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THE EFFECTS OF GLOBALIZATION ON THE FASHION INDUSTRY

BRIEF DESCRIPTION AND THE GLOBAL FASHION ECOSYSTEM MAP

Dissertação elaborada para a obtenção do grau de Mestre em Design de Moda.

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> In Globalization 1.0, which began around 1492, the world went from size large to size medium. In Globalization 2.0, the era that introduced us to multinational companies, it went from size medium to size small. And then around 2000 came Globalization 3.0, in which the world went from being small to tiny.

Thomas Friedman (2012, p.191)

In The small business bible: everything you need to know to succeed in your small business
John Wiley and Sons Inc: New Jersey

ABSTRACT

Fashion is going through substantial changes since the globalization process has started. We start this study by analyzing the effects that globalization and the global industrial revolutions had in fashion, outlining the future possibilities for the global fashion ecosystem through the context of the industry 4.0 in a global scale. In this dissertation we compile data about the global fashion industry highlighting the core abilities in terms of manufacturing, creativity and material of each country. The result is the creation of comprehensible and visual maps of the fashion ecosystem and its connections in a global context by analyzing the historical context of globalization making connections among the industry 4.0, globalization and the fashion ecosystem.

Key Words: Globalization | Fashion Ecosystem
Technology | Industry 4.0

RESUMO

A moda tem sofrido mudanças substanciais desde o inicio do processo de gobalizaçao. Começamos este estudo analisando os efeitos da globalizaçao e as relações com as revoluçoes industrais à escala global, esboçando possibilidades futuras para o desenho do ecosistema da moda no contexto da Industria 4.0. Esta dissertaçao reúne dados da industria global da moda e as especializações termos de manufatura, criatividade e materiais de cada país.Analisa ainda o contexto histórico da globalizaçao estabelecendo relações entre a industria 4.0, a globalizaçao e o ecossistema da moda. Por último a criaçao de mapas visuais do ecossistema da moda explicando as suas conexoes no contexto global e de permanente mudança da revolução 4.0

Palavras-chave: Globalização | Ecossistema da Moda
Tecnologia | Indústria 4.0

LIST OF ABREVIATIONS

BFC - British Fashion Council

BOF - Business of Fashion Organization

CEO - Chief Executive Officer

CMT - Cut, Make, Trim

CP(P)S - Cyber Physical (Production) Systems

EFFRA - European Factories of the Future Research Association

FET - Future Emerging Technologies Programe

FGI - Fashion Group International

FIT - Fashion Institute of Technology

FFD - Future Fashion Design

GDP - Gross Domestic Product

GLM - Global Language Monitor

ICT - Information and Communication Technologies

II - Industrial Internet

IoT - Internet of Things

IWTO - International Wool Textile Organization

NAFTA - North American Free Trade

MES - Manufacturing Execution Systems

QR CODES - Quick Response Code

RFID - Radio Frequency Identification

STEM - Science. Technology, Enginnerings and Mathematics

UNSC - United Nations Security Council

USFIA - United Standes Fashion Industry Association

VP - Virtual Prototyping

WMA - World Model Association

WTO - World Trade Organization

GLOSSARY

A

Analytics - The identification and interpretation of meaninful patterns in data. (ViewPoint #35)

Algorithm - A mathematical formula that maps a step by step operation used by a computer to perform tasks such as data processing (ViewPoint #35)

Artificial Intelligence - The attempt to make computers simulate human intelligence by using techniques such as reasoning, learning, natural language processing and decision making. (ViewPoint #35),

B

Big Data - Data sets so big or complex that conventional processing applications can´t handle them (ViewPoint #35)

Brief - a set of instructions given to a person about a job or task.

Boutiques **-** (Etm. do francês: boutique) s.m. Estabelecimento comercial, normalmente, pequeno e

caracterizado pela venda de artigos requintados, roupas finas, joias ou bijuterias particulares, especializadas ou importadas.
Todo ou qualquer estabelecimento que ofereça esses serviços ou seja definido por comercializar artigos de luxo.

C

Cloud Computing - Using remotely hosted data centers or web servers to store, edit and retrieve information via the internet (ViewPoint #35).

Couture - the design and manufacture of fashionable clothes to a client's specific requirements and measurements.

Creolization - is the process in which Creole cultures emerge in the New World. As a result of colonization there was a mixture among people of indigenous, African, and European descent, which came to be understood as Creolization.

Cybernetics - the science of communications and automatic control systems in both machines and living things

Cyber - Physical Systems - are integrations of computation, networking, and physical processes.

Embedded computers and networks monitor and control the physical processes, with feedback loops where physical processes affect computations and vice versa.

D

Deterritorialization - according to Gilles Deleuze and Felix Guattari, deterritorialization is the process in which to undo what has already been done. To take control away from places that have already been established.

3D Printing - a process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material.

E

E-commerce - commercial transactions conducted electronically on the Internet.

Ecosystem - a complex network or interconnected system.

Embedded Systems - An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of

a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today.

Exabytes - a unit of information equal to one quintillion (10^{18}) or, strictly, 2^{60} bytes.

F

Flying Shuttle - The flying shuttle was one of the key developments in the industrialization of weaving during the early Industrial Revolution. It allowed a single weaver to weave much wider fabrics, and it could be mechanized, allowing for automatic machine looms.

G

***Global language Monitor* -** Companhia americana que coleta e analisa dados sobre as palavras mais utilizadas da atualidade.

Globalization - the process by which businesses or other organizations develop international influence or start operating on an international scale.

I

Industry 4.0 - Industry 4.0, Industrie 4.0 or the fourth industrialrevolution, is the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things and cloud computing. Industry 4.0 creates what has been called a "smart factory".

Internet of things - A connected network of things made by attaching unique IP addresses like those currently used to identify computers to all kinds of items. This will allow everything from home heating systems and fridges to transportation systems and energy grids to communicate remotely (ViewPoint #35).

M

M-commerce - commercial transactions conducted electronically by mobile phone.

P

Petabytes - a unit of information equal to one thousand million million (10^{15}) or, strictly, 2^{50} bytes.

Phoenician - a member of a Semitic people inhabiting ancient Phoenicia and its colonies.

Power Loom - A power loom is a mechanized loom powered by a line shaft, and was one of the key developments in the industrialization of weaving during the early Industrial Revolution.

Prototype - is a rudimentary working model of a product or information system, usually built for demonstration purposes or as part of the development process.

S

Sever Cluster - A server cluster is a collection of servers, called nodes that communicate with each other to make a set of services highly available to clients.

Smart City - A city that uses digital tech to make services such as transport, energy, water supply and healthcare responsive to its citizens´needs, making for efficient use of resources and higher levels of consumer satisfaction. (ViewPoint #35)

Spinning Jenny - a machine for spinning with more than one spindle at a time, patented by James Hargreaves in 1770.

T

Technocracy - the government or control of society or industry by an elite of technical experts

Terabytes - a unit of information equal to one million million (10^{12}) or, strictly, 2^{40} bytes.

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DISSERTATION GUIDE

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2. HISTORICAL CONTEXT OF THE GLOBALIZATION AND THE INDUSTRIAL REVOLUTIONS

This chapter is divided in two main parts. The first part about the First and the Second Industrial Revolutions and how they reflected in the perspective of fashion. And the second part where we highlight the Third and Fourth Industrial Revolutions after the invention of the internet. In this chapter we also introduce the concept of the industry 4.0, Internet of Things and Big Data. A brief connection to the fashion industry is made in the end of the chapter.

3. FASHION ECOSYSTEM

After massification of the internet, the fashion ecosystem and its connections have changed a lot. The instant access to the information have changed the order and the relations of the agents in the ecosystem. In this chapter we will understand the current fashion ecosystem and each one of its main agents (Resources, Design, Industry, Distribution, Consumers) and how they perform in the present. The result of this chapter is a linear map of the fashion ecosystem and the analysis of it.

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In this chapter we will analyze deeper the Industry and Sourcing agent of the ecosystem. We will study about an example of offshoring and its reasons. Information about the global fashion industry will be compiled and divided in three different maps: the material sourcing map, the creativity providers map and the core manufacturing specialization map. This way we can have an overview of the countries that play an important role in the fashion industry.

5. THE EVOLUTION OF THE FASHION ECOSYSTEM IN THE CONTEXT OF THE INDUSTRY 4.0

The fashion ecosystem map in the context of the industry 4.0 is a link among all of the chapters of this dissertation resulting in a prediction of what the industry will be like with the evolution of the Internet of Things, Big Data Analytics and Radio Frequency Identification sensors. It represents the future of fashion´s industry in a globalized context according to the concepts of the Fourth Industrial Revolution.

6. FINAL CONSIDERATIONS

There were three main results in this dissertation and they were converted into visual maps with compiled information. The first map was about the fashion ecosystem and how its connections are performed. The second result was the construction of geographical maps with global information about fashion. The last map was a prediction of the author based on the information gathered throughout the thesis about how the fashion ecosystem map will be inserted in the context of the industry 4.0.

CHAPTER 4

GLOBAL MAP

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INTRODUCTION

There are many authors in the academic world that study and try to define what globalization is, some of the approaches are more in terms of economy and others relate more to the sociological point of view. We may say that one complements the other; therefore, when there is an object of study like globalization, it is important to keep our minds open to debate different dimensions and perspectives about the subject.

According to Campos and Canavazes (2007), in the framework of economy, the process of globalization is related to the capitalist system and to the neoliberal ideology. There is interdependence among countries, people and world organizations that interact in an economical, sociological and a political way, thus a local event in a specific country may have impacts in other parts of the world.

The KOF Index of Globalization measures three dimensions of globalization: The economic, sociological and political.

> "[…] it can mean, among other things, the growing integration of markets and nation-states, receding geographical constraints on social and cultural arrangements, the increased dissemination of ideas and technologies, the threat to national sovereignty by trans-national actors; or the transformation of the economic, political and cultural foundations of societies. (Dreher, Gaston and Martens, 2008, p.1).

According to Dreher, Gaston and Martens (2008), to analyze and measure globalization, a series of things must be taken into consideration, for instance, the types of tax policies, government spending, economic growth, inequality, union power, and the natural environment.

Through the economic aspect, we can measure how globalized a country is by its GDP (Gross Domestic Product), tariff barriers for imported goods, taxes on International Trade, foreign direct investments in the country. On the sociological point of view, the levels of globalization can be measured by the amount of personal data exchanged around the world, for example, the

telephone and internet traffic with foreign nations. Another way of analyzing the sociological aspect is to measure the tourism, the number of foreigners living in the country, the international mail and correspondence. The cultural proximity data can also be analized, for example: the number of foreign restaurants in the country or if you can easily find foreign products being commercialized in the country (Dreher, Gaston, Martens, 2008).

The political globalization is measured by the number of embassies in the country, if the country is a member of any international organization or part of international treaties. Personnel contributed to U.N. Security Council Missions per capita. (Dreher, Gaston, Martens, 2008).

This study will have a specific approach in the fashion industry inserted in a globalized world. As a starting point, we will contextualize the term globalization throughout the analysis of the definitions of different authors focusing more on the industry and having an overview of the three industrial revolutions.

Deterritorialisation[1] is one of the main characteristics of globalization, in the context of fashion we can understand that by analyzing brands that seek for production in different countries because of price of specific labor; in other words, the concept derogates from the space contingencies (Campos and Canavezes, 2007).

Another characteristic of globalization is that it is always in constant evolution, it is not a phenomena based only in one occasion but in a series of them. The evolution of the communication is crucial in this process. With the emergence of the internet, the distances shortened significantly and the speed of information became instantaneous (Pena, 2015). In the fashion field we can understand that by the fast access that people have to the information of their favorite brand through different types of social media and also by buying online through e-commerce and m-commerce (mobile-commerce).

[1] Deterritorialization- is the process in which to undo what has already been done. To take control away from places that have already been established.

Petrin (2014) claims that globalization is a phenomenon that happened because of the enhancement of the means of transportation and telecommunications, but only after the popularization of the internet that big part of the world barriers were broken. Many authors relate the globalization process with the capitalism because the countries needed to seek for new consumer markets and more specific and cheap work force. "O processo apareceu para atender ao capitalismo, uma vez que países mais desenvolvidos precisavam buscar novos mercados já que o consumo interno estava saturado" (Petrin, 2014, p.4).

Pena (2015), explains that there is a lot of polemic in relation to globalization being a positive or negative factor to the world, this is due to the big social inequality that this brings. The income and the power is normally concentrated in only a few countries, while the least developed countries become dependent producers of the richer nations. This is easily identified in the fashion industry where we can identify the richer nations as the providers of creativity and knowledge while the developing countries are the producers and responsible for assembling the products with cheaper workforce.

> Além disso, acusa-se a globalização de proporcionar uma desigual forma de comunicação entre os diferentes territórios, em que culturas, valores morais, princípios educacionais e outros são reproduzidos obedecendo a uma ideologia dominante. Nesse sentido, forma-se, segundo essas opiniões, uma hegemonia em que os principais centros de poder exercem um controle ou uma maior influência sobre as regiões economicamente menos favorecidas, obliterando, assim, suas matrizes tradicionais. (Pena, 2015, p.2).[2]

What Pena (2015) means in this quote is that the inequality is not only according to wages and money but also a a dominance in terms of culture and educational principles of the dominant countries. This means that the richer countries have a huge influence on the poorer nations, making those countries

[2] Free translation: Besides that, globalization is accused of providing an unequal form of communication between the different territories where cultures, moral, educational principles and others are reproduced following a dominant ideology. In this sense, it forms, according to these views, a hegemony in which the main power centers exert a control or a greater influence on the economically less favored obliterating thus their traditional arrays.

follow and respect their ideology, having a more homogenous world. In the context of fashion, we can analyze that by the United States and European countries setting most of the global fashion trends through their fashion weeks. They launch their products and the producing and developing countries copy or get inspiration in their trends for their next season.

From the historical and contextual point of view, the process of globalization was not pronounced only for one event, it was an evolution of events that happened throughout the world because of the increase of world trade. According to Silva (2015), some of the events that collaborated for this process were the Great Navigations and the Industrial Revolutions during XVIII and XIX centuries.

> Falar de Globalização remete para um conjunto de transformações económicas, políticas, sociais e culturais que se fazem sentir a nível mundial. Nas suas formas mais visíveis, estas transformações estão frequentemente associadas a inovações tecnológicas. As novidades tecnológicas, e a velocidade a que estas ocorrem no mundo contemporâneo, contribuem para crer que a globalização constitui um fenómeno completamente novo. (Campos and Canavezes, 2007, p.16).[3]

Campos and Canavezes (2007) relate the economic, political and social transformations to the advance of technology, so basically the evolution of the world and the globalization process are a result of the speed of information, logistic and technological advances. Both the Great Navigations and the Industrial Revolutions were processes of the evolution of technology, the production structure of many factories had changed. First because of the steam machines and secondly because of electricity. These advances were responsible for the expansion of borders and the search for new markets (Silva, 2015).

Despite the fact that the term globalization only appeared around the 1980s, this process started way before this. Campos and Canavazes (2007) highlight that there are some authors that say that the beginning of the

[3] Free Translation: Talking about globalization is to talk about a set of economic, political, social and cultural rights that are felt worldwide. In its most visible forms, these changes are often associated with technological innovations. Technological innovations and the speed at which they occur in the contemporary world, contribute to believe that globalization is a completely new phenomenon.

globalization process started with the Portuguese and Spanish Great Navigations, but there are some other authors that assume it had started way before this with the fact that the Phoenicians[4] used to have important commercial transactions in a world scale since antiquity.

In this dissertation, as a starting point, we will focus on the historical context of the three main industrial revolutions, its importance to the evolution of the world and its impacts on the fashion industry; to later on try to explain the present and future of the fashion industry through the concept of the evolution of fashion ecosystem

In the following chapters, the fashion ecosystem and its ramifications will be analyzed, understanding how fashion has evolved and is evolving in the globalized context. We will get an overview of the resources of the fashion industry, the design process and how it works, the consumer global market and its evolution in the context of the globalization and information Era, the distribution and logistics processes and the global industry and sourcing.

To understand the global fashion industry and the sourcing processes, we will study about different regions of the world and its core specialization and contribution to the map of specialization of fashion in the context of the globalized fashion industry.

After the historical analysis of the globalization process, the industrial revolutions and the fashion ecosystem, we will draft maps to get an overview of the ecosystem chain in the globalization Era and how the industry 4.0 will change the industrial processes in the fashion industry and the way people buy and interact with the products.

[4] Phoenician- a member of a Semitic people inhabiting ancient Phoenicia and its colonies.

1.1 THEME

The theme of this dissertation is to understand the effects that globalization and the global industrial revolutions had in fashion, outlining the future possibilities for the global fashion ecosystem map through the context of the industry 4.0 in a global scale.

1.2 RESEARCH QUESTIONS

The main research question is to understand how the fashion ecosystem is organized in a globalized world. what are the main compentencies of each country in the fashion ecosystem ? How did the Industrial Revolutions reflected in the evolution of fashion industry? What wil the future fashion ecosystem map industry be like in a globalized 4.0 world?

1.2 OBJECTIVES

1.2.1 General Objective

The objective of this dissertation is to compile data about the global fashion industry and create comprehensible and visual maps of the fashion ecosystem map and its connections in a global context.

1.2.2 Specific Objectives

- Analyze the historical context of globalization and making connections among the industrial revolutions and the fashion industry.
- Undesrstand the current connections of the fashion ecosystem map and how they are linked to each other
- Draw the fashion ecosystem map
- Do a brief research on the specialization of each country or region of the world, highlighting the core abilities in manufacturing processes.
- Draw a world specialization map poiting out the main material sources, creativity sources and manufacturing sources of each country.
- Redesign the fashion ecosystem map acording to the industry 4.0 concepts.

1.3 BENEFITS

This research has three main benefits:

- Ecosystem map data compilation and analytics

  Draw the relations and connections among the agents in the fashion ecosystem map in a visual and clear way.

- The compilation of global data of core specialization of each country.

There are many articles and information published about the fashion industry in specific areas of the world but it is very hard to find this information compiled into only one article or map. Having this information gathered will facilitate the undestanding of the global fashion industry and sourcing.

- The analysis of the fashion ecosystem map in the context of the industry 4.0

The concept of the industry 4.0 is relativaly new. It is possible to find information about how the industry will be like, how the consumers will react and the adaptions in retailing but it is very difficult to find information about the industry 4.0 in the perspective of fashion only. The fashion ecosystem map of the fourth revolution will bring a discussion to the fashion world that is not found in the bibliography yet and this is a very big benefit for understanding the future of fashion.

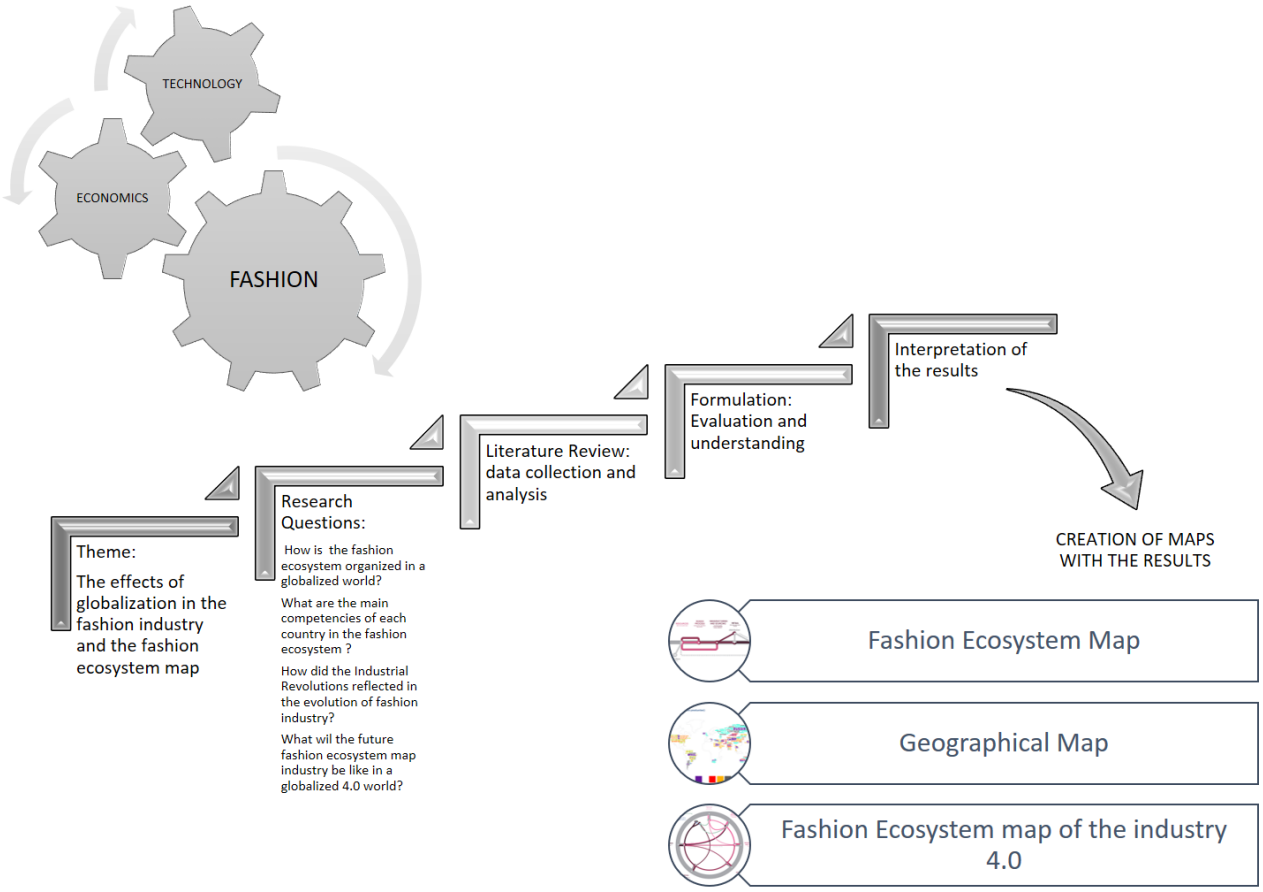
1.4 METHODOLOGY

There are many specific articles about the agets of the ecosystem and about singular countries or regions. The global ecosystem of fashion has been changing exponentially in the past few years. The objective of this dissertation is to understand how the ecosystem changed and how globalization affected that. The main areas of this research are fashion, economics and technology.

For that, the methodology of this research will be a literature review to try and connect as much information about how fashion works nowadays and what are the main connections of the fashion ecosystem in a globalized world. After the data collection, there will be the exploration and formulation process where the data will be analyzed, evaluated and selected. The objective of dissertation is to compile data about different countries and how they perform in the ecosystem.

The data selected will provide enough material to create five visual maps: the transitional fashion ecosystem map, the fashion ecosystem map of the industry 4.0 and three greographical maps with data about specialization and core abilities of countries related to the fashion world. After data selection, the author will review existing geographic maps and update information to build new maps of the fashion industry.

Graphic 1: Research design



Source: Created by the author, 2016.

CHAPTER 2

HISTORICAL CONTEXT OF THE GLOBALIZATION AND THE INDUSTRIAL REVOLUTIONS

This chapter is divided in two main parts. The first part about the First and the Second Industrial Revolutions and how they reflected in the perspective of fashion. And the second part where we highlight the Third and Fourth Industrial Revolutions after the invention of the internet. In this chapter we also introduce the concept of the industry 4.0, Internet of Things and Big Data. A brief connection to the fashion industry is made in the end of the chapter.

2 HISTORICAL CONTEXT OF GLOBALIZATION AND THE INDUSTRIAL REVOLUTIONS

2.1 THE FIRST AND SECOND INDUSTRIAL REVOLUTIONS AND THEIR IMPACT IN THE FASHION INDUSTRY

Big transformation in the political and economic life of many Europeans and Americans happened in the eighteenth and nineteenth centuries. During 1769 and 1821 a big part of Europe was under the power of the French Napoleon Bonaparte and his family. Napoleon was defeated in 1814 and some years later the revolution began to rise (Pendergast and Pendergast, 2004, p.599).

According to Thames and Hudson (1969), the economic power of all nations in the XVIII century was mostly agrarian. There were two main events that featured the first and the second industrial revolutions: the use of coal and iron in the industry in 1780-1850 and the revolution of the steel and electricity later on during 1850-1914.

Improvements of the agricultural techniques and practices turned out in a very big increase of production for many areas, supply as foods and raw materials, more efficient industry resulting more profits, the commerce started to boost, foreign and domestic distances were shortened, these are some of the main advances that the first industrial revolution brought up (Montagna, 2006).

> The early years of the industrial revolution brought technological advances that improved agricultural production and sped up the manufactures of goods, laying the ground work for the factory system that would soon dominate European countries and the newly formed USA (Pendergast and Pendergast, 2004, p.551).

In the beginning it was all related to improving the agriculture and the methods of manufacturing goods but the advances of the industrial revolution had changed the society in many levels. The industry was for sure the main

change but people had to learn how to adapt to the innovations in different ways such as how to work with the new technology and how to live in this new society.

Thames and Hudson (1969) explain that the industrial revolution that happened after the twenty-three years of Napoleonic wars, brought significant changes for the industry and for the whole society. The society had to find another way to distribute and organize the workforce. The machines started producing more and in a faster pace than the human beings. In 1840, a cotton factory with about 750 employees using steam engines could produce as much as 200,000 employees weaving it manually.

> In 1769, James Watt invented and patented the modern steam engine powered by coal. The cotton industry became the first to deploy the new technology. The productivity gains were dramatic. Between 1787 and 1840, British cotton production "jumped from 22 million to 366 million pounds" while the cost of production plunged. By 1850, coal-powered steam engines could be found across Europe and America. Still, as late as 1848—the year of the great European revolutions—hydraulic power "accounted for two and a half times more power than steam engines" in France. Hydraulic energy continued to be used in more French factories than coal-fired steam technology (Rifkin, 2015, p. 42).

Besides the great changes in the way of producing things, one of the biggest changes of the industrial revolution, according to Thames and Hudson (1969), was construction of the European Railways in the 1830s and 1840s. The advances in transportation were highly important for the initiation of the process of globalization. The railways connected countries and helped nations to buy and sell goods from different places. "England rose to become the most technologically advanced nation in the world and imposed its power across the globe (Pendergast and Pendergast, 2004, p.551).

