trying to slow down materials flow, or trying to close material loops, may result in models where

¹⁴ Closing loop strategies intend eliminate completely, or for what is possible, wastages and rejects.

¹⁵ This business model will be discussed more in deep later the paragraph “IMPORTANCE OF COLLABORATION MESO LEVEL CIRCULARITY”.

new manufactures are essentially performed with others, recycled or reused, material. The key feature is that in these cases the manufacturing happens without any new material net consumption¹⁶. Fundamental trying to implement these closed loop frameworks is the availability of materials. Exactly because of need for disposed materials of companies, take-back system and reverse supply chain operations are key aspects companies need to manage. At the same time however, mastering these activities, may have the beneficial effect of leading companies to towards reducing consistently the cost for materials while increasing the value provided. Indeed, many studies taught that long-lasting or recycled products translate in more efficient and cheaper solutions for end-consumer¹⁷. Furthermore, it is generally recognized that any non purely consumeristic approach of purchasing is allegedly positive both for consumers' pockets and environment protection. Therefore, looking at these closed loop strategies we can really appreciate how new productions paradigms will have a valuable key role in reloading that part of value existing inside products but before not appreciated. Thanks to these processes so, otherwise wasted resources will have the opportunity to be re-valued inside a new life circle, creating therefore a potentially immense positive revenue for companies.

Focusing on the retention of value natural resources, circular economy goals is enhancing these circular flows trying to capture highest possible value, economically speaking but also, since the 2 terms are becoming every day more interconnected, also environmentally speaking.

¹⁶ The main idea of reuse of resource in a closed loop strategy is no entering in the production process anything already produced and used

¹⁷ The lower positive cost for consumers is granted by the lower impact on the total cost of both virgin raw materials and of energy required for recovering already transformed products (instead of "building" new ones from a natural source).

2.5.1.1 – ENABLERS

When it comes to speaking of enablers of this particular business model, those frameworks, features or situations which may help in dragging towards circular economy, there are in literature many characteristics mentioned that we may find in.

In first analysis, studies report as a *communal policy* is considered as one of the main solutions for global environmental problem. Exactly in this direction OECD is asking to act with the aim of reducing the usage of natural resource (OECD, 2018). As previously introduced in fact, this is also the direction towards which, with their legislation framework implemented in last years, European Union and China are heading. But a common top-down framework is not the only propellers underlined by researchers. Often in fact, another aspect not enough emphasized (or even not taken in consideration) by corporation, which however in recent year's have gained a lot of space in literature, is exactly *business model*. Its mention in fact become more and more frequent along whit the emphasis addressed by authors in last years. Today in fact, business model is embedded as a clear factor in leading a circular transition and it consider three main aspect environment, resources and economic benefit. (Michael Lieder, 2016). Clearly, as discussed in next paragraphs, also the spreading of the *knowledge* on *environmental consideration* is useful in order to enable this transition towards circularity. "Consumer realizing their responsibility is key in evolving everyday habits and its promotion represent the basis for a conscious knowledge of the problem" (Kotnik, 2017). *Suppliers* are also key partners in environmental sustainability strategies. A network of specialized suppliers shall create the perfect environment for any material flow, improving likelihood of developing a more conscious circular supply chian and just in time practices. Cultivate the culture of network by legislator may benefit of firms enhanced capabilities and of firm's ability to transfer green knowledge and mentoring practices along supply chain.

When speaking of green economy or circular economy, last enabler recalled is also *eco-innovations* abilities of companies.

Exist different types of eco-innovations; mainly process vs product innovation, but also organizational, marketing, social and system innovation. In the following paragraph we will discuss more in depth eco-innovation aspects.

2.4.2 - ECO-INNOVATION

Eco-innovation formal definition is accepted as “the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives” (Pearson, 2007). It is therefore intended as these changes implemented in order to achieve the aims of saving resources in the economic model. Eco-innovation may also be defined as “the introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle” (EU Eco-innovation Observatory, 2018).

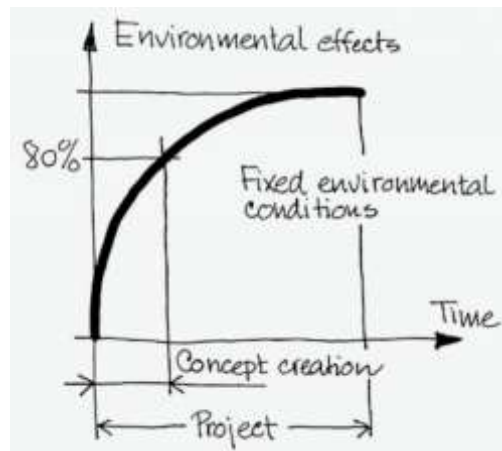
What is important to stress however is that the concept goes beyond simple innovation, based on the reduction of the consumption of resource, of environmental pressure linked to resource extraction, of emission and of wastes. Majority of scholars attribute in fact at this concept the most relevance when speaking of resource renewal and productivity, especially in EU (Giulio Cainellia, 2020). Eco innovative impact is clearly studied in correlations with decisions to invest in innovations, but also with organizational choices¹⁸ and designing phase of goods and processes.

¹⁸ See paragraph: 2.4.1 - Business Model

2.4.3 – DESIGN

After the first conceptualization of the word “eco-design” during the ’90s, many and many studies confirmed a positive relation between eco-innovations and design investment (Claudia Ghisetti, 2018). Researcher still attribute an outstanding importance to product environmental profile, as a direct reflection of the designing phase of the product. Institutions recognized the remarked association to the point that in 2009 also the same European

Figure 6 – Environmental impacts and product development association. (McAloone & Bey, Environmental improvement through product development. A guide. , 2009)



Commission adopted a set of directives, from efficiency labelling to environmental impacts requirements, formally accepting the environmental design challenges, trying to force evaluations of productions throughout their entire lifetime. The rationale behind these public intervention in favour of design are given by the fact that companies need to internalise externalities associated with poor design performances, promoting a lower environmental impact, which may also flow into a competitive advantage in the market. Has been studied that up to 90% (Figure 6) of wastages are attributed at a product since its designing phase (McAloone & Bey, Environmental improvement through product development. A guide. , 2009). Therefore, a communal environmentally sensible perspective, where company consumers and suppliers are aware of their responsibility is absolutely needed.

A systematic approach towards a more environmentally friendly manufacturing, use and disposal, should be taken into account since the vast majority of end of life effects of materials are the results of choices made during the first phases of products life.

Indeed, innovation driven companies have already engaged in eco-design practices, which of course, are linked with eco-innovation concept cited in the previous paragraph. Designers have a great influence over life cycle. A first important step towards a zero-impact model is in fact gain an insight on a product's life cycle using the so called, "*product life thinking*". The relations design-life cycle-waste creations suggests in fact that design investments looking into manufacturing processes, logistics are key for leveraging new technological opportunities aiming at a positive environmental impact. Other research furthermore strongly suggest that also *environmental policy* and *demand-side* factors are very relevant for the influence on a circular economy development driven by eco-innovations inputs. Another noteworthy important aspect when considering circularity is time. No one can object that reusing goods and product-life extension imply different relationship with time. Indeed, while recycling does not influence at all the speed of flowing materials and lifecycle of goods, on contrary in the case product-life extension we have a delay in the post use situation.

The following are the three fundamental strategies when looking at possible cycles according with Stahel definitions:

- *Slowing resource loop*: Involve design for product life extension and longer life products. Prolonging therefore usage and reuse of products over time, studying longer possible physical characteristics.
- *Closing resource loop*: Closing the loop between the first condition of use and the following ones. Recycling is the factor when example in speaking of resource reuse.
- *Resource efficiency or narrowing resource flows*: This strategy involve the usage of less possible resource per product. Reducing therefore both materials introduced in products and in the process directly reflect on lower emission of wastes, not excluding for a communal close/slow the loop strategy.

Thus, considering end life possibilities since product it is since the firsts phases of product developing has, without critics, been recognized as a crucial part when speaking of possible adoption that may limitate waste production and impact on environment. The main factis that once product' specifications are defined, there eventually may be, just some minor adaptations possibilities may lead to a drastic change of end of life impacts. Consequently, a good part (up to 70%) of end-of-life waste¹⁹ may be easily reduced just carefully evaluating it during the implementation phase.

Design strategies are therefore key concept in this sense. Around them companies could develop features for their products while easily slowing down loop strategies. This may be the case both by extending the life of a products while maintaining fixed the amount of input used or, on the contrary, designing products with higher usability but with a reduced level of minimum resources involved. For exempla, long-life products are those made and designed to generate attachment and trust, while product life extension involve the settling for maintenance, repairability, upgradability and compatibility. When speaking in particular of long-life products, design for durability may refers to physical durability, trying to create products where risk of breakage is limited, while with design for reliability the focus is in this case on the likelihood that a product will operate thought-out a clear period without a specified failure.

¹⁹ The percentage in this case simply regard the impact that design may have on possible environmental saving in the disposal moment.

Figure 7 – 7 Steps towards environmental improvement. (McAloone & Bey, *Environmental improvement through product development. A guide*, 2009)



Design for product life extension instead as anticipated, is concerned with the possibility of extension of life for the goods thought the introduction of additional and accessories service. When designed for maintenance and to be repaired, products which may require it in future, have the possibility to be repaired or maintained in good working conditions. Finally, when we are speaking of design for upgradability we refers to the possibility for adding future modifications,

while with design for standardization we refers to a compatibility searched in creating products which are able to interface with other products as well (Nancy M.P. Bocken, 2016).

Based on these results, has been clearly demonstrated that the amount of resource invested in organization, R&D and design are crucial part for eco-innovation ability by companies. According with Danish ministry of the environment, the seven-step approach²⁰ (reported in the figure) should help companies towards sustaining environmental improvements approach(Figure 7). This approach, studied as a continued physical meeting, at each step is concluded with three questions which will help to understand deeper the context and create a better strategy for the product's environmental improvement. Always in the optic of helping companies find more environmentally friendly practices, both from an efficiency based industrial system, to an effectiveness one, another interesting and very easy model proposed is the 5-step model (Figure 8) presented to sustain product design criticality (Michael Braungart, 2006). This process starts with the elimination of all dangerous substances to ensure these substances are replaced. Secondly, after having evaluated all the substances into the product and their impacts, should be applied the knowledge gained in order to choose those substances with lower negative impact on environment or health. Step 3 then requires a classification of every ingredients based on its toxicological character. The goal of this phase is classified materials according with the ability to be integrated into the biological loop. The following step include an optimization of those

Figure 8 – Environmental impacts and product development association (McAloon & Bey, Environmental improvement through product development. A guide, 2009)

- Step 1: Free of ...
- Step 2: Personal preferences
- Step 3: The passive positive list
- Step 4: The active positive list
- Step 5: Reinvention

materials previously framed. In other words, provide the proper and effective overcoming of those previously identified nutrients which were required be removed. Finally, with the last step, reinvention, authors suggest revolutionizing the product-consumer relationship, reinventing products from the perspective of services they provide to consumers. For example, thinking of

²⁰ This approach is reported in: figure 7

the service offered by a product like a washing machine, the perspective is that who buy them is not paying for the property right on material, instead, what is really looked for is the service of cleaning the machine provides (Michael Braungart, 2006).

2.4.4 - DYNAMIC CAPABILITIES

It is interesting see how the lack of a clear guidance for defining sustainability is depicted by many studies on the argument as one of the major difficulties for companies in implementing circular transition²¹.

In his paper, published in 2007, on with the argument of *Dynamic capabilities*, professor Teece, sustained a very fascinating thesis, which, addressed this limit exactly at the same companies. In fact, according with his view, a healthy competitive advantage is not built upon a simple storage of goods, but instead on core competencies, those unique strengths embedded within a firm and that allow companies to enhance the perceived value associated with their products. It is therefore not always correct speaking of economies of scale and scope as sustainable advantage drivers. More and more indeed, has been recognized that the foundation of success transcends simply being productive and R&D (TEECE, 2007). What instead may provide a real and sustainable advantage are those critical organizational and managerial capabilities necessities “to orchestrate a diverse set of resources and to deploy them strategically” (Rothaermel F. T., 2015). The thesis sustained is in fact that, the long run success of a company is built on those capabilities developed internally which drives the company throughout modification of its external environment. These capabilities able to drive companies over time, explaining and source of the so-called competitive advantage, are defined as dynamic capabilities. The adjective *dynamic* derives from the fact that this success is an effect of the subsequent modification of the external environment, which the companies should chase and fit exactly in order to exploit market opportunities. In order to outperform market indexes therefore,

²¹ See Chapter “LIMITATIONS AND POSITIVE WIN OF CIRCULAR ECONOMY”, paragraph “CIRCULAR ECONOMY LIMITATION”, for a contextualization.

what is need is not simply adopt widely diffused best practices, but instead, companies should first identify and control those essential and strategical changes in the market, recombining assets and those organizational frameworks to maintain a dynamic approach. A proactive environmental strategy has been recognized in literature as the most effective way for a firm facing an environmental state of uncertainty, ultimately associated with competitive success (Sharma, 2003). Once defined dynamic capabilities for firms, environmental challenges could be easily framed as new strategic opportunities to which the company itself have to answer proactively and voluntary, exploiting its unique dynamic capabilities in order to gain competitive advantages over competitors. Green business success thus requires the strengths, the ability and the willingness to promote a reconfiguration of business models and organizational design to reach it. Therefore, key is the firm ability to sense and seize opportunities, in order to undertake a reconfiguration and a reorganization of its asset, managing to better copy environmental change. Realizing a perfect fit between, environmental sentiment, organizational structure and its business model, any company may have the opportunity to accomplish their green goals. Sustainability aspects, anyways, should be integrated deep into the company ethics, in the company organizational design. Only in presence of an effective ability of the management to lead and accompany this transformation, firms will have the effective ability and therefore possibility to realign firm's capabilities chasing these green objectives claimed by markets. In addiction to these though furthermore, scholars also shows that all these capabilities, in order to obtain the maximum effectiveness, would be desirable that they would spread upstream and downstream along the supply chain, with the consequent beneficial sharing of those information, simultaneously contributing to the environmental capabilities of the chain, benefitting from mutual environmental managerial capabilities. (Wong, 2013).

CHAPTER 3 - CIRCULAR ECONOMY LIMITATIONS AND FURTHER PRACTICES

3.1 - CIRCULAR ECONOMY LIMITATIONS

Many different authors have deepened critical reviews of possible limits companies may encounter in attempting to implement CE.

The main limits encountered could be formally divided in 2 groups, one group that contain properly physical or chemical limitations (which could not be overtaken, not even with technological help), and a second group for which may exist the possibility to be attenuated:

The first limits we are going to introduce, are the physical and chemical ones. These limits are:

- *Thermodynamic limits*: the second law of thermodynamics state that entropy will always require energy. Therefore, there will always be a return of in term of waste which will be impossible to recover. Because of entropy laws, circular economy will always lead to an unsustainable level of pollution and waste generation. However, some theorists contested this vision, basing their leveraging the fact that Earth itself is itself an open system, which receive energy from the sun. Taking in consideration this aspect, should be noticed that, for the biosphere point of view, solar energy shall be considered as perpetual source of energy. Hence, on this assumption, looking at cyclical material flow and renewable flow-based energy, theorists believe that will be possible to recycle, reuse, remanufacture and refurbish products by using incoming renewable solar energy. If this detail limits the intensity of the problem, other studies accounted however for further drawbacks. It usually claimed as a model based on these assumptions involve some, not ignorable, unpredictability results about the possible outcomes obtainable. A renewable energy source in fact, according with thermodynamics

laws, does not secure any sustainable outcome, thus, exist the concrete risk that unsustainable practices may be perpetuated (Jouni Korhonen, 2018).

- *Spatial and Temporal limitation*: nowadays, the global system is mostly based on a linear throughput flow based on non-renewable energy source for 75%. Since no global body for governance exist, CE-type projects will be implemented only looking at local and regional dimensions. On the contrary, exist the need for assess individual projects, which are contributing to the overall sustainable development, in global, long term perspective. In second place, has been demonstrated that, the biggest environmental problems in term of global net sustainability, tend to affect especially developing countries. The roots on this phenomenon has been shown very easily. In fact, when locally speaking, environmental impact may be seen as limited (or even solved), even if, looking outside the local context, the real environmental concerns will arise. The problem of pollution shifting in fact is very common and results in moving those most polluting industries beyond national boundaries, where simply they are not visible. This type of problem however does not involve only geographical dimensions, but also involve temporal ones. Since, human economy creates both short and long-term impacts on environment, as much close in time we look, as much more difficult would be to assess and correct the overall net sustainability contribution of proposed renaissance projects. Several authors on this line of thinking, criticise in fact both fossil fuel and their alternatives, cataloguing them as entirely based on a short-term relief approach, completely lacking the interest to offset criticality in the long-term (Jouni Korhonen, 2018).
- *Economic growth limits*: Jevons's paradox emphasizes the fact that, as a result of an increase in production efficiencies, permitted by lower production costs and, a lower price, the environmental consequences that may arise from the introduction of an innovation could be very harmful environmentally speaking. The singular objections are raised because, with a the lower price, an increasing in demand should be expected, and, according with the degree of its intensity, may happened

that negativities will outpace those gains initially obtained (in form of efficiency increase) (Jouni Korhonen, 2018).

- *Green Paradox*: This paradox has been the first attempt explored in order to address those possible strategies implementable as response of institutional green practices. Theorists at the base of this paradox recognize that climate change policies are ineffective in stemming the actual escalation of global emission. Not only, according with the paradox, the effect that these policies may have on the current paradigm would be accelerating fossil fuel extraction. Because of dark futures depicted today in fact, producer may fear the decline of their business and in response they may be stimulated to sell fossil fuel with lower prices, boosting productions and pollutions emissions (Najm, 2019).

However, these just recalled are not the only difficulties that could arise during an implementation of a circular strategy. Aside from these just cited, literature recall others which may arise dealing with the transformation of a linear economy in a circular one. Even though they may be categorized more specifically according with countries, industries and other specificities (financial, technological, informational, institutional,) these we are going to see, are the most proposed operational ones:

- *Financial limits*: Financial limits represent clearly ones of the major criticality when speaking of the implementation of any strategy. In term of circular economy they could specifically be declined in technology and industrial systems costs. Access to better founding for transform processes has been identified in fact as critical for majority of small and medium size enterprises. It goes without saying that circular practices need also important ongoing associated costs, given for example the new required managerial skills and different nature of products. All these aspects translate in a more risky and costly business model, negatively impacting on SMEs (99% of companies in Europe) typically recognized as the most sensitive to financial costs fluctuation. (Mendonça, 2018)
- *Technological limit*: More often than we could think exists an economical non-convenience in the usage of recycled materials because costs are higher than the one

for non-green products. Even though usually recycled or second-hand materials have lower prices, these saving are (eventually) offset by the increase in processing requirement. In addition exist further other reasons supporting this paradox. In fact, a major disadvantage of circular products is that it does not yet exists an efficient supply chain able to move the widespread amount of second-hand green materials in a cost-effective manner. Furthermore, because of the modest environmental policies prevalence rate, this directly translates into unavailability of convenient green products. However, we want also to point out that a part of the problem is also due to the general and widespread lack of organizational capacities required in term of handling the technologies, the habits and the integration of such green practices (Donato Masi, 2017).

- *Path dependencies*: We can consider this limitation as a human's thought bias. In fact, since it is easier for human remain firmly attached to those everyday practices, will be much more difficult overcome them and transform systems into a more efficient ones. Therefore, based on this mental distortion, will be much more difficult implement any CE-related innovation exactly because of the necessity to overcome and eradicate these prevailing technologies. On the other hand, should be pointed out that others practitioners are spreading a business logic, according to which, superior technologies will easily convince the overcoming of the linear production method (Besanko, 2013).
- *Organizational strategies*: Since new business model should be actually implemented case by case, new practices apt to adopt circular design strategies will be required. These specific intra-organization management competences will be extremely needed inside companies and if no patterns are existing on the market, the weakness will be absolutely relevant. Different scholars stated that this will represent a very concrete limit for circular development. However, as discussed in the next paragraphs, also the lack of inter-organizational cooperation among firms, could also represent a major limit for a healthy implementation of circular applications. Cooperation between supplier and customer, with the blessing of public local authority, is indeed universally recognized as one of the major positive traits that could lead to an efficient

creation of industrial ecosystems. Cooperation always positively affects the overall net sustainability capacity of the framework (Rothaermel F. T., 2015).

- *Informational limits:* has been highlighted that a solid environmental information disclosure is currently lacking. A low level of relevant public information, along with no clear guidance on green projects development, nor definitions and indicator about CE, has been criticized both in Europe and also in China (Donato Masi, 2017). It is interesting see that, especially for SMEs, (key part inside the European economic fabric) the no clear guidelines aspect has been signalled as one of the main limits for a further circular developments (Matteo Mura, 2020).
- *Institutional limits:* Different authors moved charges against the current regulative environment with regards of environmental policies. A general lack in encouraging sustainability tools is suffered by those interested entrepreneurs. In addition, current policies are seen as primarily in favour of linear economy, despite the benefits associated with a circular one. Accusation are directed towards taxes for examples, seen as in favour of virgin materials, with lower taxes applied, thus preventing recycling, reusing and remanufacturing activities. This phenomenon in addition is then accentuated by the fact that currently legislative patterns provide inadequate cues for internalizations of pollutions produced. On the contrary, literature studying these topics is full of examples whose conclusion clearly state that in order to favour the abatement of negativities, pollution tax, as well as fines toward inefficiently polluter are fundamental. Currently however, European current regulatory framework still is perceived as inadequate in favouring the circular developments needed. Another aspect stressed as deemed to favour linear pattern, is the GDP indicator. Current growth models based on this indicator in fact, are seen as the perfect example of how communities are much more interested in a linear growth of indexes instead of a more sustainable throughput flow index. Concluding this point, should be stressed that exist certain scepticisms toward governments abilities to enforce some proper CE related regulations and enforcements (Donato Masi, 2017).
- *Customer irrationality:* Has been outlined that not always consumers take in consideration the net present value of the possibility to upgrade at a greener product,

because generally more expensive and perceived as less durable. Irrationality in this situation bring consumers at losing some value blinded by short-term gains. (Planing, Business model innovation in a Circular Economy. Reasons for non-acceptance of circular business model, 2015). Theories suggest in fact that in human minds exist a generous distortions in favour of present small gains in comparison with long-term bigger ones. In fact, human minds are generally highly influenced by context (Bogliacino, 2016).

- *Cultural limits:* Both customer behaviour and company orientation should be aligned towards circularity to obtain bigger results. Often however, the low value perception associated with sustainable products, still push consumer at continuing with their habits and mindset. Consumers often appear as not undertaking a clear and rational behavior, weighing up subjectivity and emotionality instead of acting for their utility. A behavioural change in favour of environment and economy policies is still not enough felt. Especially since social utilities will not have a stronger impact on consumer decision in fact, firms will be unwilling to directly tackle these arguments. Furthermore, as introduced before, also organization culture inside firm play a major barrier for the development of sustainable policies. The same companies should firmly embrace the idea of undertaking greener paths, taking them in first person decision to engage more sustainable practices. But limits encountered, in addition with the lacking of interests in the market, tend to inevitably postpone the adoption of green practices, especially for SMEs. (Rothaermel F. T., 2015).
- *Networks limits:* If we consider network effect as a positive driver associated with the spread of an innovation, we should also consider that since a proper network facility is not perfectly developed, this represent a limitation for adoption of new ideas. In addition, any effective facilitation of CE practices is put in practice by fostering sharing of knowledge about resources in a mutually beneficial manner. By working collectively companies are able to achieve better results than by working alone. For example, products discarded by one firm could become input for another. Hence, coordination over demand and needed resources, along with shared control over technological barrier, will help companies in creating both a smoother and cheaper

supply chain creating new value starting from what in a linear pattern was scratch. (Julian Kirchherr, 2017).

- *Conflict of interest within companies:* The shift towards an economy guided by performances will not be favoured by short term interests. Both companies' interest and consumers interests will not be secured by those higher capital requirements necessary in order to complete this transition. In addition to financial requirements necessary to implement all the new stages for a circular framework, it will be previously required also a significant acceptance of all the correlated drawbacks. The postponing of cash flows which will be more diluted in time, instead of one big upfront payment of the classical model, represent one big critical shift to accept within the company (Planing, Business model innovation in a Circular Economy. Reasons for non-acceptance of circular business model, 2015).
- *Fiscal limits:* As positive fiscal policies may be very beneficial in encouraging eco-innovations and favouring the implementation of greener economy, the same fiscal policies may be strongly limiting the adopting of healthier and more sustainable processes. The reason in this case is that green products will (most likely, if supported by positive fiscal policies) bridge the efficiency gap accumulated against years and years of scale economies exploitation by linear productions. Therefore, if sustainable products will be favourably influenced by positive fiscal policies, on the contrary when not favourable policies are applied, risks and difficulties will double for sustainable products development. Therefore, fiscal policies are a very valuable liability when speaking of barriers for implementing circular economy. Europe consequently in order to sustain its economic fabric, undertook a series of investment in order to re-direct its fiscal policy and provide supports for the sustainable transition (European Commission, 2019).

3.2 - CIRCULAR ECONOMY BENEFITS

In theoretical framework have been advanced several different motivations according to which firms would obtain advantages implementing a circular economy framework. For our convenience, we will divide the obtainable benefits in two main categories: *economic* and *noneconomic* ones.

The economic benefits obtainable implementing a CE, are related with a decrease in cost structure, or with an increase of revenues. Indeed, an increase in sales may be activated exactly by the green turning-point of the company, which nowadays may would attract more and more consumers. More likely however, companies simply will obtain some sort of advantages decreasing the impact of price paid for buying virgin material. Being able to recover used materials infect, buyer companies will be able to save important part of the previously expended costs, since those selling companies which instead had paid for its disposals, would have granted a maximum discount.