Before the outbreak of the World War I, England, Germany and the United States, dominated all the technologies of the First Industrial Revolution:

"Coal-powered steam technology ushered in a new communication/energy matrix—steam printing and the steam locomotive—which provided a general-purpose mega technology platform" (Rifken, 2015, p. 38).

The steam powered trains transformed the trades and commerce between countries by speeding the delivery of goods dramatically. By the 1830s, locomotives could already access the speed of 60 miles per hour, for that time the idea of traveling in such high speed was not even imaginable (Rifken, 2015). It is possible to understand how big this advance was by Rifken´s explanation on the amount of hour the trips got compressed:

> To get a feel for how the train compressed our sense of time and space, consider the fact that a journey from New York to Chicago by stagecoach would have taken three weeks or more in 1847. By 1857, that same trip by rail would have taken 72 hours. Besides its speed, the steam locomotive provided a dependable form of transportation that, unlike roads and water, was not affected by changes in the weather. They could make several trips back and forth in the time it took a barge to make one trip and could carry three times the amount of freight as barges at the same price. (Rifken, 2015, p.38).

People could rely on the time and the speed of the locomotives, which increased the trade market and reduced costs of transportation as well. Nowadays it seems obvious and it is hard to imagine, but this way of transporting people and goods made the whole difference for markets, people and the process of globalization.

The industrialists started possessing big economic power and after this they started looking for political power as well, "which monarchical systems of government denied them" (Pendergast and Pendergast, 2004, p.599). But soon this started changing and the industrialists were getting stronger and stronger and gaining not only economic power but also political power.

The first industrial revolution had a direct connection with the fashion industry because some of the main inventions were to improve the apparel industry. Frings (2005), states that the connection of innovation and the fashion industry started in London with John Kay´s development of the flying shuttle[5]

[5] Flying Shuttle - The flying shuttle was one of the key developments in the industrialization of weaving during the early Industrial Revolution. It allowed a single weaver to weave much wider fabrics, and it could be mechanized, allowing for automatic machine looms.

(1773), James Hargreaves and the spinning jenny[6] (1764), Richard Arkwright´s water frame (1769) and Edmund Cartwright´s with the invention of the power loom[7] (1785).

All these inventions mentioned above were important for the developing of a new fashion. Dressing during the nineteenth century changed dramatically. The change was influenced by shifts in taste, of course, but more significantly by the introduction of machines to the construction of clothing, sewing machines, power looms, or weaving machines, new dye formulas, and other inventions increased the speed and ease of clothing manufactures (Pendergast and Pendergast, 2004, p.605).

According to Frings (2005) with the industrial revolution, great economic changes started happening and people also created a sense of fashion. Understanding about fashion or being able to afford it was only a privilege of the high classes of society or the members of royal families but after the shift of economic power that industrial revolution brought, a middle class started to emerge and had money to spend on the luxuries of the fashion industry. Fashion became a symbol of status and also closer to people.

"The democratization of fashion began with the invention of the sewing machine, which turned handicraft into an industry" (Frings, 2005, p.9). The sewing machine was invented in 1829 by a French tailor called Thimmonier, thus the man who took credit for it was Elis Howe who patented in 1846, this new invention was ran by hand. In 1859 Isaac Singer developed a foot treadle for the sewing machine, by 1867, Singer was producing a thousand machines per day. One of the early uses of the sewing machines was to make uniforms for the army (Frings, 2005, p.9).

[6] Spinning Jenny - a machine for spinning with more than one spindle at a time, patented by James Hargreaves in 1770.

[7] Power Loom - A power loom is a mechanised loom powered by a line shaft, and was one of the key developments in the industrialization of weaving during the early Industrial Revolution.

Besides bringing a lot of improvement to the society, the industrial revolution also brought social changes in terms of jobs and most of those changes weren´t. According to Montagna (2006), the conditions in which people had to work were very bad, normally in poor ventilated, noisy, dirty and poorly lighted working spaces. Furthermore, workers had to work around twelve to fourteen hours a day. "Factory acts were later enacted by Parliament regulated the number of hours that men, women and children worked" (Montagna, 2006, p.1).

This whole change of social organization and new way of working went through a long process until the workers had their rights granted. On the last two decades of the nineteenth century, a second industrial revolution began to rise in the USA and Europe. For this one, we can blame oil as one of the main discoveries of the revolution. The invention of the internal combustion engine and the introduction of telephone were some of the huge technological progresses that happened during that time. (Rifkin, 2015, p. 42).

The second industrial revolution happened in the end of the nineteenth century and beginning of twentieth century, it was a phase of fast industrialization with the increase of technological inventions. During the first industrial revolution, a lot of advancements happened but they were concentrated to a select number of cities, it was on the second industrial revolution that these inventions became popular to the industry and were spread throughout Europe and America.

> The enormous expansion of rail and telegraph lines after 1870 allowed unprecedented movement of people and ideas, which culminated in a new wave of globalization. In the same period new systems were introduced, most significantly electrical power and telephones (Boundless, 2016).

The main goal of the second industrial revolution was to improve workers' efficiency and productivity by increasing the mechanization of the industry. The mechanization of the industry permitted the industrialists to hire unskilled workforce to perform simple and repetitive tasks following the commands of skilled staff, this means that they could hire cheap workforce and lower their wages.

Although the industrial revolution was responsible for increasing the standard of living, it also caused a big wave of unemployment because of the machines that were substituting the workforce of humans. Productivity rose, prices went down because of the lower costs and the whole society had to adapt to this dramatic changes. Immigration was another cause of this revolution because now people were able to travel long distances in a faster speed due to the railways, together with this people, their ideas were moving with them, making the process global and spreading the inventions quickly (Pacheco, 2012).

This period was marked by a series of new inventions; one of the biggest contributions was the invention of the telephone in 1876 by Alexander Graham Bell. After this, besides traveling, people were able to communicate with each other in a lot faster way. The fact that people didn´t have to send letters, wait for them to get to the destination and then wait for a response changed the world completely. After the telephone, another huge advance of this period was the invention of the light bulb by Thomas Edison in 1879, people could now work at night as well. Everything that could only be done during the day, after this invention, could now be done at night (Pacheco, 2012).

According to Rifkin (2014), factories slowly started adopting the electricity; only 5 per cent of them were actually using this powerful source by 1900. Only after the automobile and mass-production assembly lines that this started to change. One of the first visionaries that saw potential in electricity for the industry was Henry Ford.

> He would later muse that his ambitious goal of producing an affordable Model T for every working family would have been unrealizable were it not for the electrification of factories and the introduction of electrical motors. (Rifkin, 2014, p.46).

The change between steam power to electricity in many factories increased productivity in about 300 per cent in the beginning of the twentieth century. “The electrification of automobile factories unleashed the power of mass production and put millions of people behind the wheel of a car” (Rifkin, 2014, p.46).

Besides iron and steel providing a new source of construction materials, the discovery of oil provided a new source of fuel. The Spindle top geyser was discovered in 1901 and since then the oil industry boomed. "Within a year, moe than 1500 oil companies had been chartered, and oil became the dominant fuel of the 20th century" (Wall, 2016, p.1). This means that the oil industry became a strong part of the American economy.

After the invention of the airplane and the growth of the automobile industry, oil industry gained a whole new market. Oil had been for some years a useless by-product, only after the introduction of the combustion engines that this kind of extraction became important for a country´s economy. During this period, refiners started seeking for new ways of producing and improving gasoline (Wall, 2016).

The second industrial revolution was basically the second part of the first industrial revolution because in many segments it was continuation of improvements. One is directly linked to the other through the progress of inventions. The main consequences of these two revolutions were the growth of people´s standards of living, improving the society and making life significantly different than in the previews century.

2.2 THE THRID AND FOURTH INDUSTRIAL REVOLUTIONS: HOW THE INTERNET CHANGED EVERYTHING

All the changes brought from the 19th century industrial revolutions, According to Digital Experts Academy (2015, p.1), led to "an increase in population, expansion of cities, and a boom in technology and the economy". During this period, more efficient ways of producing things were developed, not everyone benefited equally, some became very wealthy and some had lost their jobs for the machines.

After the period of revolutions, The First World War erupted and many countries were involved, when the war was over, there was a huge economic

depression. The Great Depression of the 1930s was responsible for some people´s poverty and other´s wealth. A lot of entrepreneurs saw the opportunity of making money with the depression years and thinking about the future of communication. During the Second World War, important inventions came up and would only become popular some years later.

The Third Industrial Revolution or the digital revolution refers to the period after wars where the inventions tested during the war started to become popular to the public. This revolution refers to "the advancement of technology from analog electronic and mechanical devices to the digital technology available" (Techopedia, 2016) until nowadays. This revolution started during the 1950s and it hasn´t had a final date yet, some authors affirm this revolution is ongoing, but others have already started talking about the fourth industrial revolution and connecting it to the advance of cybernetics[8].

The information Era is what characterizes best the third industrial revolution, the world is now connected, the information is instant and everyone has access to it. During this revolution, computers were invented and popularized, there was a transition between analog to digital technology and during the 1990´s the World Wide Web, what we call internet, was released to the public.

According to Howe (2016), the early internet, experiences happened during the cold war, it was used only by experts or engineers and scientists. This first version of the internet was not user friendly, the system was very complex and it was very different from what we are used nowadays.

> 1993: The launch of Mosaic, the first web browser to make a real effort at usability, helped popularize the internet. As the forerunner of Netscape Navigator, Microsoft's Internet Explorer and the myriad of browsers available today, Mosaic was a crucial step in taking the internet out of the lab and into the home. (Moore, 2016).

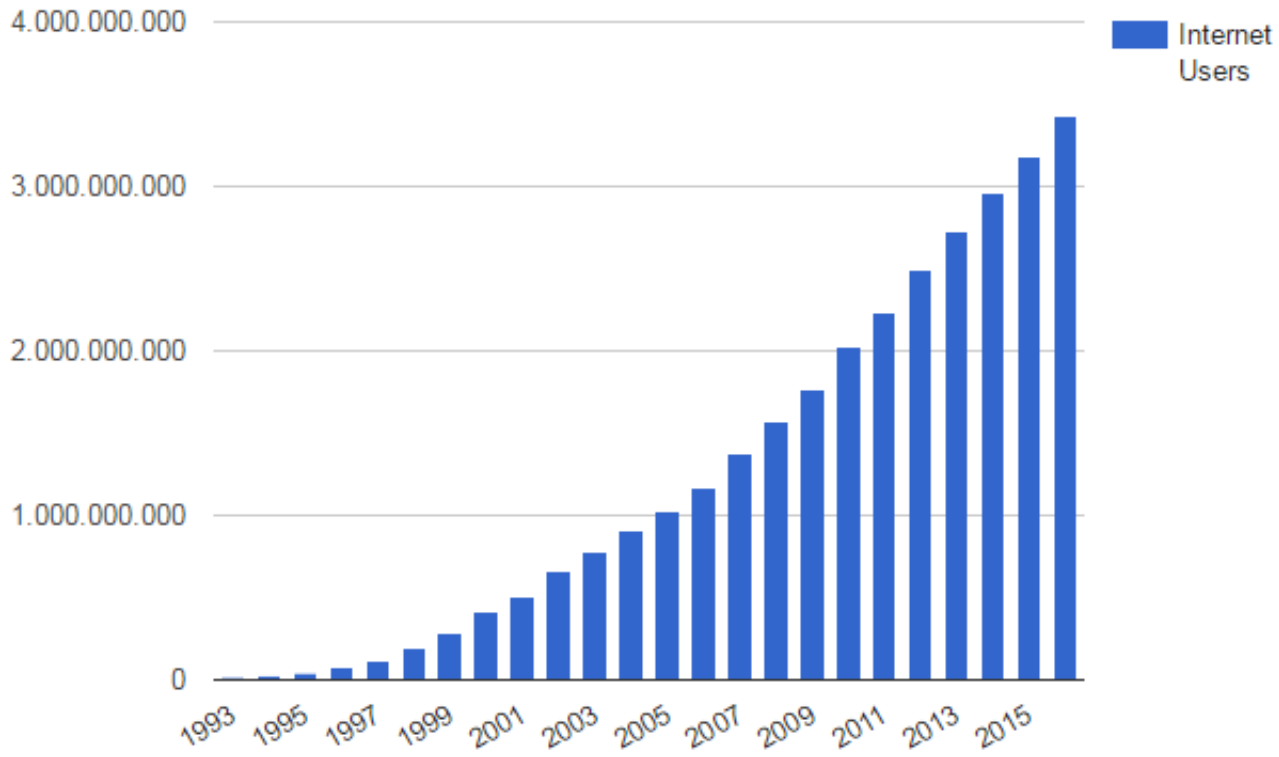
The Internet was popularized to people only in 1993 and since then it is growing exponentially. In the beginning of its popularization, the internet was used more by business people, but soon everyone was using it, it was the fastest

[8] Cybernetics - the science of communications and automatic control systems in both machines and living things.

and easiest way of communication. According to Harrison (2014, p.1), the internet allowed people to communicate in a global scale, "Before the internet, people were restricted to a social network that was just local to them including neighbors, friends and family members that were just a short distance away." But with the internet, it became possible to maintain relationships all over the world, in a personal and business scale.

The internet is still evolving, and the users number is increasing every day. Nowadays, according to Internet Live Stats (2016), there are almost four million people with internet access in the world.

Graphic 2: Number of internet users in the world from 1993 to 2016



Source: Internet Live Stats (2016).

The fast information and connection make the users´ lives a lot simpler and it will make it even more practical in the next years through the implementation of the internet in all the things that surround us. The continuation of the third industrial Revolution and the evolution of the internet Era is the Industry 4.0.

2.2.1 Industry 4.0: The next industrial Revolution

After going over the three Industrial Revolutions the world has gone through and analyzing that each one of them resulted in a great increase of productivity, we´ll present the concept of the Fourth Industrial Revolution or the Industry 4.0[9] on this chapter and open the discussion of how this will contribute to the fashion ecosystem and industry.

According to Schuh, Potente, Wesch, Wever and Prote (2014), the Fourth Industrial Revolution is happening now and it started a bit different than the other Industrial Revolutions. This new industry is not driven by the production industry itself but because of the invention of social networks and smart devices.

> The impact of the fourth industrial revolution, however, is more extensive and it affects apart from production also indirect departments, especially engineering processes. That means that the potential of productivity growth particularly lies in the improvement of brainwork and decision making process (Schuh, Potente, Wesch, Wever and Prote, 2014, p.1).

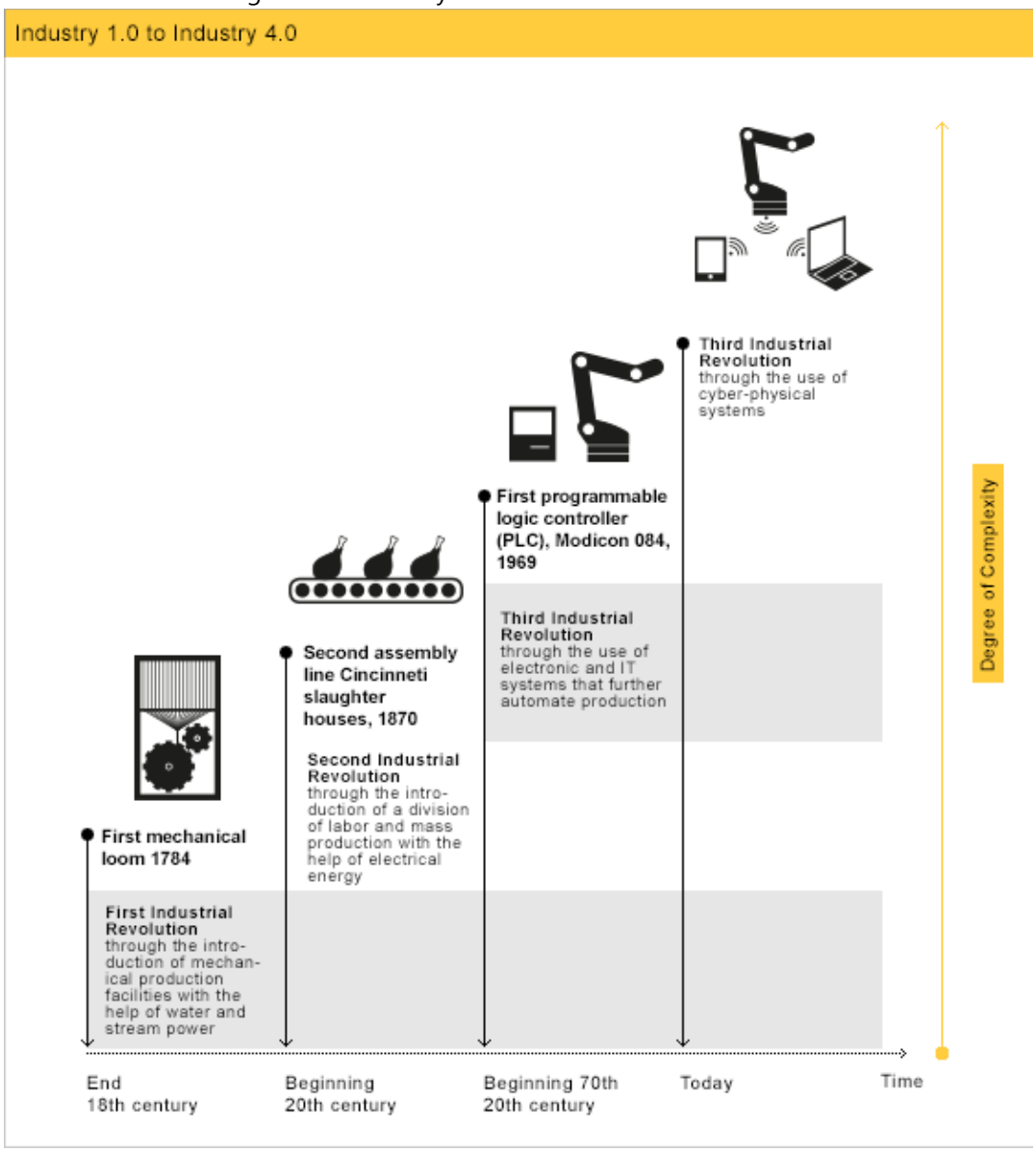
This means that the workforce will have to be specialized to deal with this new process of connecting humans to technology. In an Industry 4.0 factory, machines and humans are connected in a collaborative way, for this to happen we need advanced prediction tools, big data stored somewhere in the cloud and the all things connected through internet. For the concept industry 4.0 exist, it is necessary a Cyber-Physical System[10]-based manufacturing trend, this means an interconnection between the big data and the Internet of Things (IoT) (Lee and Yang, 2014, p.1).

The evolutionary process of the fourth industrial revolution started in the first industrial revolution with the introduction of mechanical production through

[10] Cyber- Physical Systems - are integrations of computation, networking, and physical processes. Embedded computers and networks monitor and control the physical processes, with feedback loops where physical processes affect computations and vice versa.

steam and water power; going through the second industrial revolution through mass production and the introduction of electricity; automated production after the invention of the computer and finally using cyber-physical systems to control and connect the industries. It is possible to analyze this evolution more clearly in the following image from the GTAI website.

Image 1: Evolutionary chart of the industrial revolutions



Source: GTAI, 2016.

The term industry 4.0 was created in Germany in 2013 but only in 2015 Angela Merkel, the German chancellor, publically used this concept at the World Economic Forum. Since then, a lot of studies are being done on how to connect the industry to the several innovations of the digital world (Hinks, 2015).

Cyber-physical systems (CPS) technologies connect the virtual world to the real world. "Smart machines, logistics systems and production facilities allow peerless ICT-based integration for vertically integrated and networked manufacturing" (McDougall. 2014, p. 6). The industry 4.0 is the new smart industry, where it is possible to control the whole production cycle, including the distribution and logistics.

Having such integrated and networked processes, the companies can combine different core productions to assemble one product. This new concept of industry makes it even easier nowadays to have a global supply chain. In this new industry the production that before used to be centralized, now is decentralized by an intelligent interaction of each production process (MacDougall, 2014).

> Simply put, this means that industrial production machinery no longer simply "processes" the product, but that the product communicates with the machinery to tell it exactly what to do. INDUSTRIE 4.0 connects embedded system. (MacDougall, 2014, p.3).

Smart factories are composed by intelligent machines that are able to do self-optimization, self-configuration and complete complex tasks that in the old system were performed by humans. This results in a much higher cost and time efficiency (Hinks, 2015). For all this to be possible, there is a lot of technology involved, some of the technology needed in an industry 4.0 is still being developed but most of it already exists.

The existing technology that characterizes the new industry is advanced robotics, cloud computing, artificial intelligence, sensors, digital fabrication like 3D printing[11], for instance, cloud computing, the internet of things (IoT), big data base, high level software, platforms that use algorithms and even mobile devices. This concept of industry starts with the automated intelligent manufacturing process and goes up to the control of the distribution of the goods through navigation tools and ride-sharing apps (Geissbauer, Vedso, Schrauf, 2016).

[11] 3D Printing - a process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material.

All these technological tools are characteristics of the new industry, but there are two of them that are very important to highlight: the access to the big data and the internet of things (IoT).

> The Internet of Things will connect everything with everyone in an integrated global network. People, machines, natural resources, production lines, logistics networks, consumption habits, recycling flows, and virtually every other aspect of economic and social life will be linked via sensors and software to the IoT platform, continually feeding Big Data to every node—businesses, homes, vehicles—moment to moment, in real time. (Rifkin, 2014, p.15).

The concept of the Internet of things is basically the same of the industry 4.0. The IoT is the fact that things do not need a human to command the processes. The "things" interact with humans but don´t need them to be in control anymore. This results in a big change in the society, the working intelligence and skills of the human beings must adapt to these new intelligent machines.

As we could analyze in the first chapter of this dissertation, all the industrial revolutions brought significant changes in the society. The pattern is: new technology comes and performs the jobs that were before performed by humans; humans have then to adapt and find their place in the process. The way people work, changes completely after a revolution in the industry. At the time of this writing, we are still in the early years of the fourth industrial revolution but most of the technology that composes this new idea has already been accepted by people through the smart devices they carry. It is possible to understand how much the IoT will influence people´s lives in the next few years reading this example given from Jacob Morgan that was published in the Forbes website in 2014:

> [⋯] this is the concept of basically connecting any device with an on and off switch to the Internet (and/or to each other). This includes everything from cellphones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. This also applies to components of machines, for example a jet engine of an airplane or the drill of an oil rig. As I mentioned, if it has an on and off switch then chances are it can be a part of the IoT. The analyst firm Gartner says that by 2020 there will be over 26 billion connected devices⋯ That's a lot of connections (some even estimate this number to be much higher, over 100 billion). The IoT is a giant network of connected "things" (which also includes people). The

> relationship will be between people-people, people-things, and things-things.

Having read that, we can understand that the IoT is basically the idea of adding internet to everything that we can imagine. This enables people to control everything they want from their computers, tablets or even smartphones. The industry will evolve, the way people deal with objects will change, everything will become faster and connected to the internet (Morgan, 2014).

Morgan (2014) also gives more practical examples for us to understand how the IoT will affect directly our routines. "Say for example you are on your way to a meeting; your car could have access to your calendar and already know the best route to take" (p.1). If everything is connected to the internet, the interaction of the things will become instant. "What if your alarm clock wakes up you at 6 a.m. and then notifies your coffee maker to start brewing coffee for you?" (p.1). Morgan used simple examples for people to understand how much life in general will change. Not only the industrial processes will be able to be managed through the internet but also personal devices, machines and electronics in general.

In a TedEx talk with Doctor John Barret, head of Academic Studies at the Nimbus Centre for embedded systems[12] research at Cork Institute of Technology (CIT) and group director of the center's smart systems interaction research group, it is possible to analyze good and bad aspects of the internet of things to people´s lives in a society and in the work environment. Barret (2012) mentions that for something to be inserted in the IoT, it has to have four main characteristics: a unique identity (series number, for example), ability to communicate through the internet, sensors and a way to be controlled.

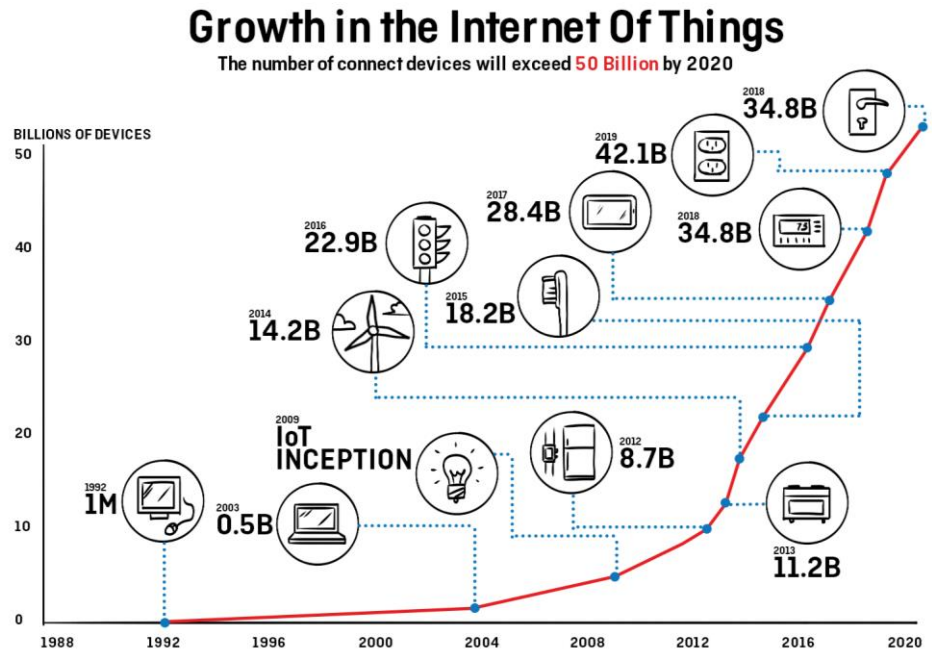
Barret (2012) predicts that in the future, Google will not only be used to search for general information and data, but also for searches like: "Where are my keys?" As everything will have a sensor and will be connected, we will be able control our private and personal lives through google as well. This brings a

[12] Embedded Systems - An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints

controversial discussion about privacy, but Dr. Barret (2012) alleges that twenty years from now, privacy will be meaningless. The new generation that is born in this technological Era is already used to sharing personal information online with the whole world, so that is not seen as a big problem for the future generations to accept.