In second place, businesses may also obtain non-financial positive development thanks CE practices. Actually, since CE perspective is very close with sustainability argument and social corporate sustainability, it is very likely that most of the obtainable benefits will be (in the first instance) non-economical. Introducing a circular architecture, may in fact play a vital role for nowadays companies, squeezed by fierce competition of those companies across the border.

Main non-financial benefits are:

- *Follow market trends*: Motivations in this case may be simply related with consumers' preferences. Since in fact consumer drive markets, any approach towards a greener behaviour will inevitably be dragged, but also drag, by consumers' interests. In fact, if for those consumer specifically interested in buying more socially responsible goods, these characteristics will be considered critical, for other consumers, green features added may represent just a positive

plus, bringing attentions and spurring them take the first step in the direction (Geoffrey B. Sprinkle, 2010).

- *Contracting benefit*: Has been discussed a lot in literature the fact that, companies engaged in circular practices, result much more attractive towards the labour market, in comparison with their non-green competitors. Secondly, those companies actively engaged in sustainable practice, have resulted to be among the more attractive companies also because their tendency to invest more in well-being also of their human resources (Huang, 2011). In fact, theoretical framework underlined several times how different factors like management support to environmental improvement, environmental training, or others social policies may be very important rewards system, as valuable as financial ones, for some employees. From these 2 arguments, we can understand how circular green companies generally attract the best available talents in the market.
- *Market strategy*: May be the case that the decision to undertake a circular pattern is simply the result of a differentiation strategy in the market. Companies oriented towards environmental attentions generally collect positive feedback, with the connected possibility to serve those consumers that require only green products, while resulting more responsible for others. Circular economy strategy may also be seen as a winning strategy, worthy to pursue, because it is today signalled as one of the main market trends in future development. Serving in this market will therefore provide uncountable growth possibilities, increasingly expanding the clients.
- *Altruistic intention*: May be simply the case that the company, according with its shareholder perspective, is undertaking these efforts aiming at more sustainable, fairer and correct environmental usage. Many companies are in fact committed to social practices simply because they are the right thing to do, other, undertake this path just because of attention of the public to the theme.
- *Risk management practices*: Corporate social responsibility practices can be classified as a lever for legal and regulatory control. Polluting companies for example, when facing the risk of a concrete reduction of maximum level of

pollutant emission, may voluntarily start acting towards a reduction of their pollution, reducing therefore the impact any possible regulation may have on their income statement. This just represent is a clear example of how a company may save several possible expenses, while adding some green appealing against the market (Geoffrey B. Sprinkle, 2010)

- *Employment effects*: Not taken in consideration by the single company, but surely a data in favour of governments and intuitions interests, in literature we find many times recalled the positive effect that the conversion to a circular framework would have on employment. Eco-innovation necessities in fact are already stimulating employment market asking for a big number of new competencies and skills, stimulating also existent and traditional sectors. The International Labour organization estimated in fact the net creation of 18 million green workplaces by 2030. Just in 2018 for examples, in Italy, the number of green jobs grown up of 100.000 unity, hitting the highest ever, 3 million jobs (GreenItaly, 2019).
- *Improved customer interaction*: In comparison with linear take-make-disposal models, circular frameworks are usually structured with patterns that increase the relationship with end consumers. In case of a service model for example, the number of iterations will be higher in comparison with the number normally associated in linear one-shot approaches. New long-term customer relationship may have very important beneficial aspects for companies. This type of relation in fact help companies in collecting all the necessary information which they will use to increase those feature that actually are creating more friction. Information access has been proved to be in fact vital for an intimate knowing of consumer's needs, improving the company ability to satisfy clients.

3.3 - CIRCULAR ECONOMY FURTHER PRACTICES

Sustainable practices may result in various positive aspects for companies. Independently from the specific development a firm is aiming to pursue, both economic, environmental and social benefits may be the results of more circular practices adoption.

The first positive aspect, the economical one, could be appreciate as result of the conversion of the processes. Experiencing a transformation of this type in fact, makes sense to speak about possible revenues obtainable. According with the positive features introduced, it is plausible assume that, along with the growing attention environmental topics are receiving today, a growing numbers of consumers will be more and more attracted by those brands which pose a particular attention to the ecological consequences of their productions (Fernanda Muniz, 2019). A positive financial aspect is probably one of the most praised motivations that push entrepreneur in undertaking the transition to a circular production process. Clearly in fact, if the value associated with more socially responsible practices may vary according with the specific type of product and the specific assessment of the market, no one could deny that in the long-term economic benefits will come from the transition. Integrating some social driver into brand's equity usually have the effect of enhance the perceived value transmitted, strengthening therefore relations with actual consumers. Adding altruistic reputation elements permit in fact to increase the possibilities for a brand escalation in the market, relaunching brand reputation and enchanting those undecided potential consumers. In an era where environmental benefits are becoming more and more drivers for markets, green circular features are absolutely sign of positive differentiation, offering to those companies which are fighting for the market, enormous advantages.

In the next paragraph we will discuss more in particular some of the more known green practices developed in a circular perspective.

3.3.1 - INDUSTRY 4.0

The new emerging technological scenario labelled “industry 4.0” (Reinhard, Jesper, & Stefan, 2016) can offer additional strategic tools for those firms willing to achieve sustainability goals.

Today, exist in the market many and many new disruptive digital technologies available for operators intentioned to transform their manufacturing processes (from robots to additive manufacturing), their organizations (i.e. big data) and their products (Internet of Things - IoT). Currently, does not exist a definition of *industry 4.0* universally accepted, but, at the same time, most of definitions contain common aspects which may help in address the problem. The 4 recurring elements are: *automation, connections, use of technologies* and *digitalization*. Such practices, made possible by both low costs and development of technologies, had the effect of increase firms’ capabilities to deeply monitor input selection and usage during the flow into production processes, tracking from the initial input acquisition, to end-product use by customer. In this context, scholars are largely debating about the positive link between sustainability strategies and the new digital paradigm (Chen et al., 2015; Kohtala & Hyysalo, 2015), within a larger emphasis which encompasses also international institutions (Ellen MacArthur Foundation, 2016) or consulting firms (Lacy, 2015). The fundamental features decanted by firms speaking of 4.0 technologies are; *flexibility, collaboration, transparency, innovations* and lastly *supply chain* relations. Within these dimensions in fact, the so-called smart companies may have the possibility to obtain large benefit from technology at different levels, for example; business planning level, operations level or also business intelligence level. Lowering manufacturing time, reducing processing cost, increasing value chain coordination while improving flexibility and customization represent the main objectives searched by companies and consumers.

The 9 pillars of 4.0 are exposed in the figure 9.

Figure 9 – 4.0 Pillars. <https://urly.it/341r3>



Tech 4.0 will allow companies to build algorithms based on historical data, giving also the possibility to share them, increasing productivity by using robot production, improve transportation system and products optimizations, managing network coordination and simulating case studies with advanced remote support services. The rationale behind smart companies concept, is in fact given by their ability to achieve absolute a control throughout the chain for the achievement of company’s purpose (Haddud, 2018).

Creating a bridge between circular economy and tech 4.0 concepts, Ellen MacArthur in 2015 proposed a specific pattern that could be adapted in implementing bot the perspective. ReSOLVE framework, based on the paradigm “*regenerate – share – optimize – loop – virtualize – exchange*”, is simply based on the assumption of diminishing dependence from virgin material, shifting production processes to a renewable input system, making sustainable operations are standard.

In a sustainable operations management view, the just cited framework with some 4.0 adaptation would become (Navin K. Dev, 2020);

- *Regenerate*: adapt production decisions to information received through IoT in order to obtain more sustainable productions
- *Share*: alignment made possible integrating both cloud-based systems and internet of things in order to obtain the flowing and sharing of information about processes, operations, business unit and products. Refining these technologies companies may improve their environmental adaptabilities and therefore boost economic performances.
- *Optimize*: Cyber Physical Systems²² and internet of things are central point of this elements of ReSOLVE framework. These technologies will lead to an incredible amount of collectable data permitting supply chain optimization and computing the best alternative in terms of inventory, order size and production planning.
- *Loop*: IoT, CPS and cloud services may help in the direction of improving circularity of resources and materials, tracking and monitoring reverse logistic, remanufacture status and recovery processes. Additive manufacturing may also offer support to the re-entry of resources over supply chain.
- *Virtualize*: technologies as cloud manufacturing, IoT and additive manufacturing permit to enable the relationship between different organizations, enabling at the same time the replacement of the physical world with virtual models simply connected with sensor and data. The enormous possibility of these technologies

²² Edward A. Lee, define CPS as “[...] are integrations of computation and physical processes. Embedded computers and networks monitor and control the physical processes, usually with feedback loops where physical processes affect computations and vice versa”. For both (physical) hardware, should be consequently created a software application (cyber), which will permit to the different physical components of different system, the exchange of information among them and also with human being, with the objective of, monitoring, managing, and controlling the system themselves.

allows to go beyond physical and temporal limits, permitting new levels of mass customization.

- *Exchange*: Finally, 4.0 may help enabling sharing of information and data of recyclable materials, introducing also new advanced and renewable goods.

While the world is fastly moving towards new needs, new issues and opportunities, the applications of these technologies represent the most effective way for pursuing more environmentally sustainable strategies. Even though there have been critics directed at the humanity's faith in technologies and their ability to introduce human beings into a new era, the majority of scholars, philosopher and great minds still address at only technologies the human beings' ability to survive on the planet. In this sense, being able to integrate both the 2 paradigms, circular economy and technologies 4.0, will foster the possibilities to reduce our impacts on environment, improving our general conditions, offsetting negativities with efficiency gains obtainable.

3.3.2 - SUPPLY CHAIN CONFIGURATION

A supply chain could be defined in several ways. The most relevant definitions recite: "The global network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution, and cash" (F. Robert Jacobs, 2018), and "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer" (John T. Mentzer, 2011). Only after 2001, therefore several years after the first introduction of the sustainability concept, supply chain started to be associated also with this topic. After the first conceptualization of green supply chain management in fact, different studies on practices, structures and processes of supply chain management were proposed. In literature we can find different research about green purchasing, manufacturing, distribution, marketing or closed loop supply chain and waste reduction, but if it is true that all these concepts point in the direction of a sustainability for human beings development, it is also true that the closest subject to CE is reverse logistic.

3.3.2.1 - REVERSE LOGISTIC

Many researches dealing with the argument indicated that among those modifications required by manufacture in order to implement Circular Economy, reverse supply chain is among the most important contributions. Especially since the last years growing awareness on the fact that raw materials are not unlimited, extended producer's responsibility laws have required producers to control responsibility along the supply chain.

A reverse supply chain requires first of all a high level of cooperation within supply chain. Higher degree of cooperation with consumers, or with others actor in the supply chain, represent itself a new value proposition and therefore it is key that also business model is aligned in order to obtain the claimed efficiencies. When designing a reverse supply chain, exist for companies' possibilities both for open loop reverse networks and closed loop reverse networks. The latter indicate a situation in which products and materials are generally returned to original producer. On the contrary, in the former ones, products are not returned to the original producer but instead they are allocated at other firms in the market which will look after reprocessing, refurbishing, recycling or remanufacturing of material flows. In both cases anyway, a well-organized network design requires cooperation among partner along supply chain, and exactly this, will be a major difficulty for implementing circularity. Taking back products from costumers and eventually recovering it involve a set of new operations which have to be implemented from zero for a newcomer provider of this service. From collection, to inspection, sorting, effective recovery or finally disposing, companies will have to set and coordinate these new activities.

Looking at reverse logistic strategies, it may exist four different possible model of managing a reverse flow of goods:

- *Basic reverse logistic model*: In this first and most simple model it is the end user the key part which decide where and when he will take back products. The situation implies the fact that exist more than one possible collector or independent provider and consequently this translate into a separate reverse supply chain not linked with the classical direct one.

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- *High Tech closed loop SC*: In this model it is the original equipment manufacturer in charge of both classical direct supply chain and of the reverse one. Producers oversee flow of parts and components thanks to direct but also indirect channels. The label high tech SC mainly derived from the fact that products are tracked by serial number with the aims of overseeing inventory and costs.
 - *Low Tech closed loop supply chain*: working in a similar manner of the previous model, in this case reverse logistics operations are managed directly by end user of the products which is in charge of returning the product for recovery or qualification of non repairable or reusable.
 - *Consumer oriented*: Finally, with this model we mainly indicate the supply chain of consumers goods. Similarly, with low tech model, also in this case it is plausible the coexistence of independent retailers, which at the same time however, represent a limit for the fluidity of the chain because of the possibility for retailer to influence the market.

Despite statistic and scholar identify reverse logistic opportunity as a profitable source of potential enlargement of market value, producers are still reluctant in implementing effectively the framework. A major problem in complementing what we call “the classical forwarded supply chain” to the new one reversed is clearly given by the cost of implementing this reverse flow.

3.3.2 - SHARING ECONOMY

Global recession, the growing environmental conscience, and the explosive development of informations and communications technologies, have lead sharing concept getting out. The model suits perfectly for all those products expensive to buy but at the same time not fully exploited by their holders. Rooms and cars are the most obvious examples of goods shared. Indeed, in Europe for example cars are parked 92 percent of the time, while workplaces and offices are used only in a range between 35 and 40 % of the time, and that’s only during the working hours (Mark Esposito, March 13, 2018).

Peer-to-peer lending do not involve only individuals. it is a powerful tool also for companies which might want to take advantages of lowers rents for offices and machines, allowing therefore greater environmental effectiveness. For the just mentioned reasons, the transformation towards a more collaborative consumption-production pattern represent a silver lining when thinking at a greener economy. Especially in medium and big cities, where growth in populations has been (and will be) exponentials and almost 70% of total energy consumption is made, it is strongly felt the sentiment for increasing possible eco-greener practices. This more sustainable consumptions-production system resulted has been made possible by the advancement of technology, that enabled a significant downsizing of those transaction costs associated, leading to a cheaper and easier sharing process.

In a sharing economy, those free rooms, office spaces and means of transportation are converted and not necessarily owned by someone, but rather used by as many individuals as possible, utilizing digital economy for coordinating the shared use. Also, tourism economy has been disrupted by these techs, just think at those vacation apartments which could be rented by more families letting the rightful owner who do not use it, to earn an income. The sharing phenomenon has further interesting consequences. In fact, by providing empty spaces in the market, the situation prevents discourage that new buildings are made, thus avoiding that several apartments remain empty for most of the year, with obvious consequent positive environmental impacts. Also laundry services and home equipment can be shared instead of each apartment owning its own. A new consumption culture is absolutely a critical part of the circular economy pattern and its effort to reduce the linear throughput flow of materials and energy. Most common program founded on a shared sustainable consumption conjugate both private and public interest, Some examples:

- *3D printed*: Presented years and years ago as one of the most disruptive tools of our time, 3D printing has already gained a lot of success, but still someone is claiming that they have not achieved the importance expected from them. The importance expected derive by that claims which has credited 3D Printers as the most transformative alternative to the classical production model. 3D printers are in fact deemed to offer positive features as flexibility and variability to

productions, and these features, in a world where mass production has been outdated and where personalization is a must, represents customer's preferences. Idea behind sharing when speaking of 3D printing is that waists the possibility for local government to subsidise both 3D projects but also 3D printing facilities, therefore not all potential users are obliged to use it with a positive environmental side

- *Pre-owned goods*: redistribution of pre-owned goods has also been thought as fundamental when speaking of efficiencies in the markets of used goods. Intermediator, as Ebay for examples, looking for personal profits, facilitate allocations and the transfer of ownership within the sharing economy pattern.
- *Car/bike sharing*: The shared use of personal vehicles among member of a predetermined network (or not), could be exemplified in different business models. Vehicle may be owned by a cooperative community, by a proprietary company (for examples "Enjoy" sharing system in Milan, Rome), or also be based on a peer-to-peer system. In the latter case the idea at the base of is the one behind the famous *BlaBlaCar* service. With this app people have the possibility to make free seat available to other users, by doing so, reducing the number of empty vehicles on the roads. Bike sharing for examples is key in breaking down the famous first mile/last-mile emissions within cities. Carsharing and bike sharing for these reasons are allocated among the most sustainable consumption practices reducing the need for users to acquire their own vehicle.
- *Workspaces*: More often visible in big cities, common workspaces represent for professional useful tools. In these conjoined realities, an efficient sharing of needed services is normality; printers, internet, meeting spaces and office are common examples. Started to settle also in suburban areas, they represent good opportunities for professionals also to interact with others in a more informal environment, creating a big potential for fostering synergies and local economy development.

- *Place to stay; Airbnb* is today the most spread short-term housing option around the globe. Its success is indistinctly associated with the innovative business model implemented. Thanks to its renting service in fact the platform has become one of the major synonymous of sharing economy.

The social objective in a sharing economy shall be very different according with the sector at which the concept is applied. Increasing employment, implementing more democratic decision-making or exploiting more efficiently product performances are generally the possible reasons according to which may bring the implementation of cooperative and community usage (user groups using the value, service and function). The social objective is therefore given by the ability of the sharing economy of supporting economy when looking at the point of view of financing, creations and services, creating possibilities of co-financing, co-creations, and may be additional services offered.

3.3.3 - REMANUFACTURING

Remanufacturing represent a key link for supply chains when moving towards the implementation of circular networks. Its importance it is definitively growing alongside with the importance of sustainability and environmental complications.

Remanufacturing in economies may be favoured (or limited) by both technological and non/technological drivers (or barriers). The process of remanufacturing start from the disassembling function. After this step, the cleaning, the inspecting, the repairing, the replacing and the disassembling ones are performed in order to preserve the contained materials to be remanufactured. It may also be the case that through remanufacturing, firms add new functionalities at a lower expenditure of energy or resources if compared with the linear process, with obvious advantages on the net-consumption impacts on environment. Indeed, especially in determined industries, where products can retain a good part of the economical value embedded initially manufactured, remanufacturing have an enormous potential financially speaking. A big emphasis has also been given to the positive effects that remanufacturing activities are also able to create when looking at job creation opportunities. In US for examples, in those sectors most

involved in remanufacturing activities as; aerospace, motor vehicles parts, machinery, IT products, medical devices, rethreaded tires and consumer products, the activity occupy a considerable part of the total full-time workers in these industries. Photocopy machines and cameras are also good examples of product remanufacturing, but at a different level. For these products, the market has relived a new gold era, exactly thanks to the revival lived by vintage products in last years. But not for all the products remanufacturing is economically viable and doable.

Ideally, remanufactured products should have: (Mitsutaka Matsumoto, 2016)

- Stable product technology,
- Stable process technology,
- Subparts physical lifetime longer than the time the product is used,
- Guideline for identifying candidate/components for remanufacturing.

The biggest market for remanufacture today are United States, where, in 2011, US International Trade Commission (USITC) have valued the total production of remanufacturing product at least 43.0 billion USD, way more valued than the 2.4 billion GBP market in UK (Mitsutaka Matsumoto, 2016).

Initially introduced during the G7 summit in 2015, remanufacturing in recent years has growth a lot also in literature, but exist a portion of companies which are still reluctant to implement it in their corporate strategy probably because of the existence of several opinions reporting the main barriers in remanufacturing.

The main and most often encountered limits are:

- Collection of products,
- Development of an efficient remanufacturing process,
- Client acceptance of remanufacturing,
- Economic feasibility of remanufacturing.

In fact, because of the numerous barriers encountered and because of the possibility for cannibalization with other products, companies should evaluate carefully the idea of undertaking remanufacture, weighting also its adherence with corporate strategy. It is however unquestionable that with remanufacturing a firm may have the possibility to approach new customers, maybe even expanding the possible audience interested with a plausible lower price involved. This, will permit also companies to collect some useful information and feedback regard product reliability, loved features, quality and durability, while also gaining a sustainability-oriented qualification on the market. Since remanufacturing is becoming more and more important, it is becoming more and more fundamental also draw up, at the beginning of life cycle, the possibility to perform a possible re-manufacture. Product design and process design therefore should represent, again, the fundamental steps also when thinking at remanufacturing efficiency. As already said in fact, more than 70% of the whole lifecycle cost is predetermined during the design of a product. And it is also in this initial phase that major inefficiencies reported may be easily rethought in order to develop better products. The need for a disassembly process, for a cleaning and testing station, or for new components may also help in this sense, developing a smoother business model proposition which brand advocate will evaluate.

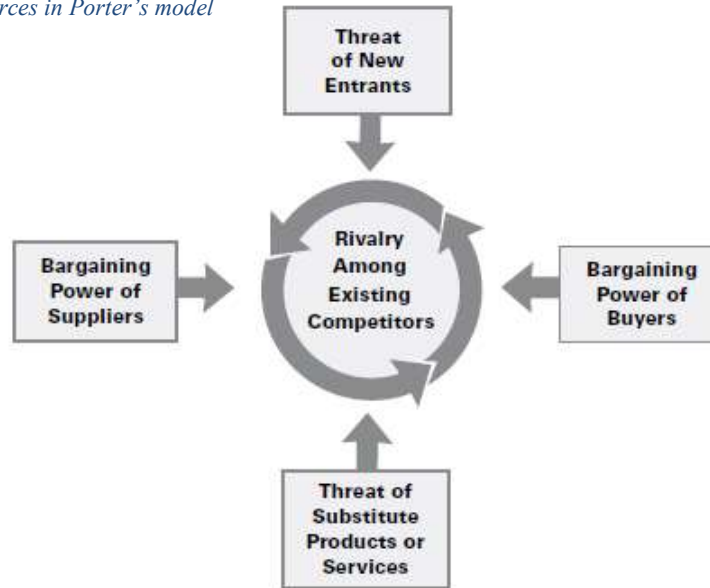
As explained in the previous paragraphs in fact, in a closed loop-oriented supply chain design, control and operational system should be thought in order to maximise value creation in every aspect, and this is absolutely more true when speaking of remanufacturing consideration.

3.3.4.1 - A NEW 5 FORCES PARADIGM (Dennis Stindt, 2016)

When speaking of remanufacturing after 2016 however, any analysis should not be conducted without considering the revolutionary approach developed by a group of researchers of Manchester University about “the attractiveness of product recovery”.

The pool of researcher, starting from the ideas developed by professor Michael Porter in 1982 in his work “The Five Competitive Forces That Shape Strategy”(Figure 10), which essentially represent the main factors that has to be evaluated in performing an evaluation of the market, implemented an innovative model looking at the forces that shape the so called *reverse market*(Figure 11). Managing a comprehensive literature review on research previously

Figure 10 – 5 forces in Porter’s model



performed and collecting information in the market they were able to rearrange the ideal model in the optics of those companies that are going to deploy a reverse supply chain. Exactly like Porter identified the famous 5 forces which shapes the environment in a forward-oriented supply chain, the new model identified those forces which could shape the attractiveness of the reverse markets. Assessing the same profitability of a strategic decision-making process and basing it on the reverse five forces requirements, it results in a different model with similarities and many comparisons.

The new model first of all, is required since the reverse market shows significant different

Figure 11 – 5 forces in the reverse market model (Dennis Stindt, 2016)



characteristics compared to the classical forward ones. The main big difference underlined, which probably entail the main limit, is the fact the fact that in the reverse market traditional consumers are also supplier of the same corporation which had sold them the goods. Not perceiving themselves as supplier however, companies are facing important trouble in finding active participation in this take-back market. Not only, also the effective quality of the goods retired represent another big challenge for companies which as in all the other functions, theatrically would need a minimum level of standardization. Even not considering obsolescence of technology in fact, the quality of products retired depends a lot on how these products were used during their life. Therefore, non-uniformity of goods plays a really important obstacle in creating a possible reverse market.

The 5-force painted by Styndt:

- *Access to recoverable products*: Within this force, a big weight should be given to the reverse market potential, or in other words, the extention of end-of-use goods

available in the market. Secondly, others aspects as customer structure²³ (White, 2003), quality of returns, 3rd parties sourcing opportunities²⁴, dominant forwards business concept, established take-back channels or regulatory policies will build the favourability of reverse market.

- *Rivalry for recoverable products*: factors associated with this force limit the accessibility at the market for foreign companies. Most common barriers, when speaking of reverse logistic activities are related with the equipment necessary to implant the effective reverse flow from consumer to producers. Since there is no necessary a symmetric distribution, the cost of investing in new facilities and infrastructure represent a first important limit. But more generally, organizations also have to face usual problems of implementing logistic chain, for example looking for economies of scale and integration of technical equipment needed. Technical feasibility then, may limit the ability of companies to recover chemicals of physical materials not just from the financial point of view, but also and especially in some industries, from the chemical and physical. It may depend from difficulties in finding some specific knowledge required for the activity need to be performed or any conformity certification which the law require to adopts in case of the activity involved.
- *Threat of IRC's market entry*: Rival companies looking for entering into the same or similar market increase the possibility of fierce competitions among market players and the supplier of market players. Assessing rivalry deterring business model, aims and market positioning is fundamental when evaluating different positioning of competitors. Specifically related with reverse market should carefully be weighted the possible take-back lock in clause that some companies may have implementers with their costumer. Take-back provision drastically

²³ Styndt highlighted as would be easier for companies obtain back goods from B2B business in comparison with B2C ones. The reason is drawn back to the fact that B2B typically exert a substantial quantity not dispersed as in the case of B2C business.

²⁴ When exist a 3rd parties sourcing opportunities, the fact that exist a buffer company between the market and the reverse buyer may simplify the possibility of remanufacturing companies for finding recoverable products

enhance the competitions in the market (Toktay, 2006). Finally, also the existence of possible intermediaries between companies and recoverable product may distort competitions modifying patterns and information of players.