In the following graphic we can analyze the growth in the Internet of Things by the year 2020. Many objects are being designed and prepared to serve the new industry within the smart cities and society.

Graphic 3: Growth in the IoT by 2020



Source: Zawadzinske, 2016

According to Barret (2012) by the year 2030, people will be able to monitor, manage and control things from everywhere. Barret (2012) also predicts that each person will be surrounded by three to five thousand connected things each day. He also uses the term "technocracy[13]" to explain that technology will be in command but humans have to join for this to become possible.

[13] Technocracy - the government or control of society or industry by an elite of technical experts.

What Barret said in 2012, is nowadays happening already, Kobie (2015) explains that the IoT is being used even to control and monitor crops and cattle in the hopes of boosting production and efficiency in big farms.

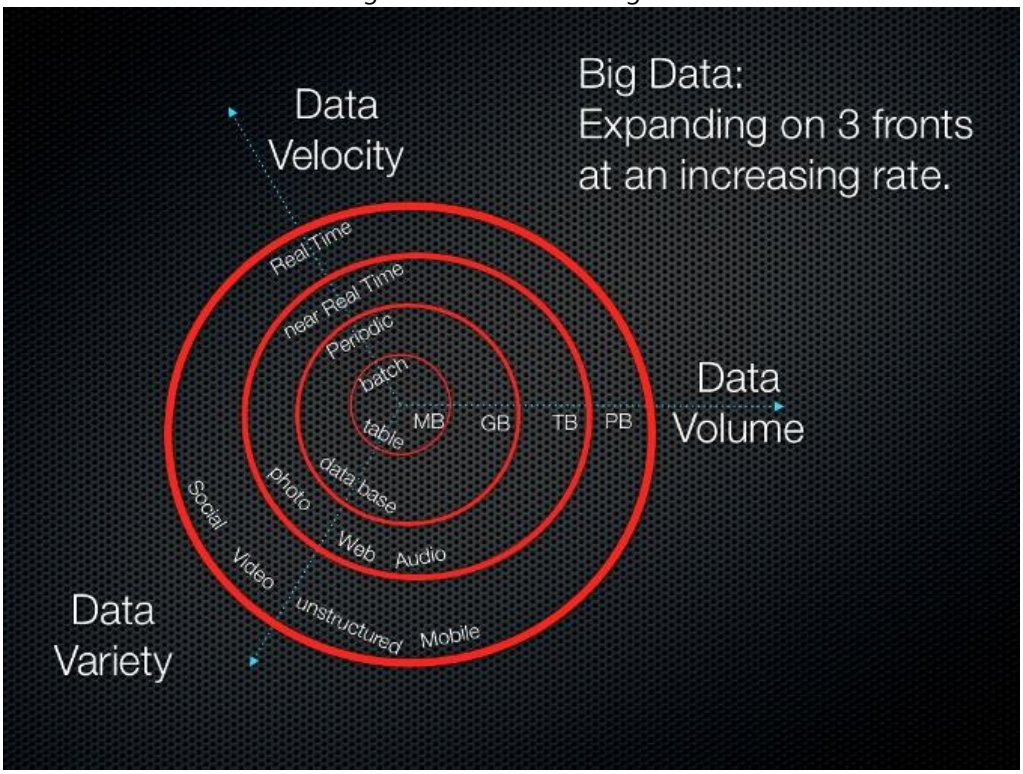
> IoT is more than smart homes and connected appliances, however. It scales up to include smart cities – think of connected traffic signals that monitor utility use, or smart bins that signal when they need to be emptied – and industry, with connected sensors for everything from tracking parts to monitoring crops. (Kobie, 2015, p.1).

All of this connectivity will only be possible with the access of the Big Data. The Big Data is "a collection of data from traditional and digital sources inside and outside your company that represents a source for ongoing discovery and analysis" (Arthur, 2013, p.1). In other words, big data is all the data available in a digital form, it could be through inputs from social media, articles, clients' data bases from product transaction information, interaction channels, sales records and all kinds of online and digital interactions.

The Big Data can arrive from different sources, systems, sensors and mobile devices transmit all of it and sometimes save data that the user does not even know that has been saved. The Big Data is mainly used to extract information about different things so that can be used in a strategically way by people, companies and the government (Rouse, 2016).

The Big Data is characterized by the 3Vs: Volume, Variety, Velocity. These three aspects are important when processing the data. The volume, for instance, is usually measured by terabytes, petabytes and exabytes of data captured; in other words, is the amount of data that is being processed. Then there is also the variety of subjects and information and the velocity that that can be processed (Rouse, 2016).

Image 2: The 3Vs of the Big Data



Source: Rouse, 2016.

According to Arthur (2013), in a simpler definition, the volume stands for data, the velocity is the speed of information generated and the variety is the kind of data available. Arthur also mentions two other Vs such as the veracity and the value of the data. To process all the Big Data, it is necessary a huge computing infrastructure. As many companies can´t afford to have that, most of the processing has been done on the cloud.

> The need for big data velocity imposes unique demands on the underlying compute infrastructure. The computing power required to quickly process huge volumes and varieties of data can overwhelm a single server or server cluster[14]. Organizations must apply adequate compute power to big data tasks to achieve the desired velocity. This can potentially demand hundreds or thousands of servers that can distribute the work and operate collaboratively. (Rouse, 2016, p.2).

The Big Data together with the Internet of Things concept will be processed with advanced analytics, converted into algorithms and "programmed into automated systems to improve thermodynamic efficiencies, dramatically increase

[14] Server Cluster - A server cluster is a collection of servers, called nodes that communicate with each other to make a set of services highly available to clients.

productivity, and reduce the marginal cost of producing and the delivering a full range of goods" (Rifkin, 2014, p.15).

In retail outlets, for example, sensors keep marketing and sales departments informed of what is being looked at and purchased in stores. Other sensors can track the products during its distribution process and let the retailers know exactly where their order is and how long it will take to reach their stores. The Big Data in this process is used to analyze information and recalibrate the inventories, control production, create new businesses and even increase thermodynamic efficiencies (Rifkin, 2014).

The new Industrial Revolution is the process of using the IoT and the Big Data to create a coherent operating network where every human being and all the things that surround them can communicate in an efficient way in order to make life easier. Optimizing thermodynamic and time efficiency, the industry 4.0 and the smart cities can provide synergy and facilitate interconnections in the society.

"Using less of the Earth's resources more efficiently and productively in a circular economy and making the transition from carbon-based fuels to renewable energies are defining features of the emerging economic paradigm" (Rifkin, 2014, p.17). Besides making everyone´s lives more connected and efficient, the concept of this new industry is also to be sustainable in a way that we stop wasting so much of our planet´s natural resources.

> The very purpose of the new technology platform is to encourage a sharing culture, which is what the Commons is all about. It is these design features of the IoT that bring the social Commons out of the shadows, giving it a high-tech platform to become the dominant economic paradigm of the twenty-first century. (Rifkin, 2014, p.21).

There is a paradigm about this new type of society and it has to do with privacy. People, nowadays, are very concerned with their privacy and sometimes get frightened to how the internet can break into their lives and homes and suddenly make your private life public. According to Barret (2012), in the future, privacy will not be a concerned how it is today. The future generations will be already born in the middle of the social network era where everything is shared

online with the whole world; so the concept of privacy as we have today, will possibly change a few years from now.

On the other hand, Rifkin also mentions about privacy in his book but he leaves the open question: "Whether future generations living in an increasingly interconnected world—where everyone and everything is embedded in the Internet of Things—will care much about privacy is an open question" (Rifkin, 2014, p.64).

The Internet of Things as it is possible to analyze through this study, will, for sure, change the way people live their lives completely. Everything is evolving, since the way people purchase goods to the way those goods are being produced. According to Hinks (2016), Angela Merkel, the German chancellor, spoke about the Industry 4.0 in 2015 in the World Economic Forum explaining that the world has to learn how to adapt fast to the upcoming technology provided by the IoT, she said it is the era where the online world and the world of industrial production will meet. To that end, the German government is investing around two hundred million Euros to encourage research about this topic.

2.2.1.1 Industry 4.0 and the fashion environment

For global sourcing and distribution processes to work, it is necessary a lot of coordination and specially time management. "INDUSTRIE 4.0 allows information to cover long distances in close to real time" (MacDougall, 2014, p.21). This new connected industry enables the industry to coordinate its processes and make them work simultaneously through the IoT.

"Robotic skins, microelectronic circuits, conductive threads and supple sensors [⋯]" (Quinn, 2012) are being developed as raw materials to be combined with high tech textiles in order to produce smart garments. Fashion has to find a way of fitting in the new technological era by being part of it.

Most fashion brands still produce their garments the way they used to do in the eighteenth century by cutting the fabric and stitching one piece to the other (Quinn, 2012). The fourth industrial revolution needs wearable technology; this means that the fashion industry must adapt to the Internet of Things concept as well. The integration of computer parts into fashion will make our clothes communicate with other gadgets and also alliance with healthcare (Quinn, 2012).

Clothes will carry our personal big data, all the information about our health and where we´ve been will be tracked by the wearable technology. "A new generation of designers is envisioning the forms, shapes and materials of tomorrow, transforming garments from passive receivers into active technological tools" (Quinn, 2012, p.12).

Electronic fibers capable of conducting electrical impulses can transmit data between microelectronic components and connectors that have been seamlessly integrated into cloth. They enable garments to function as computing devices that relay information via tiny conductors, circuits, silicon chips and sensors, and exchange data with remote systems via transmitters and woven antennae (Quinn, 2012, p.12).

> The diversity of products with wearable technologies, the employment of biotechnologies and new materials will create new demands for intelligent and functional textiles, exponentially increasing the diversity and technological intensity of threads, fabrics, notions and required auxiliary products to meet new consumer needs. The dissemination of apparel factories adhering to principles of Industry 4.0 should promote the textile industry's qualitative improvement as well as its scientific and technological development. (Bruno and Pimentel, 2016, p.1).

All the technological advancements of the textile industry are leading the fashion businesses to a whole different Era. Clothes will be part of people´s life in a much more intense way that they have ever been. Even the way people choose and buy their clothes will change.

"Many garments will be designed by their wearers, and most will be manufactured by consumers themselves, who will produce them from files downloaded from designers´ websites" (Quinn, 2012, p.6). This is one of the characteristics of the industry 4.0: Individualized customer-specific (hybrid)

products combined with dynamic processes and highly flexible production. In the business example of the image xx we can analyze how personalized the buying experience can get.

Image 3: Personalized buying experience

Source: Tilebein, 2016.

Fashion designers can come up with very creative ideas and different things but they need technology experts to make this become a reality. The manufacturing process of the factories from the industry 4.0 is completely different from the ones brought up in the other industrial revolutions. "New production technologies and new interfaces between consumers and production systems may stimulate the development of new business models" (Bruno and Pimentel, 2016, p.1).

The demand for smart clothes with functional textiles will grow and diversity of wearable technology will meet the industry 4.0 consumer needs (Bruno and Pimentel, 2016). The way factories are organized is also changing; all

the machines can be connected to a computer, designs and patterns are being done through software, this way it is possible to produce things faster and a lot more precisely.

Bruno and Pimentel (2016), highlighted some of the aspects and characteristics from the industry 4.0 that can be adapted into a fashion business, for example:

- Automation and robotics
- Information and communication technologies
- Sensors and actuators
- Pattern making and simulation
- Cloud computing
- Mobile web
- Sustainable technologies
- Biotechnology
- Materials technology
- Big data and 3D printing

With all these technological implements, the complexity of the fashion industry and apparel manufacturing is creating impacts in the entire chain of production and consumption. Consumers will need wearable technology in a close future and the apparel industry has to adapt and feed these needs. Another good aspect of the industry 4.0 is the virtualization of production because it "[…] eliminates stocks and wastes, allowing for the productive work to be more efficient in regards to the use of energy and materials" (Bruno and Pimentel, 2016, p.1).

> Traditionally identified as an industry with low technological intensity, the textile and apparel industry can make a significant qualitative leap in employing more science and technology if it is capable of disseminating cyber-physical systems, the Internet of Things, the Internet of Services and modular automation in its manufacturing processes. (Bruno and Pimentel, 2016, p.1).

Fashion industry hasn´t changed much from the first to the third industrial revolution, but from the third to the fourth the changes are significant. The

employment of new technologies throughout the production chain will change the industrial profiles through hybridization of products and new business models (Bruno and Pimentel, 2016).

2.2.1.2 Retail in the Industry 4.0

According to Smith (2016), by 2026 the shopping experience will change dramatically. Consumers will expect all the process to be seamless and through a big range of connected devices. "This will translate into interactive, highly engaging online and real-world retail environments" (Smith, 2016, p.1). The future of retail is directly connected to the ability of brands to connect the real world to the virtual world.

The new methods of trying clothes on are completely technological and soon stores will be using them. Retails shops will also be implemented with interactive software portals where consumers can get personalized style advices and get a very personal shopping experience (Quinn, 2012).

Online shopping will also grow a lot in the next few years and the problem of the fitting will be solved by virtual fitting rooms where shoppers can try the products on their personal avatar with their own body measures (Quinn, 2012). More and more retailers have been improving their e-commerce platforms and optimizing their sites to mobile versions. According to Smith´s predictions (2016), by 2026, a huge growth in mobile reliability is expected, in a way that the customers can perform the complete shopping experience through the phone, from searching for products, comparing prices, trying them on their avatar to paying for it in a reliable way.

One of the biggest problems that the online retailers face is with the perfect fit. Consumers may check the collection online, check the color options and personalization options but most of them still go to a brick and mortar shop to make sure the garment will fit (Frings, 2005). A lot of technology has been

developed to improve this and soon the e-commerce platforms will start using them widely.

Another aspect of the new consumer behavior in the new industry is the big trend of collaborative consumption. Sharing, borrowing, renting and swapping goods will become more and more common. People will search for personalization, the industry has to provide unique shopping experience will sustainable valued attached to it (Smith, 2016).

Tagging is the most developed area of the industry 4.0 concepts in the fashion industry. Radio Frequency Identification (RFID), is already being used by many brands to track their products and control stock. Radio waves transfer the products data to a reader making it possible to know all the products details (Quinn, 2012).

"The battery powered tags created by British developer Hyper tag emit infrared signals, and can be embedded in a variety of media and materials [⋯]" (Quinn, 2012). This allows the consumers to download more information about the garment, the brand and even the designer that has created the piece. This also changes the way brands work strategically in terms of merchandising its products.

The whole lifecycle of the product is saved in the sensor, the data from people that have downloaded the information, how many times that product has been touched and even track stolen items. The RFID sensors are also very useful to control the distribution and manage logistics, online buyers will be able to track the purchased items and have a prediction of when they will be delivered (Quinn, 2012).

CHAPTER 3

FASHION ECOSYSTEM

After massification of the internet, the fashion ecosystem and its connections have changed a lot. The instant access to the information have changed the order and the relations of the agents in the ecosystem. In this chapter, we will understand the current fashion ecosystem and each one of its main agents (Resources, Design, Industry, Distribution, Consumers) and how they perform in the present. The result of this chapter is a linear map of the fashion ecosystem and the analysis of it.

3 FASHION ECOSYSTEM

As stated in the Cambridge English dictionary (2016), the definition of ecosystem is when different things interact in an environment where one depends on the other to survive. "Ecosystem conveys the idea that all the pieces of an economy come together in particular places, and that their strength and interactions determine prosperity and economic growth" (Kanten, 2012, p.1).

Keeping those definitions in mind, the fashion ecosystem means the connection of all the processes of fashion from the conception until it reaches consumer. This ecosystem has changed a lot throughout history. If we go back to the period that precedes the industrial revolutions, the fashion ecosystem was a lot smaller and with less elements than the ones that came before the industry.

With the industrial revolutions and the growth of production, bigger connections were needed to make the industry flow. The world became globalized, the garments were produced in series, and distribution could reach longer distances. The interdependence of processes in the fashion industry is highly important to reach success; it can start with agriculture and end up with different recycling methods.

The apparel industry, according to Keiser and Garner (2005), is composed by a connection among fiber production, textile industry, general material suppliers, product developers, manufacturers and contractors. There are also auxiliary businesses concerning software providers, testing labs, consultants, and advertising agents. Keiser and Garner (2005, p.5) allege that "[…] companies must compete globally with products that are geared to niche markets defined by customer preferences and delivered through multiple distribution channels […]".

Fashion is a way of showing to the outer world about people and its needs and preferences in different areas, for instance, it influences what people wear, the way the talk about, it expresses a lifestyle. Furthermore, it isn't only important

in a social and psychological way, it also affects the economy of many countries directly (Jardow, Judelle and Guerreiro, 1981).

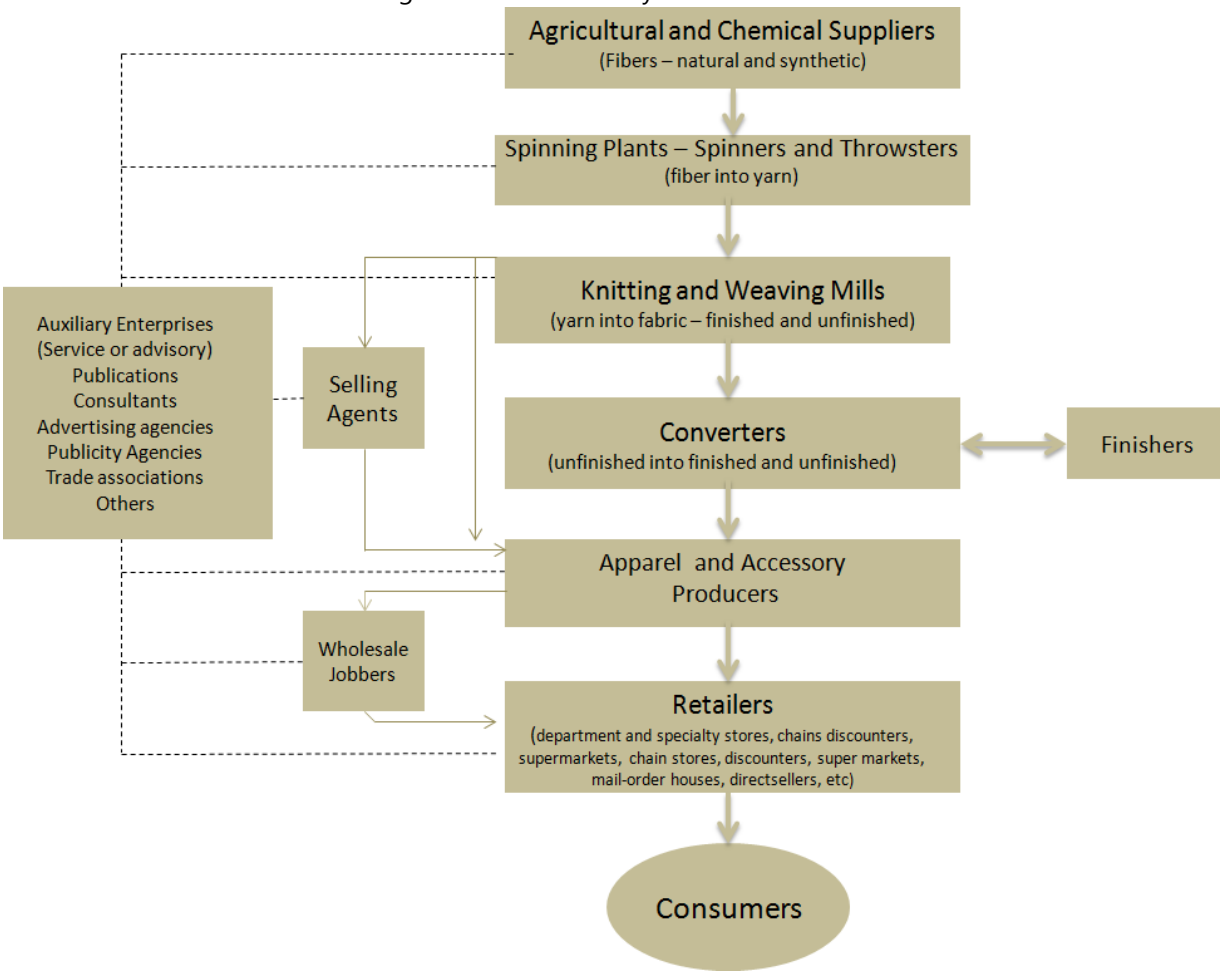
An agile manufacturing process and flexibility are two things that the fashion industry must have well defined, especially in the new Era of the fourth industrial revolution. Fashion is a lot more than a designer´s idea or the apparel industry itself, "fashion is a reflection of the social, political, economic, and artistic forces of any given time" (Frings, 2005, p.6).

> Fashion is a billion-dollar industry employing millions of people around the world, and affects almost all consumers in society today more than ever before as our economy continues to thrive. Fashion reflects our society and our culture; as a symbolic innovation, it reflects how people define themselves. (Salamon and Rabolt, 2004, p.4).

This means that besides being economically important, fashion also is important to explain and translate society and culture. Salmon and Rabolt (2004) explain that fashion means a style that is adopted by a big group of people in a certain period of time. It requires acceptance from people and results in profit for the industry. Understanding the concepts of fashion are very important to analyze it´s ecosystem in a globalized society.

As stated by Jarnow, Judelle and Guerreiro (1981, p. 3), fashion is not easy to define and it´s definition is also not very clear, it is due the complex chain it forms in the industry, there are so many products and process and there is a large number of procedures from the conception to consumer. Hereafter we can analyze the fashion flow chart created by Jarnow, Judelle and Guerreuro in 1981 to try to explain the process of fashion conception.

Image 4: Fashion industry flow chart



Source: Jarnow, Judelle and Guerreiro, 1981, p.4

As we can see, fashion flow starts with agriculture and ends at retail shops, this means a huge number of people from different areas are involved in this process. This type of business goes through farms, factories, union labor, white-collar workers, designers, creative artists, marketing professionals and so on, and all of them play an important role during the process. This means that the fashion industry is interdependent, all the processes are connected.

According to Keiser and Garner (2005, p.6), "agility demands that companies identify their core competences – the things they do best – and partner with other specialists" in order to produce better products in less amount of time. This concept is very important for this study because one company depends on the other, each company or country has a different core competence and to achieve perfection or at least be close to that, the industry has to

communicate and join each other throughout the process. Sometimes these companies can be located in different countries and that´s where technology and globalization supports connection.

> Industry growth achieved through acquisitions and mergers only partially explains the changes taking place within the apparel supply chain. Geographical boundaries create less of a barrier as technology enables companies to conduct business globally. Furthermore, the economics of doing business have changed because products that were once produced domestically at a considerable cost can now be produced offshore at a lower cost. (Keiser and Garner, 2005, p.11).

For the companies to survive they must be networked and have the capacity to "integrate, collaborate, and optimize efficiencies throughout the supply chain faster and more profitably than the competition" (Keiser and Garner, 2005, p.23). For a practical understanding, we will specify the fashion ecosystem and divide it in five different parts: design process, industry and conception, resources, distribution and consumer markets. The ecosystem of the supply chain of fashion is intrinsically linked nowadays, "each company within the chain must form virtual partnerships to meet the demands of the customer" (Keiser and Garner, 2005, p.23).

3.1 RESOURCES

The fashion industry counts on different organizations, shows, and trade fairs in order to advertise and sell its products. From global fashion weeks and fair trades to regional markets, all these events are important for the manufacturers and designers release and sell their collections.

There are resources to help designers and retailers since the trend forecasting until the promotion of the product. By resources we can understand associations, event, websites and magazines from where the designers can get the main trend concepts and collective thinking ideas.

3.1.1 Trend and material forecast

According to Dillon (2012), forecasting trends is very important for the success of a fashion business, it is essential to predict what kind of fashion people are expecting to buy or will adopt in the next season. It is not an easy job to do those predictions, it is very important to understand about economics, politics and history. If the designers had to do the trend forecasting researches, there will be not enough time for them to design the collections; this is due to the complexity of the studies that have to be done.

Trend hunters have to be aware of everything that is happening worldwide and they also have to know how to do critical and anthropological analysis of the society (Dillon, 2012). Their source of research is the consumer´s environment, so they analyze consumer behavior, political events and how they influence the society and so on.

Many designers search for trend hunters to help them define the theme for their collection, big brands can have their own trend hunters but most brands buy that information from prestigious companies such as WGSN for general trends, Pantone for color trends, fairs such as Premiere Vision for material and fabric trends (Dillon, 2012).

There are many online platforms where designers can sign up and get information about consumer behavior from all over the world, the main ones are: WSGN, Promostyl and Trendzoom. These platforms normally offer a complete package of predictions, from colors to materials where they can get information and inspiration for their own collections.

"Promostyl gives adaptations for all markets with color and silhouette direction with a balance of creativity and commercial viability" (Promostyl, 2016). This extract from Promostyl website summarizes well what all of those trend forecasting companies do, they basically give directions for designers to have a commercial collection that will be accepted by the public.

Besides searching for information in these trend platforms, designers can also research material, colors and trends in big fashion fairs. The fairs are a great opportunity for textile and material industry to sell their products for the brands and on the other hand it is also a good way for the designer to get to touch the new materials and see what´s new for the upcoming seasons.

Besides online platforms, there are also fashion magazines with a lot of fashion information content. This channel of research is becoming less used after the popularization of the online platforms. The most known magazines according to Dillon (2012) are: Bloom, Collezioni, Fashion Trend forecast, Sportswear international, Textile report, View on Color and View Point.

Bloom is a magazine that inspires print creation through photos of flowers and nature, it also gives information on possible silhouettes, colors and textures. Collezioni and Fashion Trend forecast give information about trends based on analysis of successful collections. Sportswear International brings information about jeans and streetwear. Textile report shows new possibilities for textiles and print trends. View on Color is similar to Pantone, both give information about the color trends for design products in general (Dillon, 2012).