- *Adverse effect on core business*: it may happen that the existence of recovered product has negative effects on the sales of new core products. Cannibalization of existing products is one of the keys phenomena of adverse influence of core business. Nonetheless, differential in quality of goods in new and secondary market directly influence both interest towards recovered products and also willingness of buyers to purchase it. Recovered goods may also affect the brand positioning and image of companies in the market, allowing for a new set of images in the market. Clearly, if a new green feature added on a product may be beneficial on a consumer good market, it may not be the same case on others.
- *Remarketing opportunities*: Last force mention the potential of remarketing opportunities in the secondary market. The idea, is associated with the possibility of finding input and spare parts in order to effectively process the recovery of the products. In addition, also customer willingness to pay for secondary products, secondary materials and depends on customer's perceptions and on the dynamics on the markets. Finally, technology life cycle and new technology are a key factors for understanding the market.

Concluding the quick overview presented, Styndt specify how this model does not entail all possible variations may be captured in the market. Many different specifications could shape five forces in different ways both when speaking of forward and reverse markets. Company specific characteristics must be considered when evaluating possible positive and negative development of the market along with its strengths and weaknesses.

3.3.5 - SERVICITIZATION

Satisfying costumers needs and improving environmental efficiencies while reducing emission may be realized rethinking the actual paradigms and focusing exactly at what consumers are lacking, trying to satisfy their unexpressed needs. A circular business model proposition consists in offering intangible services designed specifically in order to fulfil final consumers needs. Products-service systems are based on the concept that the main of the value provided by companies is no more simply given by product itself, but it is instead provided by the value associated with the capability of firms to fulfilling any users' need.

Also known as “functional sales” or “performance economy”, the concept may be simply expressed as servitization.

3.3.6 - *PERFORMANCE ECONOMY*

When speaking of performance economy, as outlined by Stahel, we are referring to a business model where a sale of product no more occurs. In this framework in fact, the needs that were previously restored by the physical properties of goods are now satisfied by immaterial services.

Manufacturers in this framework retain the ownership of goods becoming therefore formally service providers. With this used-oriented service framework, the producer is able to deliver just the required value. Value, which is no more simply related with the price paid for a product, but it is instead detached by physical property becoming associated with the effective benefit received. Consequently, users are no longer active users, simply instead they are granted with the satisfaction, for an indefinite period, of the needs which have searched to restore. A substantial difference compared with the make-use-dispose patter is that once the fruition is concluded, the manufacturer is in charge of the tacks-back aspects. Having therefore the possibility, after the withdrawal, to increase its functionality with new components, accessories and possibly enhancing the value associated with the product (Stahel, 2010).

The idea comes from the fact that consumers are no more interested in shifting of property of inefficient physical possession, they are on the contrary just interested in limited or unlimited access to a “vehicle” able to provide the function, which will drive them strictly towards the realization of the single need. Exist many specifications of this model, developed according with the features of the service searched, but in the majority of cases, the provider oversees repairment and maintenance of the product provided. This approach comports many advantages for the environment and limits its useless exploitation. For example, within this framework, manufacturing companies pushed themselves to invest in material and design saving, looking for product with longer lifecycle, and thus, with a lower amount of energy and material dispersed. It is straightforward that all these savings will directly translate into a lower cost for companies and positive environmental advantages from reutilization and recovery. In addition therefore, companies are directly and indirectly encouraging take-back of products, relaunching relations between consumers and materials utility. Service-systems converge also towards new and more deep information available about usage of the products from consumers perspective, enhancing possibility for better functionality. Consumer interaction become less intensive but more frequent, the first big disbursement of purchasing moment disappears, allowing a higher number of interactions like in the case of leasing (Andrea Urbinati, 2017). Considering the price, already today is no more a mere function of the amount of materials a product contains, but it is instead associated with the value a product entail. Indeed, looking at aspects as promotions and branding, the economy already faced a dematerialization of the value, now only marginally influenced by virgin materials concrete presence. The value associated with a product is now function of just how a brand is felt on the market. Tangible and intangible elements combine then in the value relationship which will results in value perceived by consumers. At the same time companies need also to upset their organizational culture, transforming in a service-oriented one, with different skills, different structures of costs, longer financial horizons and more complicated revenue schemes. Concluding, it is interesting note that in performance models, may we assist at a general decrease of the overall cost for end-users, since a possible (and plausible) diminution of the economic value of inputs is usually granted by these pay-per-use services (Patricia van Loon, 2019).

Of course, this model also has disadvantaged since it is not currently the predominant in the market. The reason is pretty simple; indeed, is given by the fact that property in linear forwards model represent a deterrent for bad usage of goods, performing an anti-abuse effect against tenants, but the same effect on the contrary is not present when speaking of a performance economy models.

This pay-per-use market transition²⁵, where users buy outputs according with the their necessities, it will be a Copernican revolution compared to the actual paradigm where needs are satisfied with products or services. As anticipated in the appropriated paragraph, it should be considered that the rise of this framework, has been made possible by the rose of connectivity and internet of things, which have permitted a considerable resize of those costs associated with on-demands services and renting markets.

3.3.4 - ENGAGEMENT AND MARKETING

As already anticipated, should not be underestimate the fact that brands which actively pursue environmentally friendly businesses benefit from their green aspects, becoming more fascinating in the eye of new consumers. Increasing the prestige associated with a brand clearly channelled results of those communication resource invested trying to improve relationship loyalty with client. Crucial is in fact understanding whether or not consumers are willing to buy greener products, trying to keep up with environmental awareness, maybe also at a premium on the market. Is then fundamental for companies remember that not just consumers are responsible for their purchase, but also the same companies have influence on it. Costumer in fact are drove in their purchases by both locals and multinationals corp, which eventually are able to influence dynamics and habits with their products. Therefore, althought the qualifications of private entities, on a par with governments and institutions, firms have a fundamental impact in driving consumption on the market. Exactly for this reason, scholars address at their ability to sustain

²⁵ Users buy the output according with the level of use. Provider maintain ownership pf products and are still in charge of maintenance. It is obliged to provide a end result but there is no specification on how the results will be delivered.

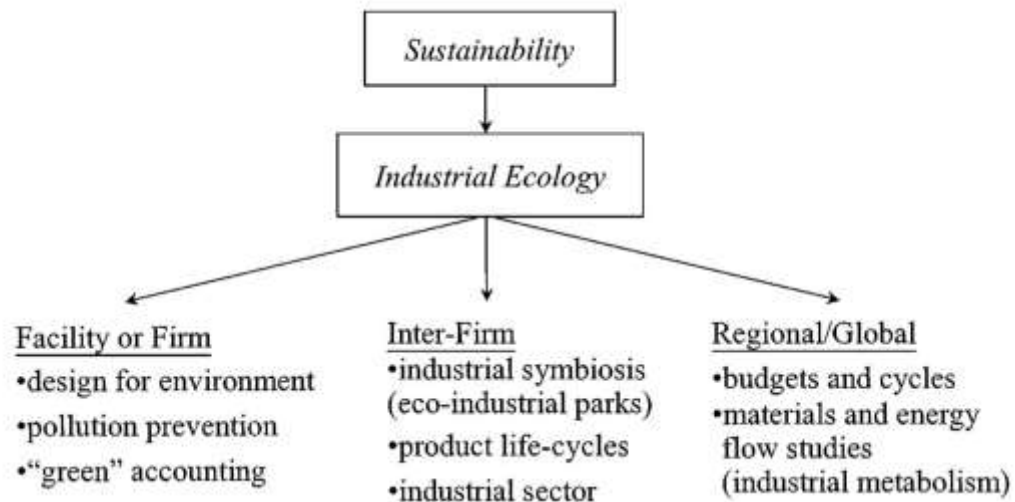
environmentally friendly movements, the actual social responsibility towards markets they serve. Therefore, critical is letting perceive that exist a strong fit between brands and social causes haunted. Another consumers weakness to bear in mind is that they are strongly subject to sense of communities when they are purchasing. In fact, their purchasing decisions become involuntary influenced by their surround network of peers, and this effect is called network effect. When it occurs, products are valued no more simply by looking at their singular features, but looking at the customers base, and therefore valuing them increasingly according with the numbers of users are actually using it. In other words, when a good is very diffused, additional people will tend to purchase it, because of a higher value perceived, given by the possibility to share the common features with others.

These arguments may sustain also CE strategies. This is the reason according to which circular strategies should be thought and implemented accounting also for these non-rational drivers (Planing, *Business Model Innovation in a Circular Economy Reasons for Non-Acceptance of Circular Business Models*, 2015). The goal for companies is therefore being able to directs their businesses goals with consciousness, aligning at the same time, consumers values and exploiting the higher perceived value created. Indeed, today more than ever perceived values are given by the sum of warranties, price characteristics and features embedded in products, but also thoughts and belief associated with products and brands. Last aspect it is worth to touch it is employee motivations inside those companies which have undertaken a sustainability-oriented path. Among the several other aspects which may motivate and increase employees' attitude, definitely we can collocate environmentally friendly engaged companies. Corporate studies in fact demonstrated as, environmental commitment highlight a positive correlation, as others non-financial benefits. Not least, also investing in training and development for workers is enormously important inside companies willing to develop better relationship with employees. The rationale is in fact that companies which actively engage in employee development paths, will seems positive include the development of the worker's skills, looking more involved with their stakeholder. In general, anyway, green policy, from pushing employee to commute to work by bike to investment for completing employee skills, are positive absorbed in corporate.

3.3.5 - IMPORTANCE OF COLLABORATION

According with the figure, industrial ecology, premonitory of circular economy, have not simply introduced sustainability aspects looking at the micro level. What circular economy later has deepened was already be previously introduced by industrial economy introducing different

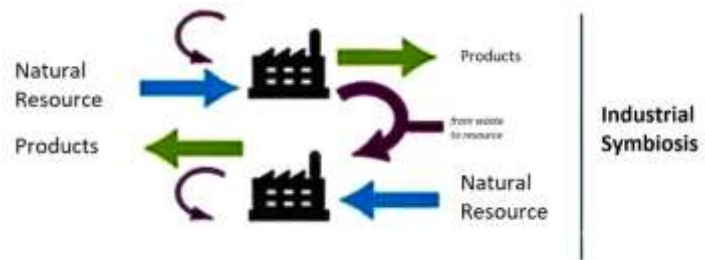
Figure 12 – Industrial ecology levels of application



notions, or more correctly, levels, of looking at efficiency around the firms.

Along with the micro dimension of a singular firm, it worth to take in considerations also the meso and the macro ones built around it (Figure 12). While with the term micro level we identify the single company and processes occurring within itself, designed in order to reduce as much as waste as possible, when speaking of meso level the focus moves towards a system of more than one enterprise. Therefore, mainly referred at the production side, meso level refers univocally to eco-industrial parks, industrial symbiosis districts and networks of companies.

Figure 13 – Industrial symbiosis scheme



The increasing configurational approach provided for supply chains, impose to those companies oriented at a greener supply, cooperation aimed at prevention of wastes and at increase of resource utilizations. Eco-industrial parks (Figure 13) are expected to become a critical part in research for harmonization with environment, looking for efficiencies in function like logistic, storage, and purchasing. Making efforts towards conservation of resources, but also trying to better value environmental and social issues, these parks are able to coordinate the overall being-together of resources minimizing waste production. Through the exchange of internal products, by-products, waste, but also implementing reutilizations and proving the infrastructure needed for sharing among members, eco-industrial park, aims to implement the best possible cycle in that determined dimension (Patrizia Ghisellini C., 2016). From a policy point of view, creations of these districts may be favoured both with a top down approach, issuing regulations and creating eco-industrial parks, but also thought a bottom up approach, favouring the aggregations of those geographically advantaged companies, which enjoy communal proximity. In this case legislator are in other words, favouring the birth of natural industrial districts. For example, in a study conducted on Kalundborg eco-parks, Denmark, have been highlighted that strengths leveraged by these infrastructures are related with an effective decrease of energy and water consumption, along with significant reduction of sulphur dioxide and carbon dioxide emissions, and also a positive increment of waste transformation (into new feedstock) (Corrado Clini, 2008). The “industrial symbiosis²⁶” concept, originally coined speaking of Kalundborg, was in fact based on the idea that exchanging companies’ waste within a business park with a limited geographical dispersion, would have existed the concrete possibility to obtain a zero-waste production model, annihilating most of negative impacts on environment.

²⁶ Concept already introduced speaking of business model that promote a more environmentally reasoned usage of resources.

CHAPTER 4 - EUROPEAN UNION POLICY ON CIRCULAR ECONOMY

The attentions in fact directed towards the flows of materials and energy within these parks, made possible the assumptions on these parks where geographic proximity of contributors permits the implementation of cycles eliminating rejects inside these eco-industrial parks.

When speaking of macro level instead, the focus is instead on cities or regions where the integrations of the same sources, but in larger scale, is aimed at the creations of a eco-system made of industries, cultural infrastructure and social system developed in a coordinated way so emission and waste are design out and mitigated (Patrizia Ghisellini C., 2016). The classical example when speaking at these macro examples are Chinese cities which are managed and optimized in order to obtain these results in the next years.