Another way of sourcing for ideas and material are the fashion fairs. One of the biggest fashion fairs in the world is Premiere Vision- France. It is a three-day fair that showcases products such as textile, leather, yarns to apparel and clothing. Other big fairs for research and showcasing is SeaWorld in Milan, DG Expo in Miami, Heimtextil in Frankfurt, Texworld in New York, Intertextile in Shanghai, Globaltex in Los Angeles, Modamont in Paris and Francal in Brazil (Expodatabase, 2016).

3.1.2 Fashion Organizations

There are many groups and organizations that establish some connections and rules in the fashion world. One of the oldest and most prestigious one is the *Chambre Syndicale de la Haute Couture* that is part of the Fèdèration Françoise de La Couture. This organization is responsible for regulating and determining what fashion houses are eligible to be actual couture houses. It is also responsible for dealing with piracy of styles, coordination of fashion collection timetables and also creating some collective advertising for French fashion (Mode a Paris, 2016).

In the United Kingdom, we can find the BFC (British Fashion Council), which is the group responsible for regulating and organizing London Fashion week. This is a non-profit trade group and their main goal is to promote British fashion worldwide (British Fashion Council, 2016).

The Fashion Group International was founded in 1928, when seventeen women "gathered by Edna Woolman Chase, Editor –in-Chief of Vogue, met for lunch in a modest midtown New York restaurant". All these seventeen women had a job in the fashion business, the consequence of this encounter was the creation of a forum to express and enhance the awareness of American fashion and the importance of women in this kind of industry (FGI, 2016).

The US Fashion Industry Association (USFIA), is an organization that represents the whole fashion industry of the United States, textile, apparel, retailers, importers and wholesalers. It´s main goal is to help the fashion business negotiate in a global market with less bureaucracy. "The United States Fashion Industry Association is dedicated to the removal of barriers that impede the free movement of textile and apparel products to the United States and International markets" (USFIA, 2016).

The World Model Association (WMA), created in 2001 is an organization that connects the fashion industry and brands to models and photographers. It is possible for agencies, models and photographers create a profile and get a lot of

benefits in the industry. This organization also helps with immigration issues for models. In their website they assure that they will "strengthen the image of the professional modelling sector while assuring ethical behavior "(WMA, 2016).

3.1.3 Fashion Capitals and Fashion weeks

According to Dillon (2012), the fashion week calendar is one of the most important elements of the fashion industry, this is due to the synchronization that the fashion weeks' event has throughout the world. The foundation of the fashion industry is the four fashion weeks in New York, London, Paris and Milan. The first one to happen is the New York Fashion Week and they normally happen in February and September.

Global Language Monitor (2015), has measured the fashion capitals of the world according to the number of fashion events, fashion blogs and publications and fashion schools. The number one of the list was London with three of the top 5 Fashion Schools of the world: Central Saint Martins, London College of Fashion and Kingston University (Ceoworld, 2016).

New York became a strong fashion capital after the Second World War. The European capitals were in collapse because of the war, that had strengthened American fashion. There are two outstanding fashion schools in New York: Parsons Schools of Design and the Fashion Institute of Technology (FIT).

Paris was the first fashion capital, great designers were born there, such as Chanel and Dior. Although New York and London are in the top of the rank, Paris continues to be an outstanding fashion capital due to its museums and galleries, fashion weeks, huge number of designers and fashion schools such as ESMOD and Studio Bercat.

Ermenegildo Zegna, Giorgio Armani, Dolce & Gabbana and Gucci are some of the big names of the Italian fashion capital: Milan. Istituto Maragoni is the main

school of the city and there are many characteristics that are similar to Paris, for instance, following traditions (Ceoworld, 2016).

Bunka Fashion college is the ninth most prestigious Fashion School of the World and it is located in one of the newest fashion capitals: Tokyo. Besides Tokyo, we can highlight Antwerp, Los Angeles, Sydney and São Paulo as the emerging fashion Capitals of the world (Ceoworld, 2016).

All these cities mentioned above provide information for designers, they are a source of museums, schools and events that have specific fashion information. Besides providing sources, they are also a way of promoting collections and ideas for new and creative designers.

3.1.4 Media Resources

"Many retailers, even those with their own in-house staffs, use outside advertising agencies to handle special projects and media buys or for concept development" (Frings, 2005, p.340). Advertising agencies help when there is a big or special project or when specific staff is required, such as illustrators, photographers or graphic designers. Retailers and brands want to be well known and want their collections to be advertised in a way that will attract consumers. Different sorts of media can be chosen according to the target of the brand and this decision can come from the director of the brand, the marketing manager or even from an advertising agency.

In publicity campaigns, usually a press package is prepared to be sent to the general media such as magazines, bloggers, newspapers (Frings, 2005). "Newspaper fashion editors usually use the publicity releases and photos sent by retailers to write their articles" (Frings, 2005). This means that the articles might have a paid advertisement behind them. Nowadays, this happens a lot with social media, bloggers and personalities of Instagram. Posts are charged when they advertise or recommend a product to the public.

According to Alter (2016), Instagram is one of the most powerful social networks for the fashion industry due to four main reasons: creation of brand identity, showing community engagement, showing the behind the scenes for the clients first hand, and monetizing results. Brand identity is easily perceived through a fast view of the brands´ Instagram profile, this means that the brand has to think of strategies to show some personality through its posts. Community engagement is also very important in terms of brand positioning, as we can understand analyzing the following example:

> Urban Outfitters, for example, runs a program, #UOonyou, where consumers post pictures of themselves wearing Urban Outfitters clothing and caption their photo with the hashtag. The photos are then looped to the retail site, marrying the physical and digital retail experience. This allows consumers to play an active role in the brand while simultaneously "selling" the brand to their own followers. (Alter, 2016, p.1).

A simple hashtag might create spontaneous marketing for the brand and engage people all over the world. Many brands have been showing their processes of design and manufacturing or backstage of their fashion shows on the Instagram story. This is a way of making people follow all the steps of the ecosystem online.

The last reason Alter (2016) points out for the success of instagram in the fashion industry is because it brings great results for the brands´revenues. E-marketer´s analysis of Instagram (2015), forecasted $595 million on sales throught this social media. "In March 2015, Instagram rolled out with a new feature, Carousel ads: a sponsored slideshow advertisement that appears on users' Instagram feed. Banana Republic capitalized on this feature while also incorporating a "Learn More" button, which served as a gateway to purchase" (Alter, 2016, p.1).

Besides advertising on their own Instagram, Brands rely a lot on fashion and lifestyle bloggers. Bilkova (2015), compares the power of an individual blogger, analyzing the number of followers Chiara Ferragni and Vogue Magazine have. Chiara Ferragni is a fashion blogger for about 5 years and has over 3.2 million followers on the social network while Vogue magazine is a recognized

fashion source with over 100 years of existence and has about the same amount of followers (Bilkoba, 2015).

> The influencing power of bloggers lies in the engagement with consumers. They trigger conversations and are credible because they are "one of us." They aren't top models, but girl/boy-next-door types that are trustworthy. And, the similarity between reader and blogger makes a big impact on the final purchase decision. (Bilkoba, 2015, p.1).

Bloggers are capable of influencing crowds because social media is where people post about their routines and lifestyle. Trusting a friend´s recommendation seems a lot more real than following magazine trends usually photographed with skinny models and being far for reality. Bloggers are seen as real people, someone that is giving tips and helping normal people look fashionable.

3.1.4 Education and Research

Academic research and design methodologies for fashion creation are a novelty of the past few decades according to Jess (2016). Research methods and practices in this field are particularly new but growing a lot. Barchelor´s degrees in the Fashion Area usually last three to four years and masters last around one to two. The course is usually taught through " lectures, seminars, practical workshops and in some cases guest speakers from the industry" (TopUniversities (2016). The evaluation methods according to Top Universities are done by examinations, team and group projects, presentations and group discussions and critiques.

The Website TopUniversities rank Universities throughout the world and they measure different aspects of the courses. " The rankings aim to help prospective students identify the world´s leading schools in their chosen field, with the list of subjects extended each year (⋯)" TopUniversities (2016). TopUniversities measure academic reputation, employer reputation and the number of research citations per paper.

The BOF website has also a methodology for measuring universities 'reputation and it is based on Global influence, learning experience and Long term value. Analyzing the data from these two websites that used two different methodologies of research, different results were found. Top Universities' top five fashion schools were: Central Saint Martins from the UK, followed by Massachusetts Institute of Technology, Rhode Island School of Design, Parsons School of Design from the USA and University of Arts of London. BOF´s top five was: Central Saint Martins, Bunka Gakuen from Japan, Kingston Universiy from the UK, Parsons School of design and the Fashion Institute of Technology in the USA. According to these two researches we can conclude that the most important fashion universities are Central Saint Martins and Parsons School of Design because they were present in the list of two ranking websites that had different patterns of evaluation.

According to Jess (2016), Fashion studies require a mix of different areas of research such as history, anthropology, art, economics and so on. Jess (2016) considers fashion an interdisciplinary field that enables researchers to specialize in different areas with a vast possibility of approaches. The field of "fashion studies" is particulary new and these recognized fashion universities have the role to improve the industry through their researches and investigation areas.

3.2 DESIGN PROCESS

When there is a need to contextualize the design process, all authors have one opinion in common: that the design process is directly connected to research. Frings (2005, p.72) states that "awareness, research, and planning are needed for producers and retailers to make, buy and sell what consumers will want". This means that the whole planning process happens during the design process. The entrepreneurs of this kind of business must be aware of what is going on in the world in terms of politics, economics, demographics and social changes.

The consumers do not know yet what they will want to buy in the next few years, so that´s a work for the designers and merchandisers; they are the ones responsible for predicting the future trends and understanding the new directions in fashion. These professionals must study the market conditions, learn how to anticipate their needs and translate it into a product (Frings, 2015).

There are many ways of predicting consumers´ needs; it can be through surveys, analysis of data, consumer focus groups and even in-store informal interviews. After a lot of research and having in mind what the market will need in the next season, the designer´s job is to interpret all the information and through his or her creativity come up with a whole different idea for the industry and the consumers (Frings, 2015).

The inspiration is a very particular process and it has to do with the designer's background and sensibility. The process usually starts with concept boards, "a collection of photos, sketches, and swatches that express the design direction they are exploring for a particular group" (Keiser and Garner, 2005, p.174). After defining more of less what the inspiration is going to be, the sketching process gets started.

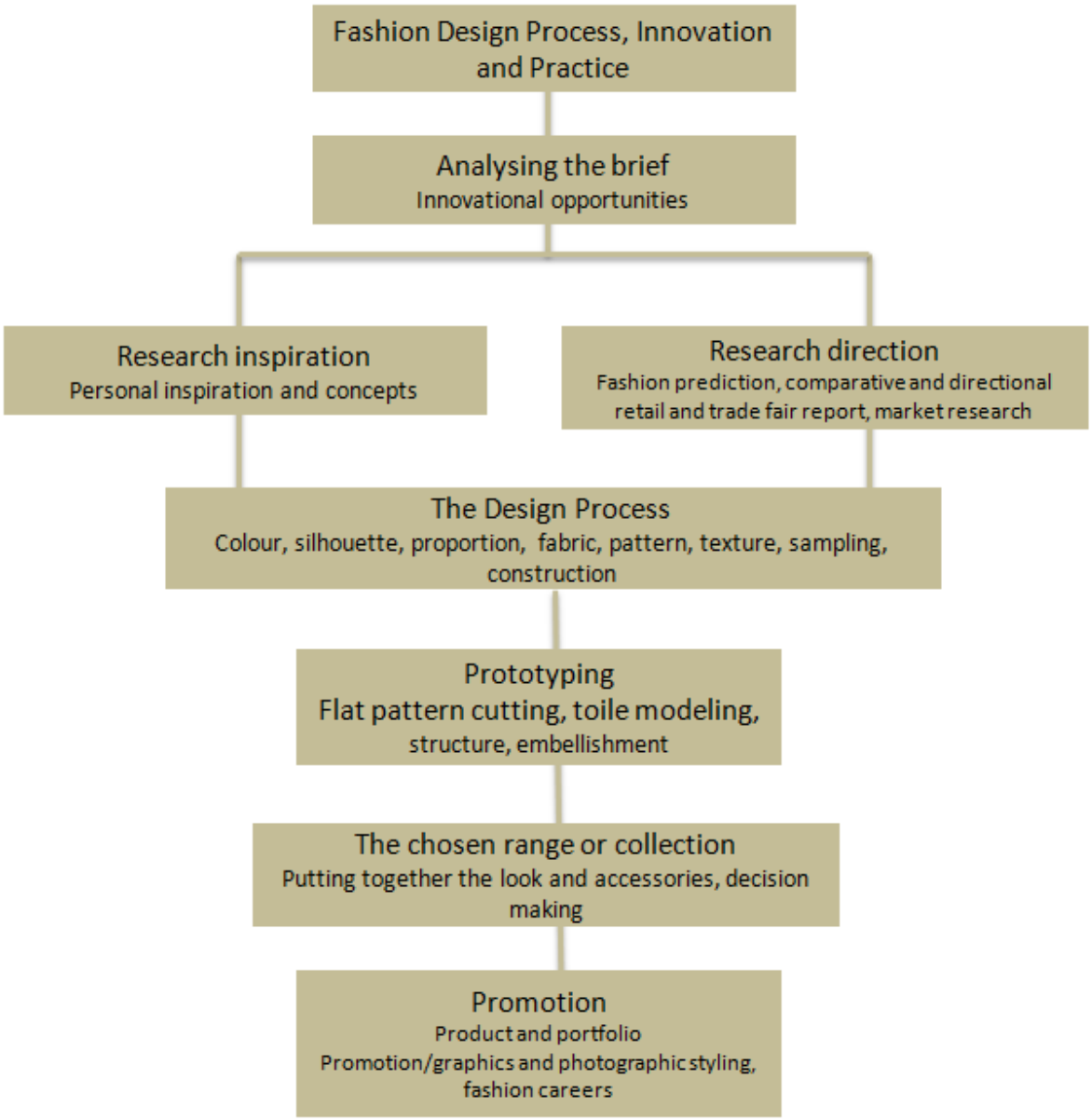
"Designers use sketches to help them record and explore design ideas" (Keiser and Garner, 2005, p.175). Normally designers put all their ideas in a sketchbook to later select the ones that have a connection to the consumers' future needs and that matches with their inspiration and style. The chosen sketches are usually redesigned to croqui sketches, redefining some details of the design, this type of illustration is normally very creative and it usually has colors. "Creative designers do not stop exploring the idea the first time they put down on paper – they rework it, using the design elements and principles to alter the idea and develop it further" (Keiser and Garner, 2005, p.177).

After developing the idea in a creative way, the designer has to transform the croqui into a flat sketch, the flat sketches are important to understand how the clothes are made, their real proportions and details. There is no exact order for the creative process, some designers even start by choosing the fabric first,

deciding the materials of a collection is a very important part of the design process (Keiser and Garner, 2015).

Below we can find a design flow chart created by McKelvey and Munslow (2003, p. 3) explaining a little bit about how the design process works, from the raw research to the final portfolio of the collection.

Image 5: Design flow chart



Source: McKelvey and Munslow (2003, p.3).

This flow chart explains the process of the design, it does not necessarily follow that order, but mostly, designers start by analyzing the brief. The brief can be business focused or creative focused; it depends a lot on the brand´s requirements. Sometimes the designers have more freedom when choosing an inspiration but sometimes it might be on the brief of the brand´s requirements.

After going through the brief, the designer also must study the research that has been done, that means, follow the research direction. The research

direction might come from market researches of results of last season´s acceptance of products (retail reports). A personal touch is normally put into collections; this is what we can call: the inspiration.

When all the studying has been finished, the manual process start, according to the chart above, the actual design process is a mix of choosing the correct colors, the silhouettes and proportions, the fabric and prints, testing the patterns and working on the construction of the collection. All of these activities are in the same box because there isn´t a specific order for that, some designers might start with choosing the fabric first, others start with the colors and textures, so this process can be very flexible.

Prototyping is the step where the products can get tested, this process is really important to understand the real proportions and check if the choice of material and color is actually good for each design. The designer can adapt a lot of things during this part of the process, correct a bad pattern, change details, embellish parts of the product and so on. When prototypes are ready, the designer is able to match different pieces and work on the styling of the collection to create a good promotion. The promotion is the final part where the designer needs to think about different ways of presenting the collection, it can be through a portfolio, photographic styling, fashion shows or other creative ways.

After analyzing the design flow chart produced by McKelvey and Munslow (2003, p.3) it was possible to understand step by step of the process and that each designer can develop their own order of following those steps. Good designers, however, should have a vast knowledge on textiles, choosing the correct textile for the garment is essential. The textile global market is highly linked; this means designers can get fabric produced in whatever part of the world they want to. The global market strategies in this section of the fashion industry are invest in innovation, high tech fibers, performance fabric and speed distribution (Frings, 2015).

> [⋯] it is increasily difficult to describe the characteristics of fashion by country or fashion capital. A clear division no longer exists between what is foreign and what is domestic; the fashion industry is becoming

> a worldwide exchange of ideas, talent, materials and products. Ideas come from all over the world, textiles are exported from one country to another, and production is done almost everywhere. (Frings, 2015, p.148).

For instance, if a designer like Karl Lagerfeld (German) moves to Paris and works there, do we consider his work German design or French design? There are capitals in the world that we consider fashion capitals and we will go through this on the chapter four of this dissertation, but in a globalized world, concerning design, it is very difficult to separate or set borders to where the inspiration comes from or the origin of the designer.

It is possible to identify some changes in the way consumers interact with the design process nowadays. Consumers want to have customized products; they want their clothes to tell them something about their personality. According to Investopedia (2016). Mass customization is the process of producing wide ranges of customized products. These products are adapted and modified to satisfy specific consumer needs, it combines flexibility and personalization with low unit costs. Through mass customization we can identify and early connection of the consumer to the design process.

3.3 INDUSTRY AND SOURCING

The fashion industry "is a complex of many different industries, not all of which appear to have anything of fashion among their products" (Jarnow, Judelle, Guerreiro, 1981, p.3). This means that the fashion industry is composed by the factories that are responsible for assembling the actual inner or outerwear pieces but also other type of business such as farms, advertising companies, retailers, creative artists, etc.

The fashion industry has changed its way to produce apparel in the past thirty years; domestic manufacture is no longer the most chosen way of producing this kind of goods. The industry has evolved and each company, region or country has its core ability. These specialized companies can offer better

products in a faster way. "The emerging industry has the core skills of design, product development, sourcing, logistics and supply chain management" (Carr and Latham, 2008, p. 1).

Consumer demand is mostly the main reason for the fashion chain to be divided the way it is. Manufacturers and retailers produce what sells, this means that a big range of sizes, prices and clothing types are available nowadays. Clothing types can vary from social apparel to sportswear, from bridal gowns to maternity clothes, from lingerie to beachwear and so on. Currently it is possible to find almost everything concerning clothing in different prices and styles, this is due the large and connected industry built behind fashion (Frings, 2005).

Fashion nowadays requires a quick response; the industry does not have the same amount of time it used to have some years ago to produce apparel. All the process has to be fast from the concept until it reaches the consumer. For this reason, company had to develop faster and better ways of producing fashion (Carr and Latham, 2008).

According to Keyser and Garner (2005), the meaning of the word manufacture is to make things, but many of the big world manufacturers no longer make apparel. Virtual manufacturers, as they are currently known, are now the ones who create the concepts, these companies are responsible for deciding the components of the products and later on deciding which target market they want to reach. They are basically responsible only for choosing the correct strategies. When these companies decide where to produce, we call that "sourcing". The sourcing of a company can be from its material to its production and this will depend on what the core of the company is (Keyser and Garner, 2005).

"A company sourcing strategy is determined by its strategic plan and marketing strategy" (Keyser and Garner, 2005, p.360). Where, how and what to produce depends on the type of business and its approach. Performance targets have to be reached in terms of profitability, quality and time of production.

Choosing the correct source of materials or production requires knowledge about the core competencies of factories and suppliers.

> A company´s sourcing requirements depend on the core competencies of its product development team. Branded product development teams may include employees who have experience with companies that at one time manufactured apparel domestically. Experience in sourcing fabrics, patternmaking, grading and marker making, or managing quality allows the team to be more involved in the process. (Keyser and Garner, 2005, p. 360).

This means that even though a company decides to have their products sourced from other companies, the employees or the designers must understand and follow the whole process as if it was being produced domestically. Once the company has employees that can identify each company´s core competencies, it is easier to decide where to produce and which level of sourcing the company needs (Keyser and Garner, 2005).

According to Frings (2005), most manufacturers don´t produce their apparel anymore, they are responsible for all the other processes as from the designing to shipping but the sewing, cutting and patternmaking is usually done by a contractor. This is a good strategy because the manufacturers don´t have to deal with the factory staff (hiring, training, paying wages) and also they don´t have to worry about investing money in plant facilities and machinery.

"Contracting provides greater production flexibility [⋯]" (Frings, 2005, p.193). On the other hand, contracting can raise the prices of the goods. Nowadays, contracting is a very good idea not only because of the flexibility but also because the manufacturers can search for specialized workforce all over the world and compare production prices.

In this way of working, normally the manufacturer provides all the information the factory needs, the size charts, the technical sheets and specifications of the product and sometimes even the patterns. The factory sends back a prototype and waits for the approval to start the production. "Contractors can be located anywhere in the world where labor is abundant; wages are

reasonable; and facilities, machinery and transportation are available! (Frings, 2005, p.193).

Most of apparel production is located in developing countries and is due the cheap wages. But also, the apparel production of European and North American countries is important for the growth of Third world countries (Frings, 2005).

According to Frings (2005) there are three ways of negotiating offshore production: The Production Package, the CMT (cut, make and trim) and Offshore Assembly. The production package is when the manufacturer has only to send the sketches, specifications and sizing standards and the contractor takes full responsibility from the production to the delivery. In this situation, the manufacturer does not have to worry about buying the fabric and trims. The CMT (cut, make and trim), is when the manufacturer buys all the material and sends it to the contractor. In this case, the contractor is only responsible for assembling the apparel, they don´t have to worry about neither patternmaking nor quality control. Finally, the Offshore Assembly is when the fabric is already cut and it is just sent to a contractor for the sewing process, this is, sometimes, cheaper in terms of taxes (Frings, 2005).

Global sourcing differs according to the culture, location and specialization of each country. On chapter three we will go in depth explaining what each country´s core ability is, and how they can contribute to the international fashion industry with what they can do best.

3.4 DISTRIBUTION

The distribution is the final process of the fashion´s ecosystem chain; it is how the product reaches the consumer, "in other words, this is the transition from

wholesale to retail" (Waddel, 2004, p.145). Marketing, merchandising, advertising and display are the sub processes of the distribution process (Waddel, 2004).

There are many ways of selling the final product to retailers, some of them are: catwalk shows, showroom presentations, stands at fashion fairs, agents travelling around the country and catalogs. In any of these selling methods, the buyer is able to select and place the orders choosing the sizes and colors they want (Waddel, 2004).

"Orders are packed and schedule for delivery according to the completion date or contract delivery date" (Keyser and Garner, 2005, p. 418). The due date is very important in the fashion industry, if a product arrives late to the store it may be viewed as a break of contract. That is, choosing the correct way of shipping might be crucial at the distribution process (Keyser and Garner, 2005).

The most chosen carrier ways are: shipping, air freight, train or truck. The least used one is the air freight one due to its high cost, this is only used when the products are of a very high cost or if the delivery is behind schedule. Some years ago the distribution process ended at the retail stores but nowadays with the e-commerce, products are sent directly to the consumers houses (Keyser and Garner, 2005).

Concerning retail as a final destination, the merchandising is crucial. The merchandiser is responsible for allocating the product to each specific store according to their target market and trying to maximize its chance of being sold as quickly as possible. Merchandisers normally work together with the fashion buyers; they are responsible for displaying the products of the store and analyzing the data of sold products and remaining products in the end of each collection (Waddel, 2004).

After the product has been allocated in the right place, the wholesaler or the retailers are responsible for letting the customers know about the news inside of the store. This is normally done through marketing campaigns and advertised in different means of communication according to the public of the store (Waddel, 2004).

Although the brick and mortar retail community is still very large, the e-commerce is growing each year. The concept of e-commerce is comfortable and convenient for a lot of consumers because they don´t have to leave their houses to choose their clothes. There are a lot of pros of buying online besides the comfort of not having to leave home, people are able to compare the prices online and get a good a deal. In this case, the factory or the fashion company ships the product directly to the costumer´s house (Keyser and Garner, 2005).

E-commerce made it possible for consumers to reach brands from different countries; nowadays someone that lives in New Zealand is able to buy a Portuguese product in a very easy and comfortable way. One of the only challenges that this type of distribution faces is on developing efficient strategies of explaining the sizes to the costumers. As the product is not physically in front of the person, it is hard to be sure that it will fit (Keyser and Garner, 2005).

"The internet opens up global markets. It reaches many people without the cost of a running store" (Frings, 2005, p. 294). It is very convenient to be able to shop at any time of the day or night, finding things quickly, getting personal services and they are able to get all of these things buying over the internet. On the other hand, brands that want to offer this kind of service have to have a very well monitored inventory and good customer service (Frings, 2005).

> Social networks and apps are not to be neglected in the rise of e-commerce, as shoppers tend to seek out user-generated online content before making a purchase. Instagram, fashion and lifestyle blogs, and even new emerging apps like Depop, a social buying and selling platform, are used along the customer journey ahead of completing a purchase. (Cecilio, 2015, p.1).

Social networks and apps play an important role in most of society´s lives nowadays, it is addictive, and this means it is a great sales strategy as well. According to Cecilio (2015), millennials will mainly consume through apps and social networks in a near future, so brands should invest on creating these kind of platforms and focus on improving their costumer services.

In Schindler´s (2016) research about e-commerce in the fashion industry, he mentions a report by Euro monitor saying that internet retailing in 2007 was

only 3 per cent of the total retail sales while in 2012 this share doubled and was growing a lot faster than other retail channels. New brands are not even investing money on a brick and mortar store, they are simply opening internet shops. The result is a large number of new brands in the market, offering new options to the consumers (Schindler, 2016).

> The Internet in general, and e-commerce in particular, are still transforming the entire fashion supply chain. Twenty-five years ago, the fashion industry was mainly driven by producers, retailers and designers. Today the industry is mainly driven by consumers and the use of new digital technologies of all kinds. (Schindler, 2016, p.1).

The whole fashion ecosystem is changing because the industry is, each day, becoming mainly driven by consumers. This means that the industry has to follow the customers' needs and develop new strategies within the new possibilities of the digital world.

3.5 CONSUMER MARKETS

The consumer markets changed a lot throughout history, when the industry changed, the consumer also changed. Nowadays, most companies define their products according to their consumer needs. The industry tries to research and predict what consumers will want to buy in the next season or some years from now. According to Salomon and Rabolt (2004, p.23) the consumer behavior definition is "the study of the process involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences to satisfy their needs and desires". The needs and desires of consumers are always changing and the fashion industry has to be capable of following it and reaching those consumers with new products and ideas.

Thinking about a globalized world, we have to consider the cultural differences between countries and regions, people from different areas need and want different products. Although the world is becoming very homogeneous,

there still is a difference of taste and needs throughout the globe. Salomon and Rabolt (2004, p.39) give a good explanation using an American example:

> A consumer´s culture determines the overall priorities he or she attaches to different activities and products. It also mandantes the success or failure of specific products and services. A product that provides benefits consistent with those desired by members of a culture at any point in time has much better chance of attaining acceptance in the marketplace. For example, American culture started to emphasize the concept of a fit, trim body as an ideal appearance in the mid-1970s. The premium placed on this goal which steamed from underlying values such as mobility, wealth, and a focus on the self, greatly contributed to the success of products related to exercise and fewer calories.

Each culture has a different idea about what is leisure, work, genders and so on, so it is really important to adapt the products according to these cultural differences. On the other had we have the globalization process in which the cultural differences are becoming smaller and smaller throughout the years, with the internet consumers from all over the world can interact and buy the same products.

As Salomon and Rabolt (2004, p.41) state "Culture is not static", this means that the cultures change and evolve throughout the years, normally these changes depend on "ecology, social structure and ideology" (Salomon and Rrabolt, 2004, p41). Ecology is how the system or the people are adapted to their habitat, do they have space for big houses like in the USA or do they need to live in tiny places as in China? This type of living structure can affect a lot on the way people buy things or on how they spend their money. For instance, if they can´t spend that much money in having luxurious and big houses or fancy cars, they might spend that money with fashion products as a way of showing their status.

Social structures, this relates to how the society is organized, what kind of social groups they take part in, how they interact with other people in and so on. Ideology is basically the mental characteristics of a population, the common worldview, their beliefs, principles and sense of fairness (Salomon and Rabolt, 2004).

It is not only the culture that interferes in consumer's markets, the generation or the age of the person may affect the taste or the power of buying,

the social class, the reference groups, the attitudes and hobbies a person has, the class and environmental consciousness. Those are all important factors to consider when defining a target market (Keiser and Garner, 2005).

When we think of the idea of global market, we have to put in consideration the difference of currencies around the world. It makes a lot of sense for European countries and the US to buy from other nations and that is due the different rates of currencies. "American consumers are able to buy foreign-made merchandise more cheaply. At the same time, American industry is hurt, because imported merchandise competes with domestic goods" (Frings, 2005, p.38). This means that it is good for the consumers, not so good for the American industry because it becomes a lot more expensive to export goods produced there.

In the opinion of Salomon and Rabolt (2004), the idea of a homogeneous market seems very appealing to the industry, but "in practice it has mixed results" (p.65). That is due the cultural differences and even climate differences, people are becoming more similar and learning how to think in a similar way as well but there are some aspects that are hard to change completely, that means that people do not buy goods in the same way all over the world.

The global marketing might work if the companies have the expertise to choose the countries that share the same worldview, global citizens and young people are also a good target for this type of marketing. The western culture is being spread out all over the world, it is easy to find Nike stores and McDonalds in almost all countries around the world. The stronger nations normally tend to influence the smaller and weaker ones. People associate wealthy western countries to modernization and sophistication. On the other hand, smaller countries try to deplore the Americanization of cultures, for instance, France are outspoken opponents to this kind of influence and they try to ban the use of English terms in spoken language (Salomon and Rabolt, 2004).

> As the global consumption ethic spreads, the products wished for in different cultures become homogenized. For example, Christmas is now celebrated among some urbanites in Muslim Turkey. Chinese women

> demand Western cosmetics costing up to a quarter of their salaries, ignoring domestically called produced competitors. (Salomon and Rabolt, 2004, p.670).

In the opinion of these two writers, Salomon and Rabolt (2004), it seems unlikely that the world will become some homogeneous that the consumers will start acting in a similar way all over the world. Consumers are not and will not soon be indistinguishable, even though the idea of a global market seems good, they consider it utopic in a short term future. Ignoring local customs and values might be dangerous for the sake of the industry.

"A process called creolization [15] occurs when foreign influences are absorbed and integrated with local meanings" (Salomon and Rabolt, 2004, p.68). This type of mixture sometimes can result in crazy different products and maybe that could be the future, a mixture of cultures and adapted products to please consumers needs according to their place in the world.

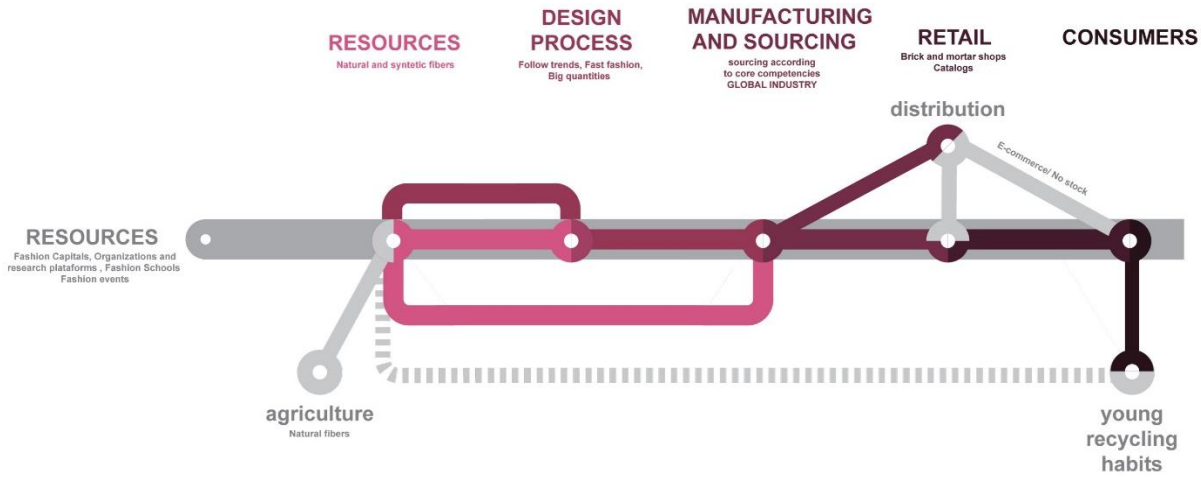
3.6 FASHION ECOSYSTEM MAP

As explained throughout the chapter, the fashion industry is an interdependent industry with a complex ecosystem where all the parts are important for the success of this kind of business, the relation among the agents of the map will become more flexible and interdependent in the future in the context of the industry 4.0.

Nowadays, in the end of the so called Third Industrial Revolution, we have the connection between the main agents: Design Process, Manufacturing and Sourcing, Distribution, Resources, Retailing and Consumers. It is possible to analyze how the ecosystem flow and how they interact with each other in the ecosystem map presented below designed by the author of this dissertation:

[15] Creolization - is the process in which Creole cultures emerge in the New World.

Image 6: Transition Ecosystem Map of the Fashion Industry



Source: designed by the author, 2016.

It is possible to identify a mixture of technology and old traditions in this ecosystem map. This is the transition map from the old industrial fashion in a globalized world to the completely linked and cyber tech industrial map of the fourth industrial revolution that we will analyze on chapter four.

Designers get inspiration from the resources of fashion industry such as shows, museums, trend forecasting platforms or even directly from the textile industry. There is a double way arrow linking the design process with the textile industry because the textile industry can provide finished material for designers to use as inspiration or the designers can create the prints and textures of their material and ask for the textile factories to produce them.

In the transition ecosystem map, the manufacturing and sourcing is already global but it only attends big quantities. The global industry is divided in core competencies and it is highly dependable on effective distribution methods. The distribution and logistics are linked to the retails and consumers because nowadays, with the ecommerce on rise, the products can go straight to the consumers´ home without having to pass through a store to be sold, this means that the brands that work with this system don´t have to worry about stocking too many products because they will only produce what has been ordered. This

is very effective in terms zero waste, besides being sustainable it is also profitable for the brand.

Consumers are becoming more aware of the importance of recycling, which is why it is called in the map "young recycling habits". Some brands have already thought of recycling methods for their products, especially in the textile industry but that is not yet what the majority is doing, so the connection between recycling and the textile industry is not so strong. In the future this connection will be strengthened because the consumers will be more aware of the importance of sustainable actions and brands will have stronger campaigns and resources for that.

CHAPTER 4

GLOBAL SOURCING ACCORDING TO CORE COMPETENCIES

In this chapter we will analyze deeper the Industry and Sourcing agent of the ecosystem. We will study about an example of offshoring and its reasons. Information about the global fashion industry will be compiled and divided in three different maps: the material sourcing map, the creativity providers map and the core manufacturing specialization map. This way we can have an overview of the countries that play an important role in the fashion industry.

4 GLOBAL FASHION ECOSYSTEM ACCORDING TO CORE COMPETENCIES

The form people do business around the world has been changing a lot since the industrial revolutions started. New technologies are always being launched and this means the industry has a constant need to adapt. The fashion industry is a global industry, and it is necessary to understand how that global industry performs in different parts of the world.

The globalization process started many years ago but only after the invention of the internet that we can say that the information became instant and the world became connected. Consumers can communicate with each other, no matter where they are located. Instant brand comparisons are possible; consumers nowadays are able to compare prices ad details of products without leaving the comfort of their homes.

All of these changes are a result of the new technologies; companies that are not able to follow the advances are going to be out of market soon, especially in the context of the industry 4.0. The fashion industry is spread all over the world. For instance, people that live in Europe can buy a garment online from the United States and receive it at their own address.

Not only consumers are all spread out but also the industry. Nowadays one product can be segmented and each part of it might be produced in a different country. The speed of technology made the industry focus on developing core competencies, as Keyser and Garner mentioned (2005, p.6):

> Agility demands that companies identify their core competencies – things they do best – and partner with other specialists to establish processes that support the development and distribution of goods and services that are costumer centered.

When a company develops a core competency, this means that its line of production might be more efficient and fast. The speed of information nowadays

is unbelievably fast and so has to be the fashion industry. When a costumer sees a fashion product online, this person wants to have that product as soon as possible. If the product takes too long to be available, the consumers might lose interest as fast as they gained that same interest. Due to this speed, the production of a single garment might be segmented and each part of the process can be done in a different country.

> Many countries may be involved in the production of a single garment. For example, a garment could be designed in New York, made in China, and then distributed to retails stores all over the world. (Frings, 2005, p.39).

Some countries have developed their core competencies because of historical matters, which is the case of European countries as we will go through in detail later, but some of them are due to economic needs. Developing countries are normally the producers, whether the developed countries are consumers or providers of new designs.

Even though there is a lot of technology and advanced machines available, the fashion industry, in its majority, employs a lot of people. This means that the producers are always seeking for skilled and cheap workforce. Because of the currency exchange rates between countries, as long as the capitalistic system is concerned, rich countries will always buy from poorer countries. Not only the prices motivate companies to seek for sources abroad, the core competencies and product quality are also strong reasons for the outer sources.

According to Frings (2005), the trade of products all over the world goes through bureaucratic processes in terms of exportation and importation tariffs. Many countries want to protect their domestic industry so they create barriers for foreign products. On the other hand, with the globalization process, many free trade market groups emerged.

The World Trade Organization (WTO) is the organ responsible for controlling all international trades. It is located in Geneva and has members of 145 countries. Its main responsibilities are: setting rules for trade behavior, setting environmental and labor standards, serving as a forum for negotiations,

protecting intellectual property and other situations related to international trades (Frings, 2005).

> [⋯] proponents of free trade (trade without restrictions), such as importers and retailers, believe that, in the long run, it would be best if world trade were based on specialization; each nation would contribute to the world market what it produces best at the most reasonable cost. In this way, consumers obtain the most value of their money. (Frings, 2005, p. 40).

According to Jones (2006), companies seek outer sourcing for different reasons but they all have one thing in common: to reach better results than if the product was produced domestically. These results can be, like in the most cases, monetary or in some cases they have to do with differentiation, quality or even because of sustainability.

In a globalized environment, developed countries such as The USA, Japan and European countries will have focus their manufacturing processes in differentiation within quality and creativity. A good example of this is Italy, according to Mead (2014, p. 309) Italy "[⋯] has taken the quality route to differentiating its products". In 2007, around 80 per cent of the Italian textile competitors were selling their products for less than one-fourth of the Italian products, this fact let it clear that Italy was not competing on price (Mead, 2014). The future of the world trade might be focused on specialization and protection of environmental issues. For this reason, it is very important to understand each country´s or each region´s core competencies.

To get a better hand of what specialization and environmental issues mean, let´s analyze an example of a global brand that sought outer sourcing because of reasons other than low production costs. Louis & Lolla is a brand of baby, toddlers and young children shoes originated in New Zealand. It was founded in 2013 and currently sells its products in New Zealand and in the United States. According to the CEO of the brand Amanda Slater, they are working on their website to start e-commerce and soon their products will be available for many other countries.

To get a better understanding about the brand´s strategies, Amanda Slater, the CEO of Louis & Lolla was interviewed. During the interview she explained

about the division of the production and the reasons for which the brand can be considered global.

The brand is relatively young, but Amanda has got more than ten years of experience in the fashion business, working in the merchandising and strategy area. After having kids, Amanda discovered a lack in the New Zealander market, it was very difficult to find good quality baby shoes there. Most baby and children's shoes sold in New Zealand were produced in Asian countries and were also very simple and cheap. Amanda was worried about quality, design and ergonomics, and so, Louis & Lolla Shoes was launched.

Image 7: Logo and Slogan of Louis&Lola

Source: www.louisandlola.co.nz (2015).

After doing some research on specialization and core competencies of production, Amanda found in Europe the sourcing for her brand. The shoes are carefully developed in Portugal, Spain and Italy, mostly handmade and always having the baby´s and Children´s comfort as a priority. The price range of the shoes are around fifty to sixty American dollars.

Amanda, not only sought for specialization in Europe but also for a sustainability status. The slogan of the brand is: New Zealand Designed – Handmade in Europe. She also explained that for geographical reasons, their consumers are aware of the bad working conditions existing in many countries in Asia and she considers Louis & Lolla´s target ecologically responsible. As New Zealand is very close to Asia there is a certain repulsion for Asian products, so Amanda sought external supplies to please the demand of conscious parents looking for quality to their children´s feet.

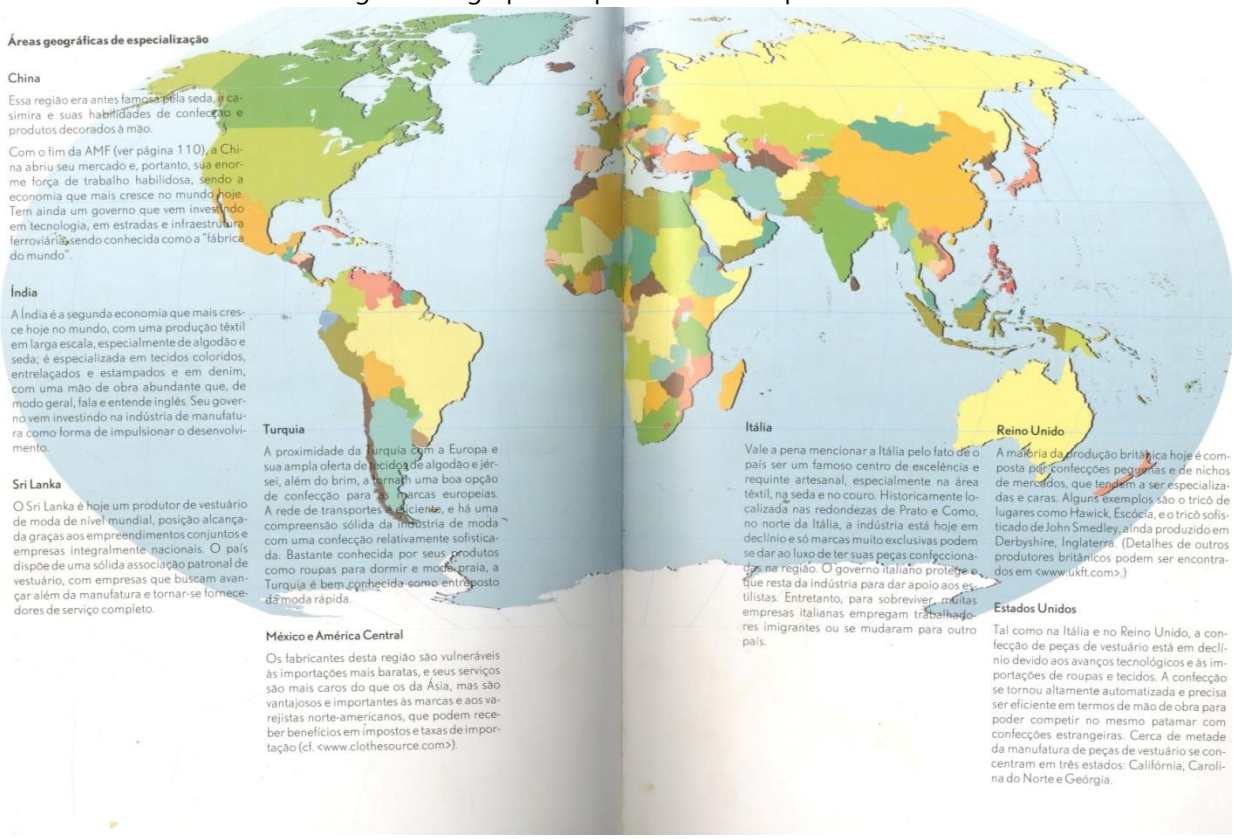
Image 8: Winter 2015 Louis&Lola collection

Source: www.louisandlola.co.nz (2015).

As the range of prices of the brand Louis and Lolla are a lot higher than its competitors´, Amanda had to think of strategies for differentiation. The way she found was producing in social responsible companies to reach conscious consumers and also producing good quality products with high level of finishing and excellent material.

For investors or entrepreneurs that seek for producing high quality products in a global environment, it is important to understand and be aware of each country´s core ability and best capacity in terms of manufacturing fashion products. Virginia Grose (2013), in her Fashion Merchandising book, created a map of geographic areas of specialization in which she explains briefly about each country´s core ability in the fashion industry. In this chapter we will understand that map and upgrade it with more information about the global fashion industry.

Image 9: Geographical specialization map



Source: Grose, 2013, p. 112, 113.

Content of the map:

China: Essa região era antes famosa pela seda, casimira, e suas habilidades de confecção e produtos decorados a mão. Com o fim da AMF (inserir nota de rodapé: Acordo de Multifibras, established in 1974...) a China abriu seu mercado e, portanto, sua enorme força de trabalho habilidosa, sendo a economia que mais cresce no mundo hoje. Tem ainda um governo que vem investindo em tecnologia, em estradas e infraestrutura ferroviária sendo conhecida como "fábrica do mundo".
India: A índia é a segunda economia que mais cresce hoje no mundo, com uma produção têxtil em larga escala, especialmente de algodão e seda, é especializada em tecidos coloridos, entrelaçados e estampados e em denim, com uma mão de obra abundante que, de moda geral, fala e entende inglês. Seu governo vem investindo na indústria de manufatura como forma de impulsionar seu desenvolvimento.
Sri Lanka: O Sri Lanka é hoje um produtor de vestuário de moda de nível mundial, posição alcançada graças aos empreendimentos conjuntos e empresas integralmente nacionais. O país dispõe de uma sólida associação patronal de vestuário com empresas que buscam avançar além da manufatura e tornar-se fornecedores de serviço completo.
Turkey: A proximidade da Turquia com a Europa e sua ampla oferta de tecidos de algodão, jérsei, além do brim, a tornam uma boa opção de confecção para as marcas europeias. A rede de transportes é eficiente, e há uma compreensão sólida da industria de moda com uma confecção relativamente sofisticada. Bastante conhecida por seus

> produtos como roupas para dormir e moda praia, a Turquia é bem conhecida como entreposto da moda rápida.
> *Mexico and Central America:* Os fabricantes desta região são vulneráveis às importações mais baratas, e seus serviços são mais caros que os da Ásia, mas são vantajosos e importantes às marcas e os varejistas norte-americanos, que podem receber benefícios em impostos e taxas de importação (cf.www.clothessource.com>).
> *Italy:* Vale a pena mencionar a Itália pelo fato de o país ser um famoso centro de excelência e requinte artesanal, especialmente na área têxtil, na seda e no couro. Historicamente localizada nas redondezas de Prato e Como, no norte da Itália, a indústria esta hoje em declínio e só marcas muito exclusivas podem se dar ao luxo de ter suas peças confeccionadas na região. O governo italiano protege que resta da indústria para dar apoio aos estilistas. Entretanto, para sobreviver, muitas empresas italianas empregam trabalhadores imigrantes ou se mudaram para outro país.
> *United Kingdom:* A maioria da produção britanica hoje é composta por confecções pequenas e de nichos de mercados, que tendem a ser especializadas e caras. Alguns exemplos são o tricô de lugares como Hawick, Escocia, e o tricô sofisticado de John Smedley, ainda produzido em Derbyshire, Inglaterra. (Detalhes de outros produtures britânicos podem ser encontrados em www.ukft.com)
> *United States:* Tal como na Itália e no Reino Unido, a confecção de peças de vestuário está em declínio devido aos avanços tecnológicos e às importações de roupas e tecidos. A confecção se tornou altamente automatizada e precisa ser eficiente em termos de mão de obra para poder competir no mesmo patamar com confecções estrangeiras. Cerca de metade da manufatura de peças de vestuário se concentram em três estados: Califórnia, Carolina do Norte e Geórgia. (Grose, 2013, p.112, 113).

On the chapter two of the present study we could understand the fashion ecosystem map and its connections. Nowadays, global sourcing is a reality for many countries, because of efficiency of production, price, specialization and also because of the search for materials (natural and synthetics). Some countries are big producers of textile, some have specialized and cheap workforce and some are geographically important to the global chain of production. The objective of this chapter is to have a global overview and a summary of the core production of each country in the fashion context and the big textile providers of the world.

4.1 MATERIAL PROVIDERS: FABRIC YARNS AND LEATHER

According to Lu (2016) about fifty-four per cent of the world´s textile production happens in China. "By 2013, as much as 64.2 percent of the world's chemical fibers, 64.1 percent of synthetic fibers and 26.2 percent of cotton were produced in China" (Lu, 2016, p.1).

Statista (2016) presents data about the year 2014 where China´s textile exports went over 110 billion dollars, this corresponds to almost 36% of the global market share. In the year 2014 China produced about 90 billion meters of cloth and 6.5 million metrictons of cotton. When it comes to fabric (natural and synthetic) China plays a crucial role in the fashion industry.

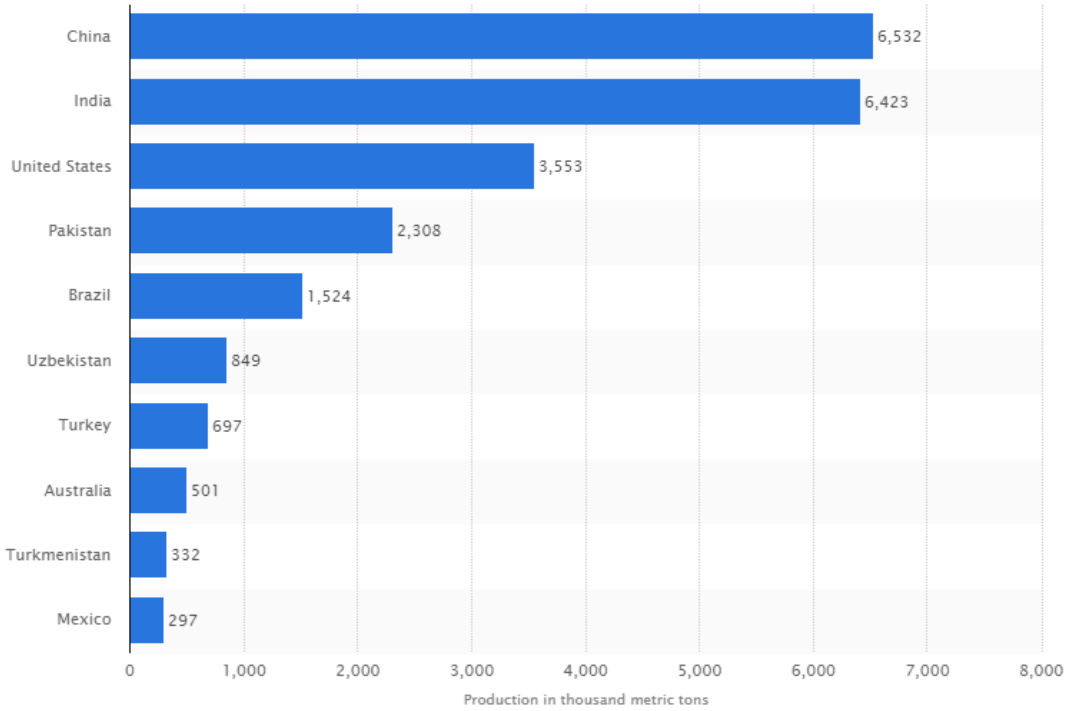
After China, we have India, Bangladesh, Turkey as big producers of fabric. Turkey is one of the biggest denim manufacturers and exports mainly to European countries. Turkey has also improved its potential of working with and producing synthetic fabrics and blends with cotton viscose, linen and wool. 2.5% of the global cotton production is also made in Turkey (Directory of Textile Manufacturers, Exporters & Suppliers, 2016).