The recognition of a need for an integration of those environmental aspects with the economical dimension has grown exponentially in public concern during lasts years. Along with the drastic scenario painted and those accusation moved at human development impact on the planet, institutions started to adopt green favourable policies. European Union in first place, is trying to foster the adoption of a a new paradigm for humanity adopting positive provisions, setting therefore new environmentally positive policies, instead of imposing constrain and prohibitions on single member states. The perspective required, according with the European Commission, is a necessarily rethinking of culture and policies for achieving awareness and acceptance on the argument, trying at the same time, to trigger a radical shift in the mind of citizens, improving their knowledge, the rise of technological innovations, and spreading skills and results within its territory. The strategy prompted has been implemented applying these set of shared values towards all the elements that compose EU economical fabric, from authorities, to institution, enterprises, business community and, as just mentioned, citizens. What has been generously leveraged by the Commission in pushing this environmental European strategy, is the identification of one common and coherent unique regulatory framework by which favour the rise of the environmental sustainability matter on the markets. But since European legislative framework is built on the integration of the power of different institution, European union have also the crucial role of dictate the line of action of every single European country. Thus, is

therefore permitted and encouraged, according with the subsidiary principle, the adoption of national specific policies as well as the integration of legal, administrative, economic, fiscal and environmental approaches²⁷. Since consumers are also a key part of the entire process, acting as participants and driving the markets, the evolution of consumers behaviours towards higher level of sustainability, need therefore both the adaptation of the whole legislation and of firms' business practices. Since inside firms the development foreseen will be always be accompanied and foster by new business model²⁸, at the same time, policy makers are playing the role of the referee, preparing and setting the proper favourable legislative environment, evaluating progresses obtained and monitoring developments. Promoting those frameworks able to generate positive impacts, the European legislator will drive markets towards more efficient results.

4.1 - LEGISLATOR PERSPECTIVE

European Union strategy provides for 2020 a determinant increase of resource efficiency in production and consumption.

As outlined by Horbach, Rennings and Sommerfeld in *Circular Economy and Employment* exist several different environmental instruments available at the disposal of legislators. Every one of these has different effectiveness in reaching the results desired and is exactly the same legislator that guide the ultimate choice on how implement the provisions towards the result searched. The general approach towards environmental policy recognizes that evaluating the exact value of a whatever environmental damages would be economically counterproductive. The reason is that would be extremely expensive derive from the market the compensation value required to be attributed to every single pollutant firm. Because

²⁷ In accordance with the European integration principle.

²⁸ Business model of a company represent the way through which it delivered value to consumers and market. See chapter on Circular business model reported in chapter 2, paragraph 5, section 3 of the present document.

environmental resources are intended as public goods²⁹, the side effect it in fact that the market will not produce the efficient amount until the legislator is able to intervene imposing the correct economical compensation to the pollutant firm. But because of the consistent cost involved, no legislators acts in this direction. Any time an adverse effect on the environment results, we could therefore assume a public good has been damaged. This assumption permits to conclude that every time an economical activity is carried out exploiting natural resources, exist an environmental cost (the correlated diminution of public good value) not accounted by communities (Martin Bennett, 1998). Since the last decade of 1900, it is well known the correlation between public intervention and market-based available instruments. Environmental taxes, subsidies, deposit-refund systems, fiscal policies and tradable permits policies³⁰ represent those levers that governments may adopt when fighting for a more sustainable paradigm.

Taxes and subsidies represent the most efficient policy instruments for long lasting incentive in resource saving. Should be noted however that their maximum efficiency occurs when they are expected to increase over time (Tietenberg, 2006). Specifically speaking of environmental taxes, has also been in-depth researched their effective ability to trigger eco-innovations (Corrado Clini, 2008). New charges for non-green products used, lower taxation mechanism for recycled materials, penalization for wastages, are in fact rationally backed by expectations on the usage of more circular products. Clearly, on the bad side, no one could deny the distortive effects that taxes have on competition and on inequality. Taxes indeed penalized

²⁹ Public goods are those goods which satisfied 2 conditions; the first condition is non-excludability of its usage and the second one is related with the possibility of using it simultaneously by many people without interfering with the quality of the service used by other persons.

³⁰ The idea is that companies which produce higher level of pollution would pay more efficient companies with low level of emission in order to buy pollutions permits. The objective of this type of eco-incentives is allocating financials resources in a more efficient way. In other words, those companies with low emission are favoured while the ones less efficient will suffer and be induced in investing in new greener technologies. Permits framework need a crucial input, the studies of what is considered a feasible amount of emission. Based on these studies the legislator will limit the quantity of pollution admissible and ones unpacked those permits, they will be sold by auctions to polluters. The intrinsic weak points of this framework are the estimations of the exact quantity of pollutions but also the difficulty derived by an effective implementation of a control over the pollution system.

much more lower income populations, than high income ones. In addition, some scholar also pointed out that the introduction of new taxes in one country may simply lead to a shift of those polluting companies towards countries with lower pollution taxes and controls.

Others form of policies associated with positive results are standards and regulations. In this case the high environmental effectiveness is assured by take-back obligation, re-use quotas, recycling quotas and deposit obligations. With take-back obligations, re-use or recyclable quotas for instance, companies have the obligation to take-back their own products or reintroduce it in new processes. With this system, not only legislators are monitoring wastages production promoting internal and external reutilizations but are also encouraging companies to invest resources in order to increase recyclability of their products. Deposit obligations works differently. The scope it is in fact increase the initial transaction impact, by adding to cost a premium, which will be deducted becoming transparent only at the end of the products' life with a simple refund.

Finally, too often underestimated especially if compared with the cost of implementing it, awareness in the market. More consciousness of the argument may be key turning point when considering environmental problems. In fact, information policy towards companies and consumers, established since decades, are directly correlated with a positive diffusion of environmental problems recognition and the consequent green best practice due. Stimulating communication and awareness on the theme is therefore not only intended as an innovative managerial tool, but also one of the most profitable ones when speaking of social capital education (Matteo Mura, 2020).

4.1.2 - NUDGE THEORY

Becoming commonly and commonly accepted, this economic theory is based on the very simple idea that having access to higher number of information provides a general advantage for users who are asked to take a decision. Was however observed that, for a consistent part of the consumers in the situation, the observation was false. What was noticed on contrary, was that with an higher number of alternatives, pickers were unable of take a purely rational and coherent

decision, thus eventually accepting the default options available (Lunn, 2014). Since the overcoming of the rational choice theory during the last years of 1990s, a lot of similar arguments has been raised. With the advent of behavioural economics, not only marketers started to take advantage of these new developments in the discipline, but also the same institution started to push collectively those unconventional measures mentioned by BE studies. Once established that human being were unconsciously victims of cognitive bias, has rapidly grown in the market the interest regards the possible ways of interacting and influence human activities. Policy choices deriving from *rational choice theory* and *behavioural economics* theory results in almost opposite applications. To bring a clear example of the difference: if rational choice theory suggests that in order to fight smoke the most useful tool are the introduction of taxes and the ban of smoker from locals, the alternative theory state that may be very effective also a mechanism for enhancing smokers' reflection, introducing impressive images on the pack of cigarette. In other words, those images everyday smokers see on their cigarette packets are nothing else that the implementation of behavioural economics studies. Today, more and more frequently, governments use both these 2 theories in order to combine effects and obtain a stronger and more effective answers on human behaviour. Thus, psychological perspective translates into the fact that human actions are highly influenced by contexts, preferences and cognitive distortions. This nudge interventions are solely based of empirical evidences, but often and often are used in order in real situations to sustain policies, as the ones with the aim of implementing circular economy.

Nudge enter therefore in the sphere of interest of circular economy because of the many questions raised by scholars about how governments should influence economies and consumption patterns³¹. Also in this case European Union in trying to combine both classical measures and behavioural ones in order to quickly react at a sustainable problem.

³¹ The choice if between a direct intervention on prices, as in the case of taxes for example, or rather through the institution of nudge system.

4.2 - SMEs AND CIRCULAR ECONOMY

Given the importance of small medium enterprises³² on the European economic fabric, where they account for 99% of all companies and for 66% of total employment³³ (European Commission, 2015), the commission decided to contribute directly at their development promoting those policies with the aim of foster the development of the knowledge and professionalisms involved. Indeed, has been developed many different solutions in order to achieve, within this segment, more sustainable practices and increase community's competitiveness. The transitions towards circular economy has always been considered a milestone of a more sustainable, competitor and profitable Europe. This is the foundation of the SMEs Commission's measure, promulgated with the aim of reaching those searched efficiencies. From a circular economy point of view, it is estimated that up to 44 percent of big corporation normally exchange by-products on the market. On the contrary, the percentage for SMEs is only 24 percent. It acknowledged that the reason is the they overall lack of specialized knowledge and technologies along with the high implantation and transaction costs associated. Another common limitation raised about them is also the international offer, since 87% of European SMEs just operate in their limited market there is a lot of room for improvement in this sense. The importance attributed to SMEs' effect on job creation, stability and innovation has pushed Europe towards a series of initiatives to sustain those difficulties typically reported by the category. Given the singular dimensions of these firms in fact, has been studied and have been confirmed by different authors that most communal barriers (Matei, 2017) are:

- Organizational culture
- Financial investments

³² Small medium enterprises or SMEs are defined as those companies which limits are lower that the one defined by the law. According with European directives and with World Bank these limits are, less than 250 employees, or less than 50 million revenues or a sum of total asset lower than 43 million euro. It fundamental understand that because of the dimension, they may follow different rules as opposed to big corporations (European Commission, 2015).

³³ Average data for all European countries in 2015.

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- No interest in the market
 - Lack of information regard benefit
 - Bureaucracy
 - Lack of competences
 - Lack of an adequate legislations.

In order to support SMEs market in these particular subject, the EU adopted a series of ad-hoc legislation to support them in evolving environmental challenges into business opportunities (European Commission, 2014).

The two documents involved in this case are:

- Green Action Plan for SMEs
- Small Business Act

They both address properly those difficulties of the category as: resource efficiency, entrepreneurship, and value chains access. In fact, SMEs need also to establish relationship and networks within markets, to facilitate the sharing of knowledge and possibly supporting green companies formation (EU Eco-innovation Observatory, 2018). All the actions need to be monitored and the EU Commission institute for this the SME Performance Review which have the role of monitoring and assessing all the progress of each Member State. Stems as well from these assumptions, all the EU recommendations moved to improve the bankability of circular projects and to help entrepreneurs in identify CE international or not opportunities. The same European Strategic Cluster Partnerships will facilitate access to international markets, fostering alliances, permitting the spread of knowledge and best practices. As well as end-consumers in fact, also entrepreneurs have a significant strategic power for determine the directions and attitude of their firm towards cleaner projects. Exactly on these assumption, trying to stimulate green entrepreneurship and fostering investment more than 10 billion euros have been spent since 2016 in encouraging circularity with *Circular Economy Finance Support Platform* (Commission, 2019).

Exactly on the line of sustain the green development of EU in the transition at the carbon neutrality by 2050, the European Commission presented the 14th of January 2020 the European Green Deal's Investment Plan with the aims of contributing for 100 billion euros to the unlocking of private funds in each member states. By doing this, Europe, one more time is putting sustainability as key objective of its Union, forcing at the same time the conversion of productive fabric and mentality in the old country. The functioning of the fund will be defined more precisely with further study later, but since now, has been outland that even though possible critics moved, the fund will be used to support those European areas most polluted, which will be called to adopt structural reform on the direction of a healthier transaction. Supported by big minds in charge, with this moves Europe is also aiming at a pardoning a strategic move for its economy. Hoping that this conversion will create a flywheel effect leading to a positive occupational effect and creating some competitive advantage in Europe capable of rebalance commercial relations with US and Asia. The plan is in fact also aligned with the 2015 “Junker 3 years Plan” for favouring infrastructure and boosting European economy unloading public and private investment.

4.3 - EU POLICY FRAMEWORK

In pursuing a circular direction, Europe, working at macro level, is one of most involved and active organisms.

In 2015 in fact, the European Commission launched the “*European Action Plan for the Circular Economy*” and the “*Circular Economy Package*”. With the “*Circular Economy Action Plan*” Europe intended to stimulate the green transition towards circular economy, boosting countries competitiveness while at the same time increasing jobs and protecting the environment. The programme of action entails an ambitious schedule and objectives; involving the production of goods, consumption of wastes and implementation of an efficient secondary raw material market. The official aim followed by European Union since the launch of this policy was the realizations of the so called, *closing of the loop lifestyle*. The objective should have been reached through a more aware resource consumption, recycle, reuse of critical materials and a rethinking

of the relations between economy and environment. Since 2015, trying to reach this target, also many and many other recommendations and initiatives on circular economy have been introduced. We will discuss briefly the most significant steps occurred. Very significant, has been the creation of the European Circular Economy Stakeholder Platform. A social platform apt at favouring the dialogue among stakeholders and where relating activities, information, and good practices on the circular economy are facilitated and advertised.