India is a big producer of cotton, goat skin and cashmere fabric, besides these materials, India has also production of silk, wool and synthetic fibers such as polyesters, acrylic and viscose. As the price of labor in China is rising, India has become a prospective substitute of China (Directory of Textile Manufacturers, Exporters & Suppliers, 2016). Because of the same reason, Bangladesh has also grown a lot in terms of textile manufacture in the last years.

> Its fabric production capacity during 1994-2007 increased drastically from 1,260 million meters to 3,500 million meters. Its fabric and apparel exports account for approximately $5 billion a year to US, EU, Canada and other countries. Bangladesh has a comparative advantage over its competitors like India, Pakistan, Thailand, Indonesia, Sri Lanka, and China in terms of labor and energy cost which are much lower and have remained static over a period. (Directory of Textile Manufacturers, Exporters & Suppliers, 2016).

When it comes to natural Fabric sourcing, we still have China as the biggest world provider, followed by India and the United States as we can analyze in the Statista graphic about the worldwide (2016).

Graphic 4: Cotton production in the world



Source: Statista, 2016.

There are many sources of natural fabric, such as cotton, wool, silk and linen, but cotton is the most important and most used of all of them in the fashion industry. According to Muthu (2016) it is responsible for 40% share of the global fabric consumption.

Another important natural fiber is silk, a lot harder to produce and with a very delicate process. It is a fiber produced by the larvae (silkworm) of the mulberry moth. The biggest silk producing countries are China, India, Japan, Thailand, Middle East and Brazil (Clothing Fabric Information, 2016).

Wool is the world leading animal fiber and according to International Wool Textile Organization (2016) it is produced in about one hundred countries around the world, but the main producers are Australia, China, India, Iran, New Zealand, Russia, South Africa, United Kingdom and Uruguay. Depending on the country

and on the culture, wool can be produced in small farms or in big operations (IWTO, 2016).

One of the most expensive natural fibers in world is cashmere fabric, this fabric is gotten from cashmere goats, "these goats are originally from Kashmir, an area in Pakistan" (Clothing Fabric Information, 2016), but it is also possible to find it in Mongolia, New Zealand, Australia, Iran, India and China.

When it comes to leather, the biggest provider is again China, with a production of 3,913.1 million square feet of leather, the double amount of Brazilian leather industry that comes in the second place with 1,832.7 million square feet. The third biggest leather providers and the European leader is Italy, after that we have Russia, India, South Korea and Argentina (Potrebic, 2016).

4.2 PROVIDERS OF CREATIVITY

The countries that we consider providers of creativity are directly related to the resources on the fashion ecosystem. We can call those countries like this because they have a history related to fashion design and conception. Before the globalization process, the conception and the production of a fashion product used to be done in the same place, nowadays the design can be done in one country and the manufacturing in another.

According to Frings (2005), in the globalized scenario that we are inserted nowadays, it is difficult to classify and distinguish where the design comes from. One of the reasons for that is the migration of designers. Designers that were born in one country and have their home country cultural background might move to another country and study different concepts of fashion ending up with a complete globalized and mixed design result. Karl Lagerfeld is an example of that because he is a German designer living in Paris and working for the French Couture house Chanel, for the Italian house Fendi and for his own brand. Marc

Jacobs is another example of a global designer, he is North American and worked for the French House Louis Vuitton from 1997 to 2014 (Frings, 2005).

The countries that provide the most fashion information, hold the biggest fashion events, set trends and have important design houses are called fashion capitals. According to The Global Language Monitor (2015), an American research company that provides data and research trends for different areas, listed the current fashion capitals to a degree that these cities meet the requiems of providing fashion material to the world.

Image 10: Fashion capitals according to GLM

2015 RANK	Fashion Capital	Previous Rank
1	Paris	2
2	New York	1
3	London	3
4	Los Angeles	4
5	Rome	6
6	Milano	12
7	Barcelona	5
8	Berlin	7
9	Madrid	14
10	Tokyo	11
11	Florence	13
12	Hong Kong	20
13	Sydney	8
14	Singapore	19
15	Shanghai	10
16	Sao Paulo	15
17	Dubai	30
18	Rio de Janeiro	28
19	Miami	39
20	Dallas	21
21	Monaco	43
22	Moscow	18
23	Amsterdam	34
24	Boston	32
25	Antwerpen	9

Fonte: Global Language Monitor (2015).

The main countries that provide creativity are France, Italy, England and the United States. France is considered a creative country and the reason for that is historical. The fact that the first famous fashion designers in a global scale were

from there, Chanel and Dior and also because the *Federation Françoise de La Couture* estar is located in Paris. The Federation is a chamber responsible for regulating the couture houses of the world. There are a set of rules that the design houses have to follow to be considered part of the *Haute Couture*,

> To qualify as an official Haute Couture house, members must design made-to-order clothes for private clients, with more than one fitting, using an atelier (workshop) that employs at least fifteen fulltime staff. They must also have twenty fulltime technical workers in one of their workshops. Finally, Haute Couture houses must present a collection of no less than 50 original designs — both day and evening garments — to the public every season, in January and July. (BOF, 2016).

The official couture houses are: Chanel, Maurizio Galante, Atelier Gustavolins, Bouchra Jarrar, Alexis Mabille, Alexandre Vauthier, Frank Sorbier, Christian Dior, Jean Paul Gaultier, Stéphane Rolland, Givenchy, Adeline André. Membros estrangeiros: Versace , Valentino, Elie Saab, Armani, Giambattista Valli. Membros convidados: Julien Fournié, Serkan Cura , Maison Rabih Kayrouz, Zuhair Murad, Schiaparelli, Rad Hourani, Iris van Herpen,On Aura Tout Vu by Yanna Samouilov and Livia Stoianov, Serkan Cura, Yiqing Yin, Marco Zanin, Béatrice Demulder Ferrant, Ralph & Russo, Hervé L. LeRoux (Mode a Paris, 2015).

French design is recognized by its perfect finishing, clean and sophisticated lines, Italian design, on the other hand, is considered a little bit less formal than the French fashion (Frings, 2005). Italian fashion is casual and easily adapted to everyday life. Besides being a creativity provider, Italy has a strong quality tailoring and leather industry. Well tailored and leather garments are one of the characteristics of the Italian design.

There are Two important fashion weeks in Italy, Milan Fashion Week and Rome Fashion week, as we can see in the GLM table (2015), these two cities are important fashion capitals. *Giorgio Armani, Roberto Cavalli, Doce&Gabbana, Gucci, Valentino e Versace* are some of the big names of Italian design. Most of them have elements in common, for example, the extravagance and the mix of prints and materials. This is one of the aspects that differ French fashion from Italian fashion, French designers are often more minimalist on their creations (Frings, 2005).

London is the third most important fashion capital of the world and according to Frings (2005), it is recognized for being very diverse in terms of style, it can go from classic tailoring to young streetwear.

> [...] a cidade é muita coisa ao mesmo tempo: berço dos movimentos punk, que contribuíram largamente para a moda com seus coturnos de courso, calças rasgadas e cabelos coloridos; casa da maior comunidade indiana fora da Índia, que trouxe suas cores, sáris e tempero oriental; e lar da realeza mais famosa do planeta – e que fez a moda inglesa rejuvenescer, inspirar e pegar fôlego com a chegada da princesa Kate Middleton. (Expedia, 2014).

British fashion can travel from the punk movement to the influence of Indian culture, the biggest Indian community outside India is in London and this is also a source of inspiration for the English fashion. Julien MacDonald, Stella McCartney, Alexander McQueen e Paul Smith are some of the big names of British design (Frings, 2005).

The American fashion started to bloom during the Second World War, when the communication with Paris was no longer possible. American designers got recognized all over the world fast, among the big names of the American fashion we can mention: Tom Ford, Tommy Hilfiger, Marc Jacobs, Donna Karan, Francisco Costa, Michael Kors, Ralf Lauren, Vera Wang entre outros (FRINGS, 2005). One of the strengths of the American fashion is the sportswear, American people are very informal and casual, this might be one of the reasons why sportswear is so popular there.

The American Fashion Capital is New York, considered by the Global Language Monitor research (2015) the most influential fashion week in the world. Besides New York, we can also mention California as an important area for the creative industry, this is due to the fact that the main manufacturers of the United States are located between San Francisco and Los Angeles. Los Angeles has a big influence in the global fashion context because of its industry, fashion week and also because of Hollywood. Hollywood productions are watched worldwide, so it is really easy to set trends and style through this channel (Frings, 2005).

4.3 MANUFACTURING NATIONS

4.3.1 Developing Countries: Asia, Mexico, Caribbean, Brazil and Eastern Europe

Global fashion sourcing in terms of manufacturing goods has changed a lot in the past decade according to Young (2016). Resembling the manufacturing process, the biggest apparel manufacturing country nowadays is China with exports of 111.7 billion dollars in 2014 (WTO, 2016). According to Frings (2005), Asian manufacturing started in Hong Kong, country that is currently considered an outstanding provider of high quality and high tech apparel manufacture. "Producing 60% of the world's shoes and exporting over 43% of the world's clothing, China has become indispensable for designers, brands and retailers across the globe from fast fashion to luxury" (Young, 2016, p.1).

China is known for providing cheap and specialized workforce for the fashion industry but according to Young (2016) this reality is changing because the wages are going up and Chinese factories are becoming more technologically advanced and innovative. China´s new strategy will be to search for success improving its value chain to more specialized and strategically manufacturing producing smaller quantities but with a bigger profit.

"China is continuously developing both the hardware and the software needed for its rapid, sophisticated supply chains." (Young, 2016, p1). This means that the Chinese industry will be rapidly adapted to the new context of the industry 4.0 with its connected supply chain.

In Asia there are other countries such as Taiwan, South Korea and Bangladesh that provide cheap and specialized workforce. They are far behind China in terms of mass manufacturing, technology and apparel exports but they still play an important role in the geographic map of fashion sourcing. The closest country to become a manufacturing power is India, holding 24% of the world´s

spindle and 8% of the world´s rotos, is valued in about 108 billion dollars and expected to be worth 141 billion dolars by the year 2021 according to Vogue India Editor in Chief Tewari (2016).

Several brands around the world have invested in India, some of them are the vertically integrated ones such as Zara and Mango from Spain, Promod from France, Benetton form Italy, Forever 21 from the United States and Tointernational high quality brands as Chanel, Lanvin, Elie Saab and Valentino. These brands have sought India for its recognition in the soft power of handwoven heritage of the country (Tewari, 2016). Embellished fabric and embroidery are some of the specialties of countries like India and Sri Lanka, this means that these big brands don´t seek them only because of the cheap workforce but also because of their core abilities in manufacturing delicate fabric.

> A India é a segunda economia que mais cresce hoje no mundo, com uma produção têxtil em larga escala, especialmente de algodão e seda; é especializada em tecidos coloridos, entrelaçados e estampados e em denem, com uma mão de obra abundante que, de moda geral, fala e entende inglês. Seu governo vem investindo na indústria de manufatura como forma de impulsionar o desenvolvimento. (Grose, 2013, p.112).

According to Grosse (2013) Mexico and the Caribbean in comparison to Asia have different reasons for being recognized fashion manufacturers. The workforce in these countries is usually more expensive but it is interesting for American brands to produce there because of geographical reasons. Importation rates are cheaper, the distances are shorter and some brands can even bring the products to the United States to finish and tag them as American Products giving a higher quality status for the product.

Eastern European Countries have similar reasons to Mexico and the Caribbean to be considered big apparel manufacturers. These countries are inserted in a strategically geographic area where they can feed the European market. According to Frings (2005), the main eastern European countries that produce apparel are: Poland, Hungary, Moldavia and Slovakia.

Brazil also plays an important role in the fashion manufacturing industry of the world. According to Farrah (2014), Brazil´s fashion industry is recognized

worldwide for its beachwear items and for the shoes and leather goods. "More than 140 countries buy shoes from Brazil. Among the biggest buyers are the United States, Argentina, and Paraguay" (ApexBrasil, n.d).

4.3.2 Developed Countries: Italy, United Kingdom, Spain and United States

The manufacturing process in the developed countries has nothing to do with cheap workforce, it is completely linked to each country´s core competence or ability on the process of manufacturing fashion goods. Technology and specialization are the main aspects of these fashion manufacturers' countries.

Italy, for instance, is famous for its excellence and perfection in producing leather goods and tailoring as in an artisanal way or in a more industrial scale. Historically specialized in luxury goods and exporting expertise for Asian countries, Italy despite of being a small country, still plays an important role in the fashion industry and supply chain. For the Italian fashion industry to survive, many brands had to hire immigrant workforce (Grose, 2013).

As we could analyze in Grose's specialization world map (2013), the United Kingdom is famous for its knitting. British fashion manufacture has high quality and artisanal processes but such as Italy operates in the market with very high prices.

In Spain we can find the global fashion leader group Inditex, which main strategy is to invest in rapid changes and fast fashion. The group produces its apparel in many different facilities around the world but specially in Spain. Big retails names are part of Inditex group such as: Zara, Pull&Bear, Massimo Dutti and Oyosho. Because of the fast fashion business model and he need of having new collections of products in a period of two to three weeks. Spain is experiencing a process of reshoring "which is the return of some of the business

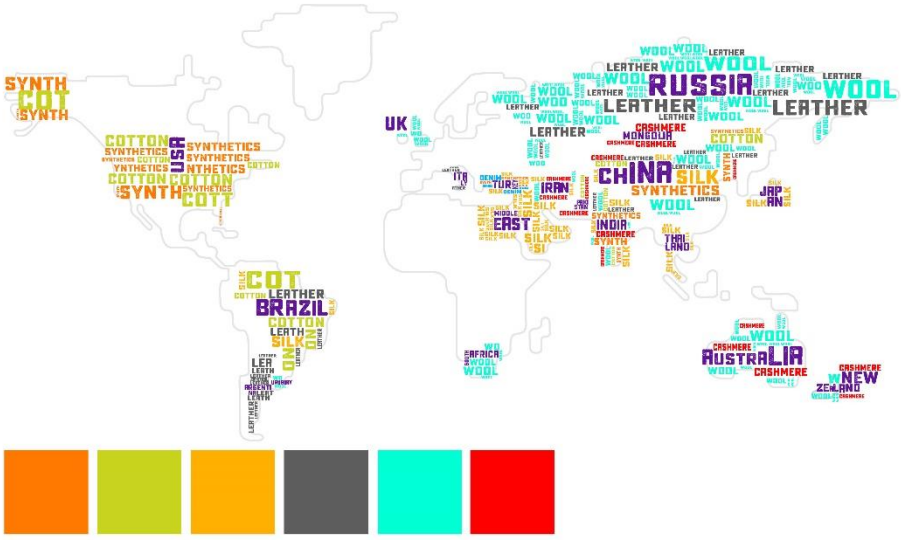
to plants based in the country where retails sales are made" (Punkett Research, 2016), this is because the fast delivery would be almost impossible producing the apparel offshore.

Finally, The United States are recognized by the specialization in sportwear. This kind of apparel requires a lot of technology and it suits the American country well because culturally speaking it is a very sporty country. The main apparel factories are located in New York and California (Frings, 2005).

4.4 GLOBAL FASHION INDUSTRY MAP

The updated version of the fashion industry specialization map presented by Grose (2013) brings updated information about the countries and classify them as: material providers, creativity providers and manufacturing providers. The information compiled throughout this chapter led us to develop visual maps showing were the main producers are and that information is represented through colors and world. The first map is the material map, in this map we can identify the main producers of natural and synthetic materials to supply for the fashion industry..

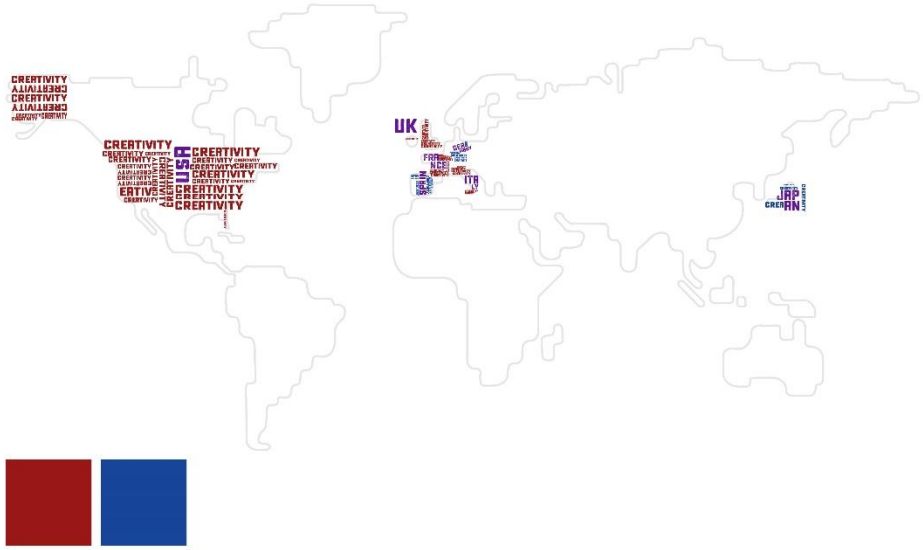
Image 11: Countries that provide material for the fashion industry



Source: Designed by the author (2016).

The following map shows the main countries that provide creativity to world and that is mostly in terms of resources. These countries hold important fashion events; they have the most prestigious fashion schools and most of the creative offices of the world. The map is divided in two colors; the first color represents the countries that have the main fashion capitals in the world and the second color represents the emerging fashion countries that are considered providers of creativity.

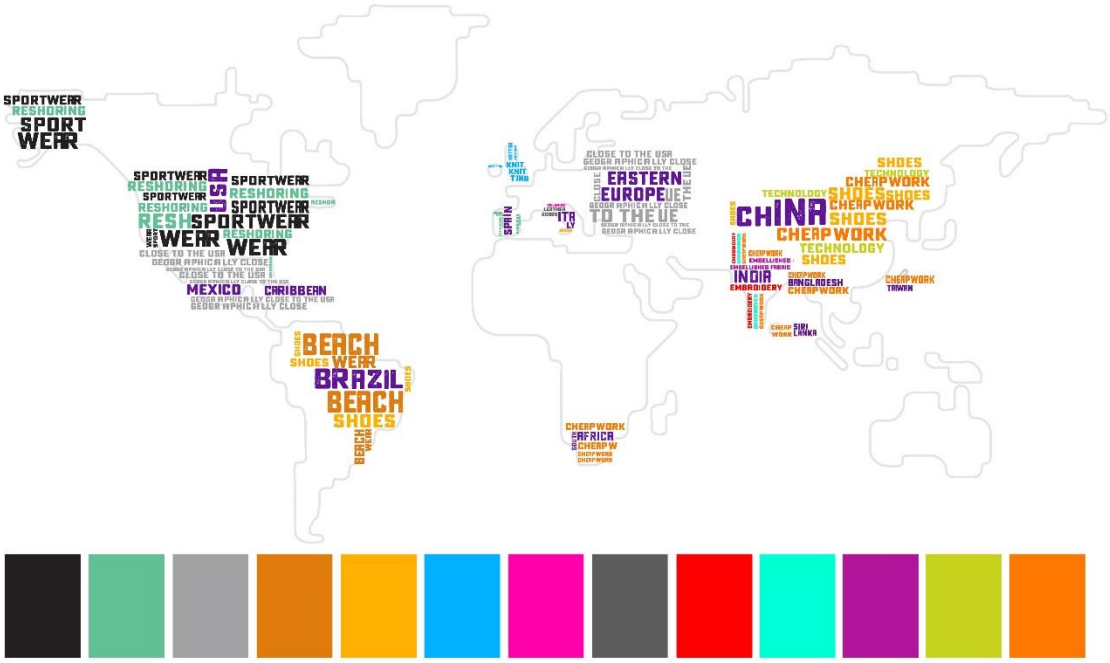
Image 12: Countries that provide creativity for the fashion industry



Source: Designed by the author (2016).

The third map gathers information about the manufacturing industry and the main specialization of each country. The colors are organized as Sportswear, Reshoring, Cheap and Geographically convenient workforce, Beachwear, Shoes, Knitting, Tailoring, Embroidery, Handwoven, Embellished Fabrics, Technology and Cheap Workforce.

Image 13: Manufacturing Fashion Industry



Source: Designed by the author (2016).

CHAPTER 5

THE EVOLUTION OF THE FASHION ECOSYSTEM MAP IN THE CONTEXT OF THE INDUSTRY 4.0

The fashion ecosystem map in the context of the industry 4.0 is a link among all the chapters of this dissertation resulting in a prediction of what the industry will be like with the evolution of the Internet of Things, Big Data Analytics and Radio Frequency Identification sensors. It represents the future of fashion´s industry in a globalized context according to the concepts of the Fourth Industrial Revolution.

5 THE EVOLUTION OF THE FASHION ECOSYSTEM IN THE CONTEXT OF THE INDUSTRY 4.0

The evolution of the fashion ecosystem is happening and the system is becoming a lot more connected and circular. The next fashion ecosystem will be interconnected in different ways, according to Artemis (2016), the new ecosystem will have global connections but in a more independent and consumer driven way. Nowadays only companies that manufacture big quantities are able to produce their products offshore, but in the industry 4.0 context, the trades will be simpler with smaller quantities.

> Its value extends beyond just the clothes we wear as it relates to the way we live, the way it's made. We believe that every country in the world could build a thriving fashion industry for the benefit of their local economies and communities. (Artemis, 2016).

The fashion experience will become more personalized; people will want to cultivate their unique style by being part of the creative process as well. Consumer will become more concerned about where their clothes come from and under what conditions they have been manufactured. (Artemis, 2016).

According to Bare International (2016) retail research, consumer behavior is changing and there is a need for the industry to adapt. This is one of the main differences from the Fourth Industrial Revolution to the other ones. The consumers are completely adapted to the digital world, so they expect technological shopping experiences, better services, faster deliveries, better quality products. It is not the new ideas, inventions or technology that is changing the scenario this time, it is the completely consumer driven revolution.

"The growth of social mobile technologies and social media is redefining interaction and communication structures and changing

consumer behavior as a result" (Bare International, 2016, p.12). There is a need of adaption in the industry in all of the agents of the fashion ecosystem, from the way people interact with the merchandise to the way it is conceived.

The use of big data will be a very big change from the trend research process, analysis of merchandising data and consumer trend behavior to the way the product will be sold and advertised. This will be the main re for all the agents in the ecosystem. The main goal of fashion retailers, according to Bare International (2016), will be providing consumers a multichannel development, transforming the store´s networked into a modern, innovative and technological environment.

5.1 RESOURCES

The main change in the Resources agent is the fact that it is linked through the entire fashion ecosystem making it look circular, proving data and information to all the other agents of the ecosystem. The big data analytics will be used to identify trends and utilize this in the production and distribution system making them highly efficient and easy to control and track (Costa, 2016).

The big data will also allow the companies to determine profitable quantities to be produced about each product and color. This will be possible due to the analysis of consumer demand, this way companies can reduce the over ordering and waste (Costa, 2016). "Big data tells you the range of colors that were purchased, and you may use your data to choose a range of colors that are popular." (Sutter, n.d). Data analysis will replace the fashion shows analysis and even the trend platforms. With the content available in the cloud, designers can have access to internal information and also competitor's information, making it possible to create products that can easily reach the target.

According to Sutter (n.d.), big data analytics will explain when and how costumers purchase goods and also how many items are sold. This data can be used to decide which products are more necessary and which lines deserve more attention. Big data will also provide a better retail experience, where everything the consumer has purchased may be tracked and used when he or she is buying new merchandise, this can be useful for selling products that match with what the consumer already has at home (Bare International, 2016).

Bare International (2016) spots two main tech innovations for fashion retail and we can consider this a channel of resources to reach the consumers, one of them is the live digital scannable shop window and the other one is the interactive mirror in fitting rooms.

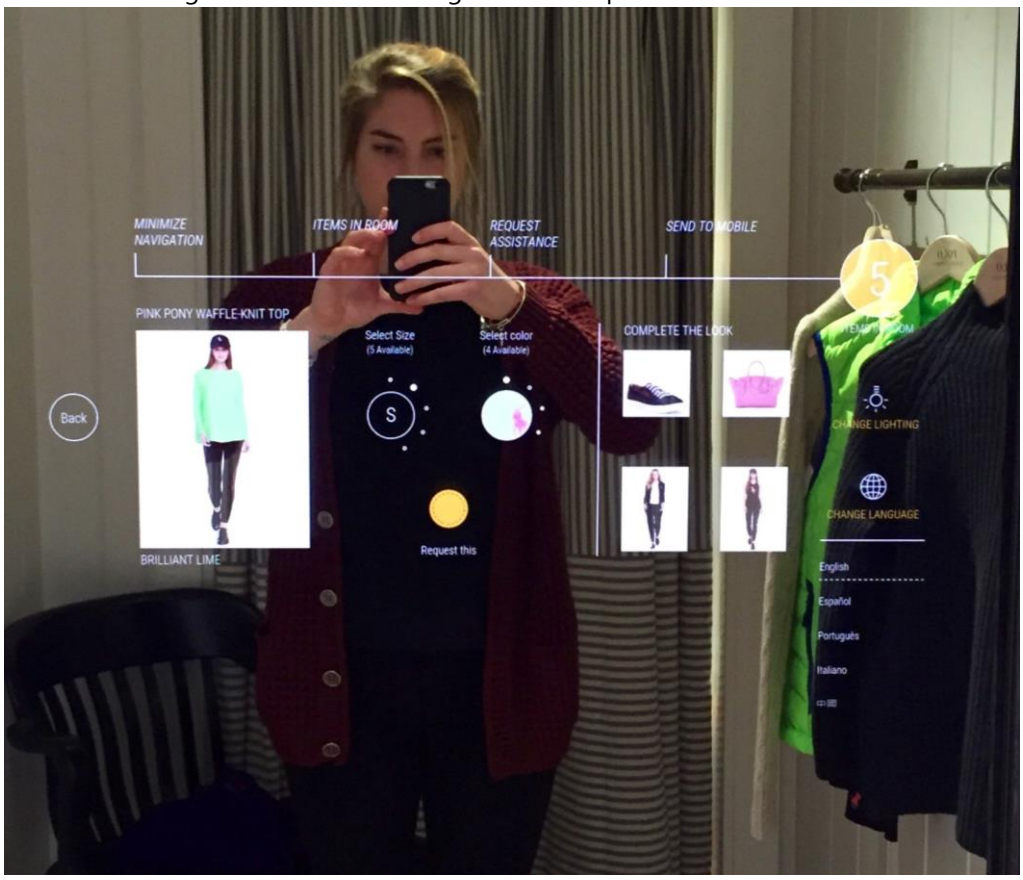
According to Bare International (2016) data, John Lewis, a chain of upmarket department stores from the United Kingdom, has been testing QR codes to launch the virtual windows where the costumers can interact and purchase items in a very fast and practical way. Costumes read QR codes from the window and complete their purchase on the website of the store through their phones. This service is called "click and collect", it means that in 24h the item the costumers had scanned and purchased will be available in the chosen address or store.

Image 13: Click and Collect scannable window at John Lewis

Source: John Lewis Website, 2016.

The interactive fitting rooms are rooms that have their standard mirrors replaced with a touch screen mirror, nowadays those mirrors are built by Oak Lab´s software and the first label to try this was Polo Ralph Lauren in the Fifth Avenue in New York City with eight samples of the new touch screen mirrors. When the costumer enters the room, the mirror greats him or her and gives different options, for instance, the costumer can choose what kind of lightening he or she wants, the options are: Fifth Avenue daylight, East Hampton Sunset and Village Candlelit Dinner. After the costumer choses the favorite lightening, the mirror tracks the RFID tags of the items that were brought into the room and read all the information of the store's inventory on those items to display size and color information on the mirrors. Besides stock information, the mirror also shows styling information for those items and they can also request for sale´s associate´s help when they need different sizes or colors (Bare International, 2016).

Image 14: Interactive fitting room in Ralph Lauren Fifth Avenue



Source: Nazario, 2015.

The interactive fitting rooms will evolve, according to Bare International Studies (2016), to a point where the client will be able to be offered products in the fitting according to his or her previous shopping experiences, displaying options of products that match with what the client already has at home.

The big platforms that provide Big Data Analytics and Trend-making for the fashion industry nowadays are Editd and WGSN according to Noyes (2014). Edidt is a platform that combines fashion trend information to sales data from different sources in the world, the data come from everywhere in the globe and from different sources such as social media and retail shopping experiences information. "The company's dataset includes no fewer than 53 billion data points on the fashion industry dating back more than four years. It covers more than 1,000 retailers around the globe and boasts 15 million high-resolution images" (Noyes, 2013, p.1).

Editd provides weekly and sometimes daily reports on the chosen categories, its analytics tools are to help the designers and fashion buyers to understand and read the data about what kind of product the consumers want and they can also analyses data from the competitors and redefine their products and strategies. "One Editd customer, the British online retailer Asos, credits the company's services for the 33% jump in sales it saw in the last quarter of 2013." (Noyes, 2013, p.1).

WGSN has created their Big Data platform as well: the Instock. The Instock connects trend forecasting with product categorization data to provide its clients the best combination of information for future sales strategies and design. "More than 6,000 customers use WGSN's trend service today. The newer Instock service counts almost 50 global clients in nine countries." (Noyes, 2013, p.1).

Another Important resource besides the Big Data Analytics, will be the use of nanotechnology in apparel. "The possibilities for merging technology, biology and the human body are set to change the fashion industry beyond recognition" (Brinton, 2015, p.1).

Nanotechnology will be used as a provider of sensors, injectable or wearables, to create a digital skin with an operating system connected to the Internet of Things and providing data worldwide.

> Researchers are also investigating the potential for the microencapsulation of drugs and perfumes, which can then be incorporated into textiles and delivered directly to the skin, and biometric sensors that will detect when you're stressed or restless and give you a burst of calming fragrance. (Brinton, 2015, p.1).

The studies on the possibilities of the new context of industry are wide and will provide experiences that consumers cannot imagine. Things will be designed to make people´s lives easier, simple and connected. The field of research will be extremely crucial for the resources of the new industry. Wearable technologies require deep investigation and obligates the designers to be almost IT specialists. In other words, Fashion studies will continue to be multidisciplinary, as stated by Jess (2016), but in this new ecosystem the connections will the with engineering and technology fields.

5.2 DESIGN PROCESS: COLLABORATIVE PLATFORMS

The design process in the industry 4.0 context is completely different from the design in the current fashion ecosystem. Besides having the access to the Big Data Analytics, helping to reach costumer´s satisfaction a lot faster, designers can work together from different parts of the world. This is possible due to collaborative platforms of design. These platforms can be used by designers or even by the consumers to come up with new products and ideas.

"This is where collaboration tools come in – they make it easier and faster for designers to get feedback and approve artwork in a professional manner" (Stewart, 2016). Speed is a key element of the industry 4.0, collaborative platforms allow designers and collaborators to get fast feedback from consumers making this process fast and easy.

The FFD (Future Fashion Design) project, is an example of the design process in the industry 4.0 context. This project has received funding from the European Union´s seventh framework to research fast prototyping and and technological development in the fashion industry. The aim of the project is to make companies and people to adopt the concept of Virtual Prototyping (VP),

> [⋯]by drastically improving the speed of obtaining realistic garment simulations (development of massively parallel simulation techniques based on multi-core computing), the accuracy (simulation from yarn - to fabric - to garment, virtual garment close to real sample) and the functional integration aspects. (FFD, 2016).

According to FFD (2016) project, studies are being made to improve the simulation quality when it comes to Virtual Prototyping making it possible for people and companies use design platforms more widely and in a more intuitive way. The success of collaborative platforms is due to two different trends that we will go in detail further in this work, namely: sustainability and consumer behavior.

According to Quinn (2012), consumers will be able to buy digital patterns on the internet and they will be responsible for the fabrication of the garments themselves. If they can download a file from a website to a 3D printer the items

can be made even by people that do not have any sewing abilities. Co-creative forums are also a reality of the new industry concept. Consumers will give direct inputs into the design of a garment. These forums allow designers and consumers to discuss ideas and challenge the traditional clothing construction. One of the big advantages of these collaborative platforms of design is that the input ins one single garment may be global (Quinn, 2012).

5.3 INDUSTRY AND SOURCING: LOCAL AND GLOBAL

According to Snugg (2016), global sourcing will still be part of the structure of fashion ecosystem in an industry 4.0 context but with some differences than in the previews ecosystem organization. Snugg (2016) calls the future of sourcing as a "patchwork planet" which means that everyone will be able to purchase and manufacture goods in different countries, not only big companies that produce big quantities. Customers will have the opportunity to customize their clothes and buy from different sources throughout the world through the internet.

One of the big changes in an industrial context is the fast prototyping through 3D printing. 3D printing is changing many concepts in the design context, it is a very easy and practical tool that can be used with zero waste of material while there is always some waste when there is traditional patternmaking and prototyping with textiles. It is possible to say that 3D printing is only in its early ages, its matter is still a little stiff but some slowly changes are being made and there are several studies on how to make the material more similar to a real textile (Tarmy, 2016).

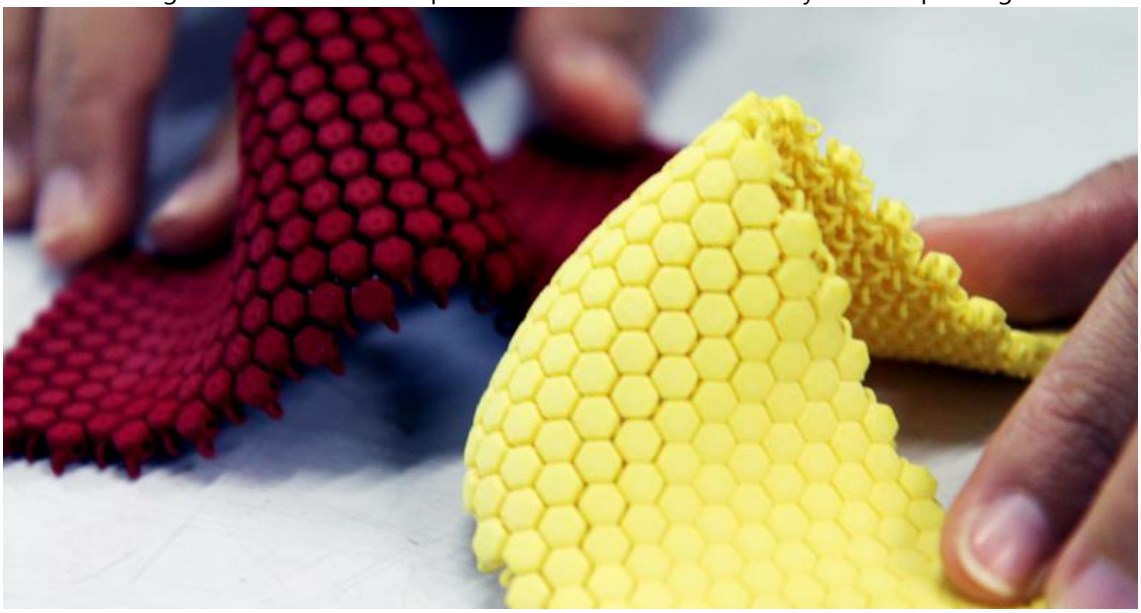
In spite the fact that, 3D printing material is still far away from looking like actul textile, fashion accessories such as jewelry, footwear and eyewear can easily be printed and adopted (Tarmy, 2016). There are many conceptual collections using 3D printing for clothes but the practical applications are still in a very early age (Grunewald, 2016).

Image 15: Example of conceptual collection using 3D printing

Source: Pang, 2015.

The first step of 3D prototyping is to find a very selective laser sintering process to try to reach a high leve of detail which is necessary to produce movable materials that can have similar malleability to textiles. Researchers have developed geometries that can be connected and movable in a way that can imitate a textile performance (Grunewald, 2016).

Image 16: Geometrical shapes in order to reach malleability with 3D printing



Source: Grunewald, 2016.

3D printing is also an important hope for sustainability because it can virtually eliminate pollution and end with waste of material in the manufacturing process (Grunewald, 2016). This way of producing apparel will make fashion industry capable of providing the necessary materials and files for printers where the consumers can print and adapt the designs as they wish. This leads to the opposite of what we have today, which is a globalized mass production, the ideas and connection will still be global, but the manufacturing process might be a lot more local and consumers might even have a printer of their own.

The traditional manufacturing floor is also about to change with the use of the Internet of things. The productivity in the production process will improve dramatically with the cyber-physical systems potential, the industrial processes will be able to govern themselves through the big data analytics and where the machines will take corrective actions to avoid waste and damages (Löffler, n.d).

Löffler (n.d.) also states that within the Internet of Things concept, the world production will become very networked and interlinked; logistics will be a lot simpler and easy to control. According to Davenport (2013), the IoT is merging people, process, data and things building a bridge and connecting everything. The machines in the apparel manufacturing scenario will all have sensor and be

linked to the internet to have access to the cloud and be able to reach the data necessary for intelligent and fast manufacturing enabling designers and operators to communicate with the machines in real time through their computers or phones (Davenport, 2013).

Operational stages will be so interconnected and synchronized that the productivity will increase very fast. Machines with capability of communication and being self aware of their process will completely change the way the manufacturing industry is organized nowadays. Equipment efficiency will increase and "the risk of downtime declines" (Davenport, 2013).

5.4 DISTRIBUTION

The distribution process in the fashion industry 4.0 will be highly efficient to e-commerce and m-commerce (mobile commerce) to endure. Radio Frequency Identification (RFID) is not a new concept, but in the industry 4.0 context it will play a very important role in the logistics of apparel.

According to Dong, Yaun and Wei-Min (2009), RFID is a technology that enables complete control of the location of merchandise. It provides "[…] strategic significant incremental benefit to the supply chain of manufacture, logistics, wholesale and retail industry."

Tracking is the main application of RFID tags; these tags have sensors that are able to transmit information about the object such as sequence number, style of equipment and where it is located. This enables inventory management at real time from all over the world; making is possible to know when it is time for replenishment and to reduce errors. RFID Technology can speed up the process of delivery and lower the distribution costs (Dong, Yuan and Wei-Min, 2009)

Having accurate track of the inventory is very important for managing efficiency and loss in the manufacturing process. Knowing exactly the arrival time

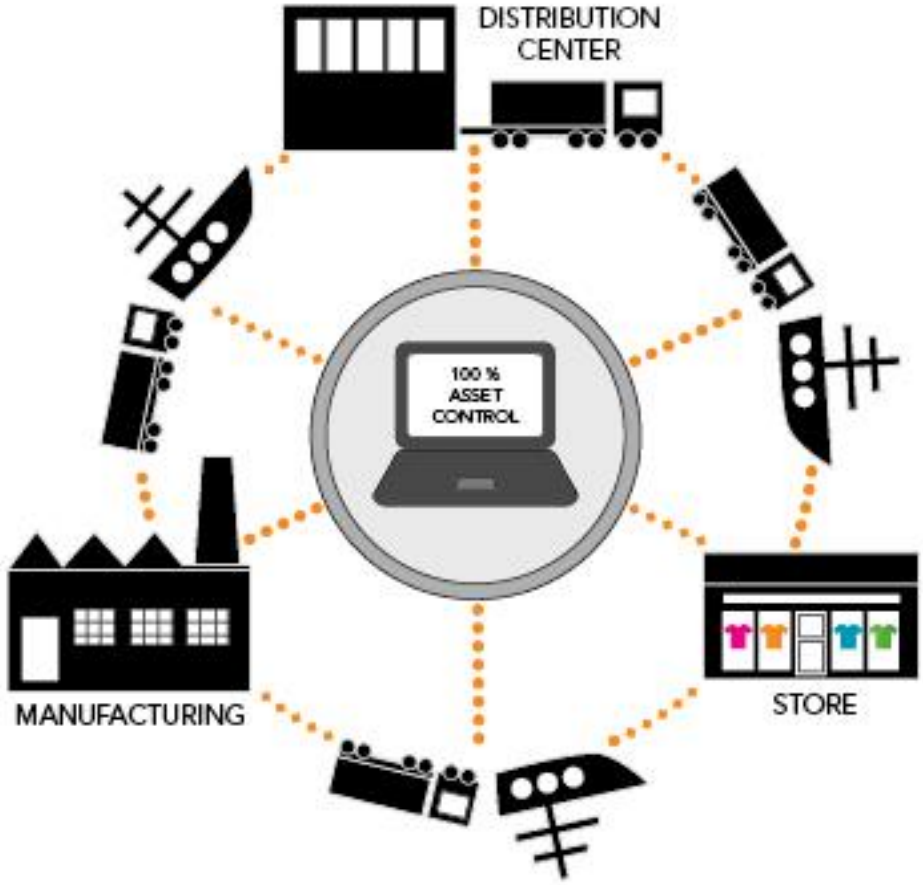
of the product is also very convenient especially in the e-commerce or m-commerce experience (Dong, Yaun and Wei-Min, 2009).

> With the help of tags, the company may realize the real-time monitoring raw material, half-finished product, end-product, transportation, stock, delivery, putting on the shelf and sales even returning the goods. For instance, through RFID technology, the operator can immediately know the situation and do rapid replenishment, to reduce 10-30% safety stock and storage costs. (Dong; Yuan and Wei-Min, 2009).

Tagging items with RFID sensors give retailers and consumers the complete control of where to find the product. It gives the complete visibility of the item´s journey from manufacture to sale. "RFID can show precisely when a specific item was put on a truck, when it arrived at the distribution center, and at the retail stockroom." (Michener, 2013). This kind of metrics can help companies to achieve great level of efficiency.

Having the inventory accuracy helps to sell more products, especially in the system "buy online and pick in the store", a reliable inventory is essential to this kind of business. RFID tags can help not only to track items as also to control stock and try to have an efficient and correct amount of stock according to the consumption data (Michener, 2013).

Image 17: Connected distribution process



Source: Michener, 2013.

"Distributors handle millions of shipped products, hundreds of suppliers, thousands of customers, and a wide variety and volume of products in their inventory" (Mangler, 2016). But using the attributes of the new industry concept, adding technology, the IoT and RFID sensors, it becomes a lot simpler and easier to control global distribution of merchandise.

5.5 CONSUMER MARTKETS: MILLENNIAL´S CONSUMER BEHAVIOR

The relations between consumers and producers will change drastically in the context of the new industry. The consumer's adaptability to smart technologies is

already a reality, so this makes it simple to image the future of the industry 4.0 (Roblek, Meško and Krapež, 2016).

"The future of industrial manufacturing will be distinguished by the significant **customization of the products** through the **increased flexibility of manufacturing** conditions: mass customization" (Symestic, n.d.). This will happen because of the new trends in consumer behavior, people will not accept mass products, they want to be different from others, and this is a characteristic of the millennial generation. According to Schawbel (2015) on a Forbes article, millennials value authenticity, 43% of them rank exclusive products the main reason for their purchases.

In order to archive this level of customization, factories need to have a very flexible Manufacturing Execution System (MES), to reach a big variety of different products in smaller quantities. In the context of the Industry 4.0, customers and producers will be highly integrated through the big data sources to achieve high quality and smart hybrid products (Symestic, n.d.).

"Industry 4.0 requires **real-time transparency during manufacturing** and the communication of the systems, participants and products involved in the manufacturing process beforehand." (Symestic, n.d.). Millennials have fast access to information of the products through sites and blog reviews. According to Schawbel (2015), 33% of millennials rely a mostly on blog reviews before purchasing a product and only 3% rely on traditional media such as TV and Magazines.

> The information that Industry 4.0 provides together with, for example, big data, social media, and cloud computing, make it possible to optimize the decision-making process, secure design decisions early on and respond flexibly to disturbances, as well as optimize all the resources across more than one site. (Symestic, n.d.).

According to Simões (2015), Millennials are people that were born between 1980 and 2000, during the Internet Era. "Having a certain age when historical events take place has influence on people's psychological development" (Simões, 2015, p.4). This means that the consumer behavior has also different characteristics than the previews generation.

This generation is more civic oriented and think about an engaged world with collaborative systems. They are expected to bring courtesy in social relations; they usually study longer and marry late (Simões, 2015).

Different than the previews generation, they see internet as a mean of social integration and getting closer to people in a globalized world, it is not a way of individuality like the generation X sees it. Millennials are also very inclusive, the opposite of their parents that have a more individualistic behavior (Simões, 2015).

The millennial´s consumer behavior is completely collaborative, they want to be part of the processes and they see the world with smaller distances. Online shopping, e- commerce and m-commerce will grow a lot in the next few years. This generation trusts the internet more than the previews generation. This does not mean that the physical shopping experiences will be extinct. They will still exist but with some adaption to technology (Brinton, 2015).

Image 18: Technological Bick and mortar store

Source: Jiwon, (2016).

Collaborative design platform is tool that millennials enjoy because they like giving their input on things and at the same time they like the idea of group work and collaborative processes. The new consumers want to be aware and be part of all the parts of the process of assembling clothes. The industry 4.0 enables them to be part from the creative process, 3D print or fast prototype garments at their own house (Quinn, 2012).

The new technological systems provide global consumers rapid and wide access to fashion in all parts of the world through the internet. According to Snugg (2016), high tech will improve the access people have to fashion information but the manufacture process might be a lot more local than global. This is because of the new prototyping technologies that enables the consumers to manufacture clothes on their own and also because of sustainability issues.

People are living longer and so are products. "It is claimed the first human to live past 150 has already been born, and long, active lives well past 100 may soon become the norm" (Brinton, 2015). According to Brinton (2015), 90 will be the new middle age, this will bring huge changes and the way people interact with products as well. Products will have a longer live, things will be reused and recycled a lot more than they are nowadays (Snugg, 2016).

Using the 3D printing technology, people will be able to reprint products. "Wearable technology will be updateable" (Brinton, 2015). Clothes-lending systems will be a global reality, people will share a lot more and when something can´t be used anymore, the material of it will probably be reused in a different way or dropped into the recycling basket (Brinton, 2015).

"As our knowledge of science and technology increases, people are taking more of a stand when it comes to preserving and protecting the environment" (Snugg, 2016). New consumers will be very concerned about the origin of their garments, sustainability and social responsibility will be essential issues for the success of a brand. **"**Slow and sustainable trading measures will be considered fashionable" (Snugg, 2016) and people will be willing to pay more because of that.

5.6 FASHION ECOSYSTEM MAP IN THE INDUSTRY 4.0 CONTEXT

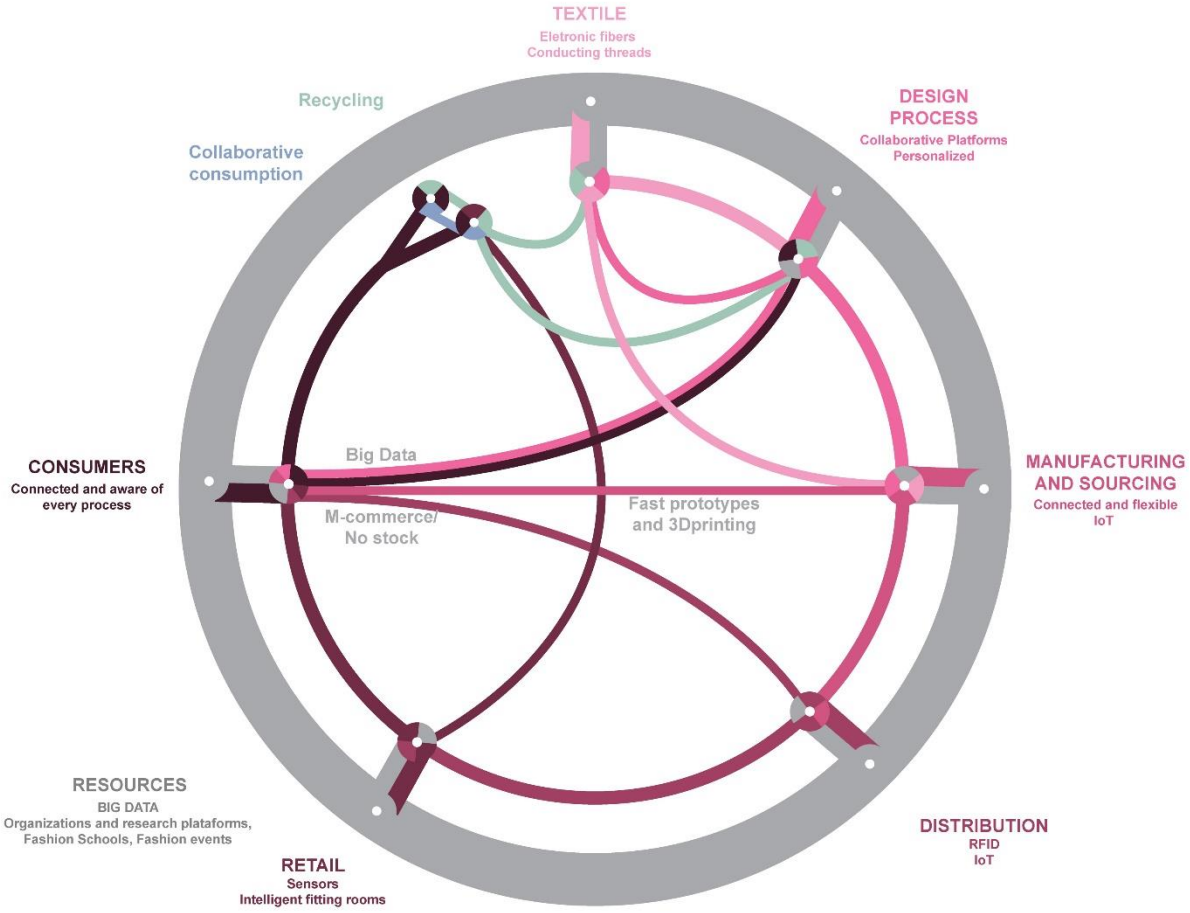
The future of the industry and the changes in consumer behavior will bring a lot of changes in the fashion ecosystem interactions. The system will be more interconnected, every process will be able to be controlled and adapted using the internet of things and big data. The risk of waste will be a lot smaller because the manufacturing system will be more optimized and all the items that might not be sold will be recyclable.

The main resource of this ecosystem is the big data analytics, thought the data and the Iot, things will be controlled worldwide through internet. Local processes will be part of the global data as well. The evolution of E-commerce and M-commerce will also be important for having a no stock manufacturing system.

Fashion continues to be global but in this context of the industry 4.0 the global aspect of it will not be only a reality for big industries. Logistic strategies are improving and becoming cheaper, this will enable small manufacturers and consumers to have access to the global sourcing in a very simple and non-bureaucratic way.

The Fourth Industrial Revolution Fashion Ecosystem Map is represented in a circular way rather than a linear way because that´s how the process will be. All the agents will be highly dependable in one another and the connecting between them are a lot more intense because of the RFID and IoT technologies.

Image 19: Fashion ecosystem map of the industry 4.0



Source: Designed by the author (2016).

FINDINGS AND DISCUSSIONS

Fashion and globalization are linked since the First Industrial Revolution as we could see on chapter one when we reviewed the historical context of the Industrial Revolutions. It was possible to identify the evolution of the globalization process and how that reflected in the fashion industry through innovation and inventions.

The advances of transportation with the creation of the railways and later with the airplanes was very important for the logistic and trade of products throughout the world. It is undeniable that with the e-commerce and m-commerce rise, logistics solutions are one of the main concerns of the fashion industry. Besides logistics solutions, there were many important inventions in the first and second industrial revolutions that changed fashion completely, among them we can highlight the mechanized cotton spinning powered by steam or water and the sewing machine.

On the other hand, the Industrial Revolutions had social and behavioral implications that had a direct connection to the fashion ecosystem influencing its configuration. As examples of that we may point out the generalization of ready-to-wear, the democratization of fashion, the prominence it has in young consumers, and the multiple relations that fashion has with different areas such as art and cinema. We can also point out the importance of the development of media for the fashion industry, reinforcing the role of clothing in the characterization of the contemporary society.