Furthermore, also recently revised, European waste recycling policy has been implemented in 2015. After a review in 2018, the reduction waste targets, trying to establish a credible long-term path for recycling proposed:

- A common EU target for recycling 65% of municipal waste by 2035;
- A common EU target for recycling 70% of packaging waste by 2030;
 - Paper and cardboard: 85 %
 - Ferrous metals: 80 %
 - Aluminium: 60 %
 - Glass: 75 %
 - Plastic: 55 %
 - Wood: 30 %

In reinforcing the supply chain for all these just cited critical material, EU also reinforced any provisions able to implement prevention objectives and minimum requirement needed for create extended responsibility schemes (European Commission, 2019). EPR, defined by OECD as “a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products” (OECD, 2001). The main objective of these provision in increasing awareness about the contribution of a product on the environment, stimulating the process design performed by manufacturer, with the previously mentioned positive development caused. However, extended producer responsibility (EPR) provides also both financial and functional responsibility and therefore, producers responsibility is extended up to consider; take-back, recovery and recycling function, with all the connected economic liability associated for these required steps. This obligation, because of the direct

effects on the manufacturer, have settled important basis for more conscious planning in the market. Clearly however, aware of the effort introduced for companies, the commission planned also the possibility for producers to take care first hand of these requirement, but also to delegate these activities to third party provider which will heal and fulfil these obligations (EU Eco-innovation Observatory, 2018). More recently then, in 2018, the European Commission pressed a report on the previously launched “Circular Economy Package”, which included: the “*EU Strategy for Plastics in the Circular Economy*”, the “*Monitoring Framework for Circular Economy*” and the “*Report on Critical Raw Material*”. The *Report Critical Raw Material* have as objective the highlighting of the potential for making the usage of 27 critical materials more circular. In this report, the material individually recalled were:

- Mining
- Landfills
- Electrical and Electronic Equipment
- Batteries
- Automotive sector
- Renewable energy
- Défense Industry
- Chemical and fertilisers

We can notice how all these sectors recalled are playing and will play in the future a strategical role inside every developed economy on European, or not, countries. The decision is therefore also strategically important for the future of the Community since currently it is majorly importer of these resources. Increase the circularity in the sense will lead the double advantage of securing the supply base to European’s industry from one side, but also improving resource efficiency with the consequent economic advantages from the other (European Commission, 2018). Nevertheless, should be notice that the same sectors are key also when speaking of environmentally sustainability. In fact, very often the processes stemming from these materials have considerable impacts on the environment. Therefore, any progress concerning this sector and processes represent an enormous advancement for the health of the planet. The Commission in addition in 2018 adopted also the *EU Monitoring Framework for the Circular Economy*,

thanks to which, through 10 key indicators, it has been able to measure the progress in circular economy directions. Another important and useful document within the discipline subsequently introduced is the *Best Available Techniques Reference Documents* where companies and member state may have the opportunity to find useful green processes techniques research. Furthermore, a series of further specific recommendation has been approved. Always in 2018, the “*EU Strategy for Plastics*” was launched. The main reason for European Union to launch this strategy was to upset the actual plastic industry, enticing industries to redesign way of producing, using and recycling plastic, in order to achieve by 2030, a complete recycling capability in the whole sector. Hooked with this legislative measure, has also been established at both European and national level a framework for monitoring any progress in this sector towards circularity. As usual EU provided a set of key indicators selected in order to identify monitorable progress. According with European Commission then, also measure like *Ecolabel*, *green public procurement*, *EMAS* are the main tool by which EU is influencing the community at looking at the whole life cycle of products.

In the direction of empowering consumers, EU introduced the *Product Environmental Footprint* concept, a general *Ecolabel* and the *EU Ecolabel* (Figure 14). General *Ecolabels* are

Figure 14 – EU Ecolabel



used for signalling to consumers which products are the best performing for a particular category in the market. They usually are adopted in a voluntary disclosure manner since exist the willingness for good manufacturer to expose the quality of proper products which are performing above the average.

Otherwise, this particular label represented in the figure, the *EU Ecolabel*, has been introduced to consumers in order to provide accurate information about ecology roots of the products. It should have the effect to encourage a wiser product choice since only those products with high environmental standards could obtain this mark. In other words, only those products with higher efficiency and low environmental impact throughout their life cycle, which therefore contribute positively to market pressure on products' criteria, may be characterized by this Eu Ecolabels. According with the Commission in fact, more accurate environmental information will likely inspire better habits for consumers, which in turn will improve durability and reparability of goods and the implementations of the circular economy transitions across EU. With *Green*

Figure 15 – EU Green Public Procurement criteria approved

Eu Green Public Procurement criteria	1 -	Cleaning products and services
	2 -	Computer and monitors
	3 -	Copying and graphic paper
	4 -	Electrical and Electronic Equipment used in the Health Care Sector
	5 -	Electricity
	6 -	Food Catering services and vending machines
	7 -	Furniture
	8 -	Public Space Maintenance
	9 -	Imaging Equipment
	10 -	Office Building Design, Construction and Management
	11 -	Paints, varnishes and road markings
	12 -	Road Design, Construction and Maintenance
	13 -	Sanitary Tapware
	14 -	Road lighting and traffic signals
	15 -	Textiles
	16 -	Toilets and Urinals
	17 -	Road Transport
	18 -	Waste Water Infrastructure
	19 -	Water-based Heaters

Procurement policies (Figure 15), the commission objective was to drive companies towards a more conscious procurement. By issuing this requirement, EU facilitate also a correct development of eco-innovative products, favouring those companies which actively work in the

direction of more environmentally sustainable goods and stimulating a healthier economy. In practices, green public procurement, does not refer necessarily to circular aspect but allow to reinforce those minimum requirements for buyers and encourage therefore innovation. Established since mid-1990s in EU, this tool permitted to increase the know how and efficiency for those companies interested in improving their environmental performances. *EMAS*³⁴ focus instead on resource efficiency helping organizations in finding proper tools to reach the environmental goals, ensuring an external and independent supervision of the registered processes and providing public information with regard of the company's environmental management and audit schemes. The major benefit identified in the context of this provision for companies have been; improved operational performances, legal compliance, and a higher level of public awareness with consequent upside both in employee and market attitude. To deliver a concrete example of a requirements provided in this measure for example, in 2017 EMAS require organization to assess their environmental impacts, increasing therefore knowledge and awareness on associated circular opportunities. Today, beginning 2020, all the 54 prescribed in the action plan presented 5 years ago has already or are being actuated with the evident influences they already have demonstrated in moving European Union towards circular economy. The whole European system should clearly be read bearing in mind that cooperation among each individual member state is a must for addressing all possible decentralized need may arise at regions, citizen and firms' level. Exactly with this aim, EU promoted and created the "*European Enterprise Promotion Awards*" and also the "*Cluster Excellence Programme*", devoted at promote growth and entrepreneurship inside EU. Concluding this section on the European strategy for sustainable development implementation, given the very dispersive nature of its geographical but also political and legislative framework, it is clear that it should be reinforced proving a univocal regulatory framework and implementing a cross-integration of environmental policies.

Clearly, this goal is not reachable in a pre-determined time horizon given a multitude of aspects which right now are boiling in the popular imaginary. Scepticism, distance from the

³⁴ Eco-Management and Audit Scheme

theme, national protectionism or advocates of economic growth will mistrust all these resources withdrawn from linear economics, fighting instead for those investment made aiming at enhancement of technological green innovations able to sustain European economic competitiveness. Therefore, according also with decentralization principle, at national level should be started too, as soon as possible, the process of instruction and transition towards this transformation. The urgency given by the latest economic and climate change effects should have highlighted the path necessary which is necessary to follow at global, European and national level. Navigate towards the development of best practice, attention for environment, cleaner technologies should be fostered in the context of the European framework developed.

In this direction is in fact exactly going Italy which in addition to European practices and experience shared, since year 2000 is collaborating with several institutions and universities of China, where the climatic problem is strongly felt, for creating an more effective environmental friendly policy oriented at more sustainable development (Corrado Clini, 2008).

CHAPTER 5 - CASE STUDIES

5.1 - THE ALISEA CASE STUDY

Since 1994 Alisea, an italian based companies become famous worldwide thanks to its innovative and exclusive pencil made of graphene powder, Perpetua. The company, since the beginning, decided to set up its business model; designing exclusive objects, using innovative processes and granting absolute quality results, starting however from those materials no more valuable in the market. The decision to start a company with these unusual values, in a time when sustainability concept was not already present, comes from the realization of Susanna Maruzzi, Ceo and founder of Alisea, that especially in the promotional products sector, the only valuable logic was become the price, where however the competition was absolute fierce. After this meaningful realization, strong of her ability to sell gained in previous experienced, she

decided to create itself a category of products which was not existing in the market yet, a series of products not only valuable for their price, but for what they meant to the market. Started proposing to some firms the possibilities to manufacture their worthless rejects in order to create different gadgets, assuming therefore all the connected risks, Susanna Martellozzo fought since the very first beginning of the Alisea project in order to provide the company some fascinating, non-trivial, exclusive objects. Today, Alisea connect those companies with worthless materials, with others in search for an ethical one. What is really innovative in this philosophy, is that Alisea does not want to simply profit leveraging rejects and second-hand raw material, masking previous their life use as usually happens for recycled material. Instead, the very proper strength in Alisea products is exactly enclosed in their previous life characteristic, enhanced through a series of creative touches. Its portfolio is in fact composed by several different types of products. Organic waste derived from fruits and vegetables manufactures, paper recycled and transformed, recycled plastic from headlights and reflects, leather supply rejects, used rubber rather than discarded furniture fabric, are the most common materials manufactured in order to reintroduce in the market new revolutionary gadgets.

Figure 16 - Perpetua by Alisea Figure 4961 – EU Green Public Procurement criteria approved



Transforming research and innovation in favour of clients' needs, enlightening the value of its object, Alidea represent the perfect example of how Circular Economy principle could be exploited in order to gain an healthy competitive advantage. Born in a moment when circular economy concept was not already ideated, working on this revolutionary business idea, this little company in some years find itself projected into an innovation driven world, entering also in as many businesses as possible, launching also a project for those companies which share its same objectives and values. With the brand *Endorsed by Perpetua* in fact, the firms offer the possibilities to other companies to be accompanied in developing, creating and managing new projects using perpetua the worldwide accumulated Perpetua know-how. With this brand therefore, the companies introduced a new shade of Alisea way of interpreting circularity, effectively become, a startup incubators, proving both patents and help for young entrepreneurs with the aim of spreading those patterns and values at the basis of Susanna Martucci ideas.

*Most know Alisea product, **Perpetua**, represent both for Italy and for Susanna Martucci, Ceo and founder of Alisea, a source of pride. Result of years and years of resource spent in searching for new processes, Perpetua was born from the request of a mechanical company to present at an exhibition a product obtained through its waste. Realized starting from graphene, a material typically difficult to be disposed, the innovative process without glue or varnishes, permitted the realization of this new generation of advanced pencils along with the internalization of the Perpetua brand.*

5.2 - THE SFRIDOO CASE STUDY

As unique as innovative, this company is born from the idea of three young entrepreneurs, is based on the idea of an economy intended as a big arena for industrial symbiosis. In this arena, rejects of one company may become inputs for another one, reducing therefore any not required material usage. The initial project provides in fact the creation of a marketplace, where participants would have the possibilities to post material and receive offers from other companies, permitting a connection between supply and demand of worthless materials which otherwise would have represented a cost.

Andrea Cavagna, one the 3 founder of the companies, explained that the idea was born 3 years ago, trying to implement this platform where companies would have the opportunity to trade their waste, ideally saving on disposal costs, or also earning some values from the dismissal of useless products. The idea at the base of the entire process however did not ended as expected, because of different limits encountered by the startup, one among all for example, the proper usage of this innovative platform which was not correctly digested by companies. Since therefore anyways, aware of the good design of the project, the company have always performed but in the form of a consultancy firm, where clients willing to create value for their useless material, have the opportunity to take advantage of the advises provided, maybe creating earnings, or more realistically, limiting the cost of disposal of those unwanted materials. Adopting therefore an advising model of business, Sfridoo, once the companies have been in touch and the project confirmed, have ended it role. In other word, the company is not involved in any physical transportation, modification, adaptation of the products, with consequent advantage for client's companies which are not buying a service on an ongoing basis, but just on a "una-tantum" base.

5.3 - THE FAVINI CASE STUDY

Born in 1736 Favini is a paper mill which serve markets worldwide, committed in both the traditional paper sector (in minimum part), and the luxury and fashion design paper sector. After in fact, a transformation made necessary in concomitance with the end-century sector downturn, prompted especially by the fierce international competition, Favini shifted the focus of its production towards the new and more remunerative paper design sector. In particular then, Favini further subdivided its more recent business into 2 different business segments, once servicing those industrial operators involved in segment like eco-leather, producing stamps for leather texture, and a second one which involves special papers produced for the packaging world and other functions. This last 2 divisions represent today the absolute majority in terms of revenue composition for Favini.

Since 1991 Favini implemented different solutions in order to produce its products transforming creatively industrial wastes and by-products of other industries. It is fascinating understand how the first thrust towards this new sustainable way of doing the paper business approached the companies. During 1991 in fact, existed a serious infestation problem of some algae in the Venetian lagoon. Because of the aggressive impact of these seaweeds into the venetian ecosystem, with a correlated foreseen risk, venetian entities entrusted of the problem decided to create special boats able to filter lagoon waters, extracting the unwanted biological material. Instead of being simply disposed into landfills, these entities decide to explore the possibility for reintroduce these organic materials as resources in the economy. It is in this assumption that Favini entered in contact with the unknown, until then, circular perspective, becoming the only positive results emerged as alternative for algae landfilling. From this episode started maturing in Favini the idea of undertaking the new model of business based on alternative materials transformed, taking therefore advantages of sustainable propulsion. If these may be the first and most emblematic case, since the realization that the markets positively transposed the new features, Favini has been committed in an ongoing basis in building new relationship with companies with an availability of valuable organic wastes. The goal clearly was, and still is, to being able to implement something that can mutually benefit, by applying upcycle processes to

waste materials. Thus, this is the path occurred for the other products in portfolio, developed after the presentation of potential transformation to unconscious producer. Today in fact, has launched different product lines, producing papers converting oranges skin, mais rejects, leather scraps.

Speaking with Michele Posocco, marketing manager of the the graphic specialities unit, it interesting the fact that even though Favini patented its technologies in the middle of 90s, when however the market was not ready for this ideas of ecology, Favini started to benefit from these patent almost fifteen years later, when starting from 2010, consumers directed their interest looking with more attention also at the sustainable aspects of their products. What makes Favini very proud of its innovative processes is undoubtedly their ability of up-cycling scratches. The technique in fact involve the reusing of poor material, wastes for other industries, in order to create what new objects with an embedded higher value. This idea of transforming poor material, redefining their character and usability is exactly the underneath of products like Alga Carta, Crush, Remake and Refit, all product that Favini currently have in portfolio, and which are thought to be also an example of coordination among companies of the industrial dimension, aiming at a minimization of the materials landfilled, being also able of profit from zero-value materials. Pricewise specking then, what it is really interesting for the categories of the products, is that, considering the segment of luxurious and design packaging, papers made with bio-industrial sectors component, those are delineated in the Crush line, are also, economically speaking, convenient. When compared with competitor's classical alternative,

Figure 17 – Favini orange recovery procedure.



Starting from citrus fruits fibers rejected during the pressing phase performed by other companies, Favini is able to transform this, otherwise discarded, 60% into a new up-cycled material. The process is implemented thanks to exclusive processes cared internally which lead the new value creation.

where the lower amount of transformation impact less on the final price, Favini thanks to the innovative type of material used, is able to offset this gap and gain a slight advantages over competitors, to which we should of course add the environmental benefit associated with the creative products.

5.4 - THE ECOZEMA CASE STUDY

Converting its previous production process, focused on the production of callipers in wood and plastics, Ecozema represent today an absolute avant-garde in transformation of biological discarded materials. To provide a quick overview of the innovation approach of the company, should be noticed that the company has been the first one which has manufactured plastic clips in Italy during the 60s. Whit time however, also thanks to the foresight of its management, the company has been renovated and renovated in order to be alienated as possible with the market. Since first years of 2000 in fact, in response to a strong international competitive pressure, but also internal from the same distribution channels, Ecozema started to work in order to adapt its business to newer economic trends emerged, trying therefore to reposition itself in the market and gain some competitive advantage. Being a small size company, appear clear at that management that find a reliable partner on which leverage Ecozema capabilities was key for its development. Finally, scanning for those searched competencies, Novamont was selected a the target fo the collaboration. Novartis in fact was a chemical company, whose model of business was (but, still is) based on the research for the efficient use of renewable resources as bioplastic or bioproduct. It together in fact that Ecozema and Novamont obtained the realization of a new, exclusive, polymer, built by joining technical competencies with chemical ones accumulated by both companies, which become the first ever compostable products certified to be composted by common industrial compostable plants. If initially the company was engaged in wood manufacture, after the realization of the incredibly potential of the new market that was expanding, using Novamont competences, the company started to produce compostable cutlery. Once become the first company ever certificated for the possibility to confer its products to

industrial composting plant, Ecozema proceeded into the direction of fostering environmental attention. Today, with a portfolio composed by plates, glasses and cutlery, the company portfolio is certificated as compostable products, created from organic materials, able to be destined as composting.

At the time almost non-existent, the environmental fibrillation was ready to come, and Armido Marana, actual general manager of the company, formed by his previous experiences gained creating compostable shoppers, sensed that the waste business was absolutely ready to develop itself flowing into an enormous rich market. Having consolidated in the market a certain type of competencies, know-how and brand awareness the company is today very confident in what will be the development of the market even though, today that several companies are entering in this market, and that the key for obtain success are different, the difficulties are greater than 10-15 years ago. Especially concentrated directly towards great events, festivals and parties, Ecozema today also manage to keep small and medium festival through a distribution network. Does not surprise in fact that Ecozema' innovative products served international events as for example Expo 2015 Milan, London Olympics 2012, Internazionali BNL Tennis Rome.

Figure 18 – Example of Ecozema compostable line of products



5.5 – MANAGERIAL IMPLICATIONS

This thesis was aimed to discover, which were the main limitations companies faced in implementing circular economy techniques, what did convince them to undertake these strategies and which has been the benefits observed by company after the implementation.

Once it has been defined limits and benefits³⁵, it is useful discuss briefly about what pushed companies and how they should interact with their external environment in order to be always updated on major trends.

Firstly, in view of results presented, should be said that Circular Economy is generally perceived as a main importance characteristic also for small medium companies. This is not just a sentiment, the cases studied for example reported as, in response of the fierce competition in today markets, deciding to to adopt a differentiation strategy these companies had beneficial development. For 3 cases in fact³⁶, the revival of the companies has been granted exactly by the new green orientation. The uncommon positioning in (today still) niche markets, has permitted them to strive against more articulated companies with considerably lower prices and scale economies. Feedback received reported how, especially these niches, are positively evaluating the unique features offered by sustainable products. However, they also indicated the fact that, if the green products market 10 years ago was served by a minimum number of suppliers, today it is going to be flooded several companies with green strategies. Hence, converting production line, introducing elements with a limited impact on environment, while 10 years ago was innovative, today will be increasingly a must for those companies willing to compete on differentiation advantages.

Together with the advice reported in this research, we can also underline some useful implication for entrepreneurs and management in order to understand how the transformation

³⁵ See chapter 3.

³⁶ The fourth case, Sfradoo, is a company based on an innovative approach, which therefore could not be considered in terms of relaunch of the company.

towards a circular economy should be taken in order to most efficiently convert companies' efforts into profitable success. We are now going to understand how this companies are required to act in order to maximise the probability to capture the new trends in the market considering the organizational point of view. Empirical feedback has underlined as fundamental in this sense are both the organization dynamic capabilities and the collaborative relationship of the firm with its external environment.

Inside the firm it is in fact key mastering that capacity to adapt and easily align internal processes to external necessities. In all the investigated cases for example, the conversion has been fuelled by the forward-looking ability of entrepreneurs, willing to challenge the fundamental capacities of their companies in response to development of markets. But more in general, especially for those firms with more complex organizational structures, is required that companies actively act and are available to listen market whisper. In our cases however, because of the limited organizational structures of the companies, a proactive approach of the management has been the sources of the firms will and ability to sense opportunities and market's requests. Anyways, both for small-medium and big corporation, sense opportunities involve a continuous dialogue with external actors in order to identify stakeholders needs. Creating ah-hoc functions, apt to involve supplier opinions for example, may be beneficial in the optic of creating opportunities and benchmarking competitors' strategies. Furthermore, also collaborations with academics, start-up incubators, consulting companies or other realities deeply rooted in the market, may help to obtain a clearer vision of where the market is shifting.

The research highlights also some common patterns followed by 3 out of the 4 manufacturers. The fourth company, Sfridoo, given its innovative and exclusive business model, represent a great example of future circular economy development, but since does not faced a proper re-definition of its business, will be excluded from the following considerations. Drawing conclusions from these interviews, analysing the opinions collected, it is clear that (may be because of the limited dimensions of the companies composing the sample), a very important role in deciding the strategy is held by entrepreneurs. In the case of Alisea, Favini and Ecozema in fact, empirical analysis addresses the *become different vision* to the leading figures of the respective companies. Another common aspect confirmed, is the importance of external partners,

especially speaking about the development of innovate products and processes. Suppliers and institutions with specific knowledge in the fields of material and chemics represented in fact the key partners with whom the companies choose developed core products. Overall therefore, what is interesting to observe is that if the technical capacities have been fundamental for reconverting, recycle and reutilize materials, the first spark for searching in the field of circular economy, entirely comes from the central level of these companies. Therefore, we want to stress again the importance that collaborations still play for small medium enterprises devoted to greener production philosophy. Key is developing strategic alliances with external partners, both clients to which allocate new products, but also supplier with which integrate capabilities in order to stimulate innovation. Finally, once recognized these elements, as reported in chapter 2.3.4, we also have to remind that, not just the ability to sense and size sustainable objectives is required, but fundamental are also the ability and the willingness to promote a reconfiguration of the business organization. In order to better copy with external environment in fact firms had realigned internal assets. Speaking of technical capabilities for example, a very interesting aspect signalled by more companies, is that the composition of technical figures inside firms, with time gradually have evolved and it is grown in importance, clearly integrating more and more those competences required by the market. According with the referents of the cases studies, staffs have been assumed exactly forecasting those capacities needed not in any specific point in time, but instead in the future, trying to anticipate possible market scenarios, investing in new, more specifics, professional figures. This factor reflect in fact 2 very interesting aspects; first the fact that inside these firms exists the farsightedness of watching at future and understand what will be needed, but also the effective ability to invest in the possibility to align internal competences, internal abilities and in general internal organizations to external events,

CONCLUSION

The study aimed to present those central concepts of the Circular Economy doctrine, promoting its knowledge and the spreading of those key points at the base of European latest policies.

Firstly, it has been introduced the Circular Economy doctrine, born as result of the of the sustainability issue, defining also sustainable development and corporate social responsibility concepts. Moreover, the research registered common difficulties and benefits encountered during and after its implementation, analysing both literature on the argument and real cases. Finally, it described the actual European legislative framework, listing those main initiatives promoted to support the green transition, before exposing some meaningful case studies.

At sustainable lifestyle patterns and circular economy practices have been dedicated several theoretical articles today. If it is true that the urgency of developing new paradigms towards a more sustainable life on the planet is well known, it also true that different institutions promoted several policies with the purpose of sustain this green transformation. The current commitment of European institutions for example, clearly set an important starting point from where build a more sustainable development. As expressed however, the legislation alone is not sufficient to make the necessary shift happend. Unless a radical distortion of nowadays patterns in fact, any development will be much slower than what would actually be needed. Literature then reports as still the focus is on individual sectors and products, whereas a responsible transition would require a more integrated approach which would consider all possible interlinkages between sectors, economic actors and value chains. Optimization of resource yields, preservation of materials and enhancement of natural capital should be more finely controlled, from micro to macro level, by framing with each other all the possible interactions happening on a global scale.

Hence, according with both literature and feedback received, appears clear that markets are still very oriented towards linear models, sometimes even stemming circular adoptions. In saying this in fact, should be notice that those reality today oriented at Circular Economy, are the

merely result of some forward-looking entrepreneurial spirits and of the competitive pressure. Indeed, interviews carried out³⁷ equally highlighted the importance that competition from low-cost country, had had in pushing these companies to undertake the conversion of their processes towards more ethical choices. The recalibration of their product portfolio was become therefore a clear voluntary strategy, adopted in order to let companies survive in the markets. In this sense, in line with the economic European fabric, fundamental have been the visions and perseverance of European entrepreneurs, not just willing to respond at markets shifts, but also willing to pave the way for a new generation of sustainability-oriented consumers. Interesting has been in fact heard that currently only limited niche markets are available to value green features proposed.

According with the theoretical framework, still exist an underestimation of the importance that a common integrated view, especially at macro and meso level, would have in favour of a more sustainable behaviour. More circular oriented fiscal policies, aimed at encouraging a more responsible use of recycled and remanufactured materials, as well as, at foster the creation of industrial symbiosis on the market, would have an incredible power in directing the Green Transformation. However, if literature suggests significant cost saving opportunities, reduced risks and dependences from external environment, increased employee motivation, higher customer satisfaction and generally positive feedbacks, Circular economy may also have possible negative development especially for small medium enterprises. Because of their minor dimensions in fact, critical are factor as high technical costs, lack of financial and human capital, as well as costs associated with Circular Economy complex frameworks. In conclusion, the objective both for institutions and companies, should be try to reduce the cited limits, while enhancing favourable circular strategies in near future.

³⁷ Even though could not be intended as a significative number, since the limited number of cases.

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