Regarding the Third Industrial Revolution, the internet played a very important role in the context of the current transitional Industry. The internet is responsible for the instant and fast access to information and this had changed fashion industry completely. People have different access to information nowadays than they used to have before the invention of the internet, magazines had to adapt, the industry had to adapt, designers had to learn how to be more

creative, collections became more frequent and the way the brands advertise and sell their products had changed completely.

Understanding the main elements of the fashion ecosystem and analyzing their connections is essential to identify how the fashion industry is organized nowadays. According to this research we could see that the fashion industry has interdependent processes and it is going through substantial changes because of the internet evolution. The internet had made the world smaller and has also allowed brands and companies from different parts of the world to start doing business together as if they were in the same city.

The current fashion ecosystem has a global industry and a global market as well. Strategies of big brands must be global, maybe with some local adaptions, but seeking world scale results. Small companies became global, too. Consumers became retailers, with the grow of second hand market, and the grow of new business models such as Airbnb[16]. Consumers are starting to behave in similar ways around the world because of the globalization process.

The concept of distance had changed a lot since the first industrial revolution and the fourth industrial revolution will make people connect even more with people from different cultures and countries. The fashion industry, as we could analyze on chapter 4 of this dissertation, is completely global nowadays. This process had started because companies were seeking for better prices and mass manufacturing. In the context of the third and the fourth industrial revolutions we can identify some changes in this reality. Consumer behavior has been changing. People want to be aware of what they are wearing and where it was produced. This means that companies had to change their strategies, cheaper prices are not as important as they were before the third industrial revolution.

The global fashion industry is spread in different countries and we can recognize the development of core specialization in the industry of some

[16] Airbnb - is a peer-to-peer online marketplace and homestay network that enables people to list or rent short-term lodging in residential properties, with the cost of such accommodation set by the property owner

countries. Most of these reasons are historical and geographical, especially in the countries that provide materials and creativity. Currently, specialized factories only work with mass production, this means that there is a minimum amount required for them to produce to other companies. This situation is changing because the globalization is a phenomenon that reaches not only businesses but also individuals.

The industry 4.0 will enable consumers to buy online products or concepts from all over the world and maybe manufacture at home with a step by step manual or with new technologies such as 3D printing. Manufacturing processes will not be so huge as they are today. At least, mass productions seem to be coming to an end in the next few years. Consumers want more personalized, sustainable and technological clothes.

New technologies such as the concept of the internet of things and big data analytics will change the industry completely and will enable consumers to be part and control all the steps of the conception of a fashion product. After doing this research, it was possible to predict some aspects of the future of the fashion industry.

The main result of this study was making the connection of the concepts of the industry 4.0 with the fashion industry in a global context. The design of the ecosystem map helped on the understanding of the current connections of the globalized fashion industry and how those connections will change in the next few years according to the fourth industrial revolution progression. Having information compiled and visually expressed in a map updating the fashion ecosystem from a linear process to circular process was the main result of this work.

CONCLUSION

A quote from Thomas Friedman (2012, p.191), opens this dissertation explaining about how the size of the world had changed in terms of globalization:

> In Globalization 1.0, which began around 1492, the world went from size large to size medium. In Globalization 2.0, the era that introduced us to multinational companies, it went from size medium to size small. And then around 2000 came Globalization 3.0, in which the world went from being small to tiny.

And by the end of this study we conclude that after Globalization 4.0, the world went from being tiny to being super tiny. The concept of globalization is not new, but in the context of the Fourth Industrial Revolution, we can understand how tiny the world got by who has the access to it and who is affected by it. In parallel with this reduction in space, we see an increase of elements regarding the fashion ecosystem, and essentially an exponential growth of the relations established among those different elements.

In the early years of globalization, during the Great Navigations and the First and Second Industrial Revolutions only a few big companies and the governments were able to benefit from the wonders of globalization. After the invention of the internet, things started changing in an exponential proportion and smaller companies could also benefit from the global market and industry. What is expected according to this study, is that individuals can benefit even more and be considered global individuals.

A global individual is a person who lives in Portugal, dresses French designed, Asian manufactured pieces of clothing, wears Brazilian leather shoes and African beaded accessories. This person eats Japanese, Mexican or Australian food and works for an American company. In his or her free time, this person learns Italian, practices martial arts and yoga and watches Bollywood movies. Barriers and borders are not so important anymore.

Cultures are merging and it is becoming difficult to identify exactly where things are from. Other elements begin to have more relevance, such as ethics and values, greater sustainability, co-creation, and assigning new meanings to fashion. Other variables become more prominent when the distances are cancelled. Not only the geographic distances are reduced, but also the role of the designer and consumers and how they interact through the process. In the on-going transition ecosystem, the consumer can be a promoter, posting online releases about the products expressing their opinion to the world. In the new ecosystem, the consumer can also be a producer, the 3D printing is enabling people to prototype things in their own house.

We are living the early years of the Fourth Industrial Revolution, this means there is a lot more to come, distances will become almost inexistent, people will connect even more, the internet will make communication easier and faster. Everything will be connected and interlinked. What is the future of fashion? It is certainly difficult to predict, but according to the data compiled in this dissertation we could predict some events and some connections displayed on the fashion ecosystem map of the industry 4.0.

Countries will become even more specialized, people will be more aware of sustainability issues, big data will be analyzed and organized in a way that everyone can have access to it and use it as a source. People will rely more on technology and will become dependent of it. The human brain and technology will be even more connected and they will work together resulting in time and effort efficiency. Wearable technology will be part of everyone´s closet and what we wear will be a continuation of our own bodies, making it perform better in terms of health, comfort and information.

Cyber Physical Systems, The Internet of Things, Radio Frequency Identification Sensors, Big Data analytics, those are all new concepts of the industry 4.0 that are being inserted into the fashion ecosystem making the connections stronger, more reliable and interlinked. Globalization is directly connected to innovation and technology. According to this research and the data

compiled, we can expect big changes in the fashion industry and in the way people live their lives and interact with things in a close future. People will be not only aware of the whole process of fashion, but the will also have a direct participation in many of these processes. Fashion will be completely consumer driven during the industry 4.0. The designer will not be the main conceiver anymore. Being a fashion designer during the new ecosystem will have a lot more to do with the ability to adapt and create customized products and also the knowledge of technology and connecting to the new platforms.

The main research question of this dissertation was to understand how the fashion ecosystem is organized in a globalized world and during the process of this dissertation we could identify that the fashion ecosystem has been going through substancial changes. A transitioning ecosystem map was needed to express the current sistuation of the fashion industry, where part is connected and technological and part is still analogical and connected to historical processes. In the end we got to the fashion ecosystem map of the industry 4.0 that is a prediction of what fashion will be like in the next few years. New business models will be brought up, gathering new technology to industrial processes.

The secondary research questions were about countries´ specialization in the industry and how the industrial revolutions impacted fashion. The response for the specialization and core abilities of each country were the geographic maps, created by the author, were imformation about global sourcing was compiled and visually transformed in three different maps: Material Providers, Creativity Providers and Manufacturing Specialization. Historically, Industrial Revolutions had a very big impact in the fashion industry, in terms of manufacturing, society changes and consumer behavior. Analysing the Three first Industrial Revolutions, we were able to predict how the Fourth and on-going Industrial Revolution will impact the way fashion is organized and changed its ecosystem completely manking it look more circular and completely interlinked.

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PARECERES DO ORIENTADOR

Candidata: Maísa Regina Benatti
Nº do aluno: 20142014
Curso: Mestrado em Design de moda
Title: The effect of globalization in the fashion industry: A brief description and the fashion ecosystem map

Orientador científico: Doutora Ana Cristina Bolota Couto

Maísa Regina Benatti é aluna de mestrado em Design de Moda na Faculdade de arquitectura da Universidade de Lisboa e está sob minha orientação para desenvolver a tese proposta no presente trabalho. O tema desta proposta de dissertação é: a influência da globalização na indústria da moda.

A dissertação segue as normas científicas e acadêmicas e está em condições para dar continuidade a investigação para a obtenção do grau de mestre. Sendo assim, dou o parecer de que a dissertação tem qualidade suficiente para ser entregue.

Lisboa

Data: 26.10.2016

Assinatura do orientador:

_____

APPENDICES

APPENDIX 1

ENTREVISTA – CEO LOUIS AND LOLA SHOES: AMANDA SLATER

A breve entrevista apresentada a seguir realizou-se no dia 05 de janeiro de 2016 com a CEO da marca de sapatos infantis Louis and Lola Shoes, Amanda Slater. Pela nacionalidade de Slater ser neozelandesa, a entrevista aconteceu em inglês e foi traduzida pela autora deste trabalho. O foco da entrevista foi entender os motivos pelos quais a marca produz fora de seu país de origem. Após uma explicação sobre o histórico da marca feito pela própria empresária, segui para as perguntas que serão aqui apresentadas:

1. Atualmente, onde se encontram as instalações da marca Louis and Lolla?

Amanda: O design é feito parte na Nova Zelândia e parte em Portugal, como resido em Portugal, gosto de controlar a criação, porém a produção é toda terceirizada no exterior, produzimos aqui em Portugal, na Espanha e na Itália.

2. Por que estes países?

Amanda: Basicamente a ideia inicial da marca era produzir somente na Itália e o motivo é o mais obvio possível: a excelência em produção calçadista. Entretanto como vivo em Portugal, em termos de logística fica mais prático produzir aqui, posso ir nas fábricas, controlar a produção de perto, a qualidade de produção aqui em Portugal também é muito boa, porém os modelos mais complexos e em pele, prefiro manter na Itália ainda. Espanha também foi por uma questão de logística e preço, o slogan da marca é "*Designed in New Zealand, handmade in Europe*" (desenhado na Nova Zelândia, feito a mão na Europa), portanto todas as empresas que produzem para Louis and Lola são europeias.

3. Por que a decisão de produzir na Europa, visto que geograficamente vocês encontram-se muito próximo a Ásia onde as vantagens competitivas em termos de preço são bem maiores?

Amanda: Porque o intuito da nossa marca não é destacar-se em relação ao preço, justamente por estarmos próximos a Ásia nossos consumidores sabem as condições trabalhistas das fábricas asiáticas, eles estão cientes, diferente dos consumidores da Europa e America que estão longe geográficamente daquela região. É uma questão de consciência de sociedade, de sustentabilidade... e não só isso, também buscamos qualidade. Nossos clientes sabem que a probabilidade de um calçado feito na Europa, mais especificamente na Itália, com certeza durará mais tempo e terá melhor qualidade do que um produzido na China por funcionário que fazem jornadas longas de trabalho em condições sub-humanas.

4. A estratégia da marca é diferenciação por qualidade então?

Amanda: Sim, impossível competirmos com o preço de países como a China e Indonésia, sem dúvidas é a diferenciação por qualidade e por ser um produto consciente.

5. Quando você fala em produto consciente, quer dizer o que?

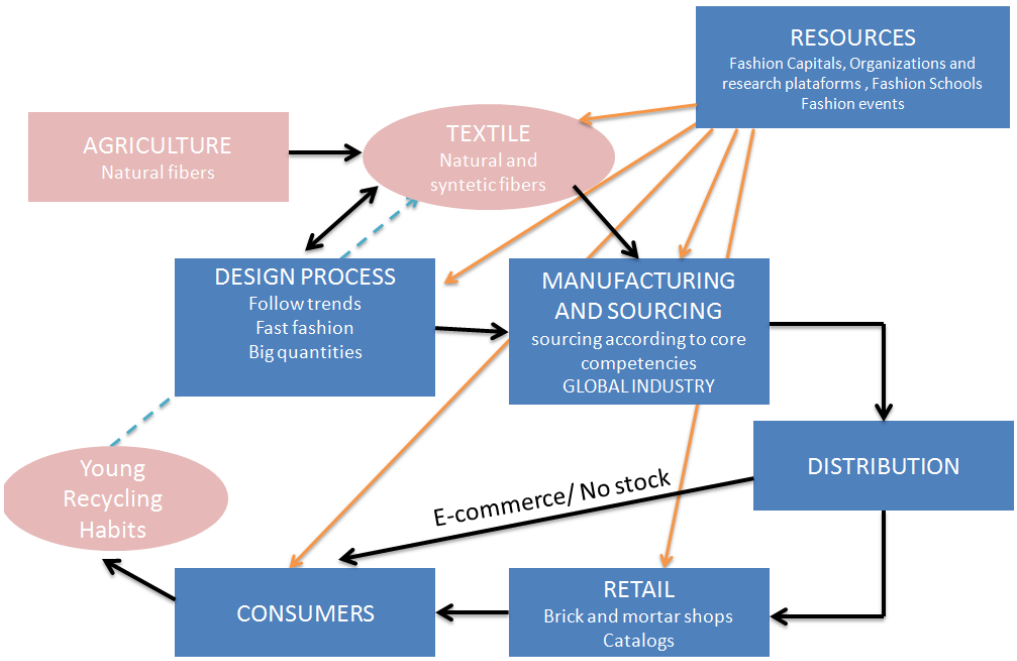
Amanda: Quero dizer que pagamos todos os impostos e as pessoas que fazem nossos calçados são trabalhadores que recebem todos os direitos, eu mesma faço questão de ir nas fábricas e constatar as condições de trabalho dos empregados, pago os impostos e procuro usar o Maximo de materiais sustentáveis possíveis. A marca Louis and Lola é uma marca *eco-friendly*. Na Nova Zelandia valoriza-se muito marcas *eco-friendly* e principalmente produzidas na Europa.

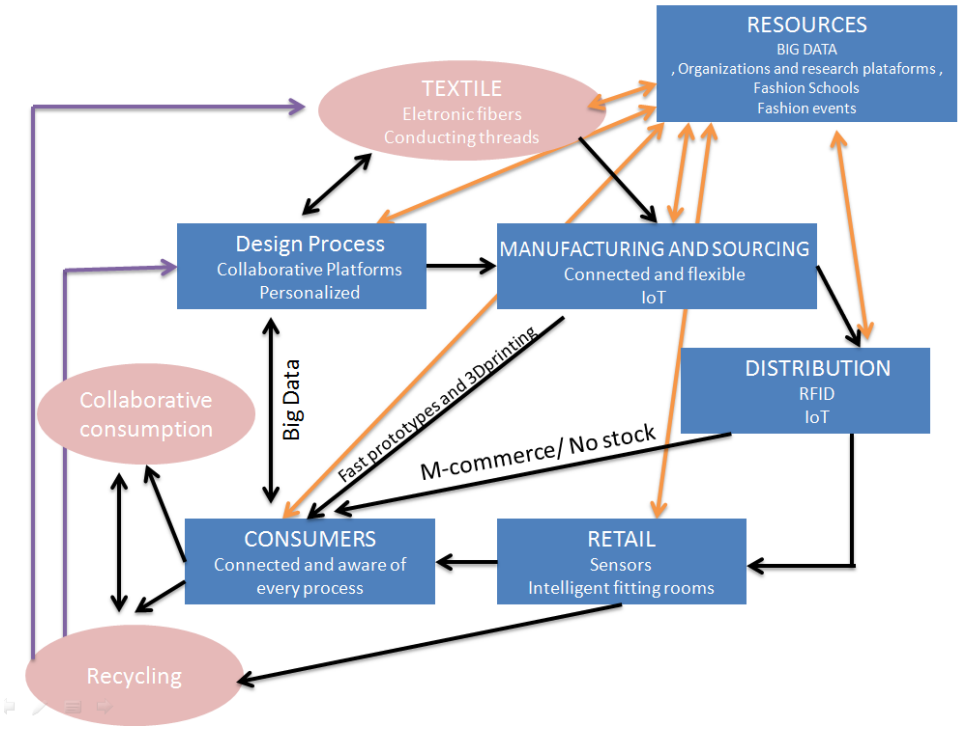
6. Quais as maiores dificuldades que a marca enfrenta atualmente no contexto globalizado em que está inserida?

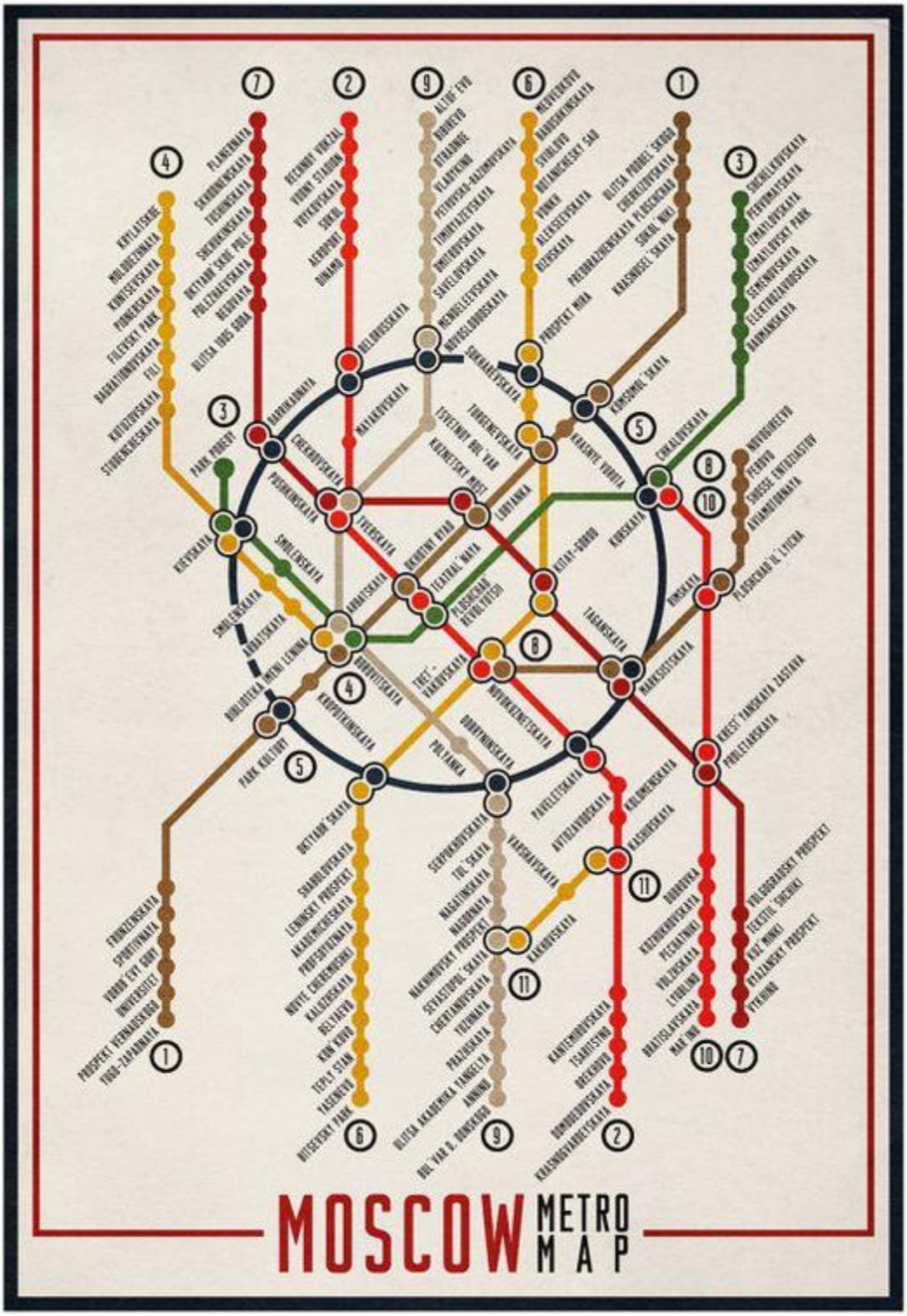
Amanda: A marca é bastante nova para eu fazer estas analises mais aprofundadas, mas acredito que a resposta mais adequada seria a logística e os impostos.

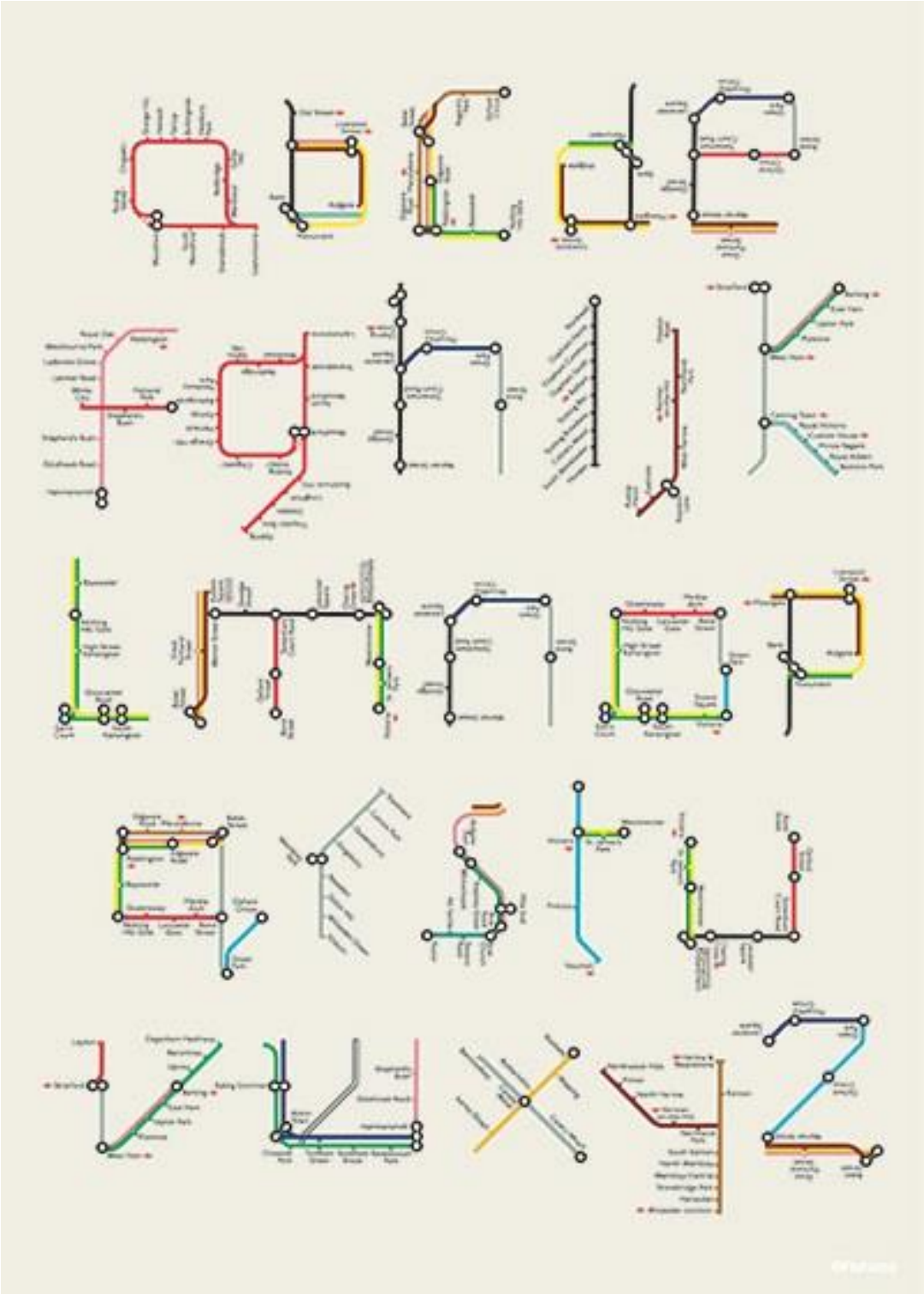
APPENDIX 2

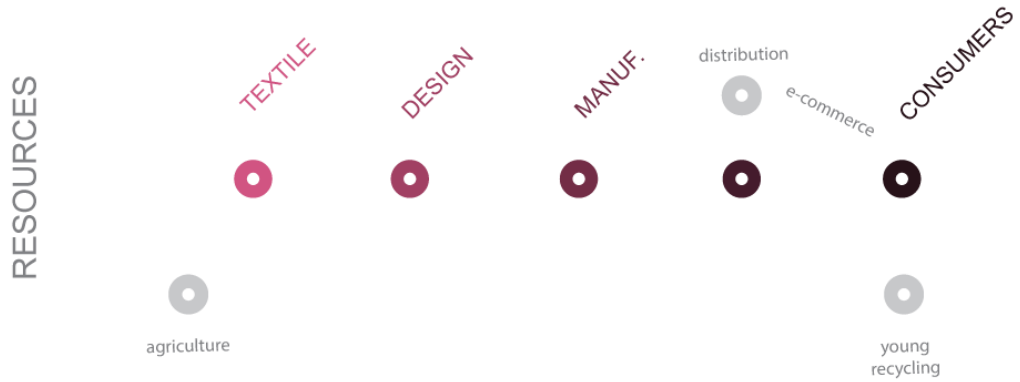
Creative process and construction of the ecosystem maps.






MOSCOW METRO MAP




RESOURCES
TEXTILE
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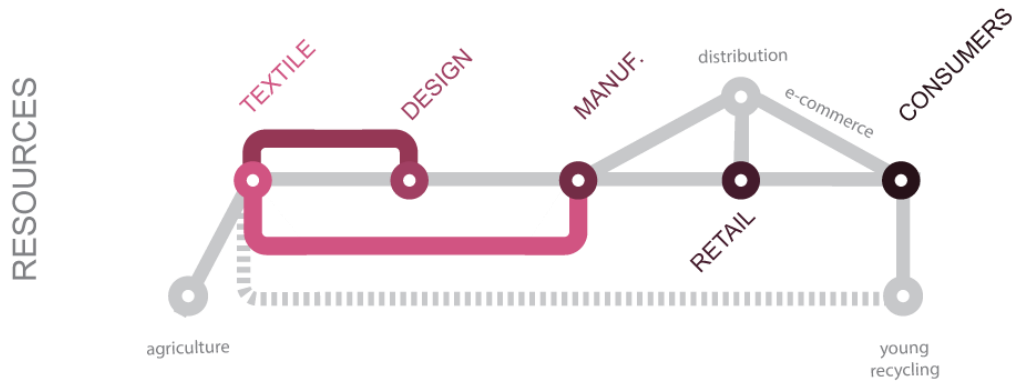
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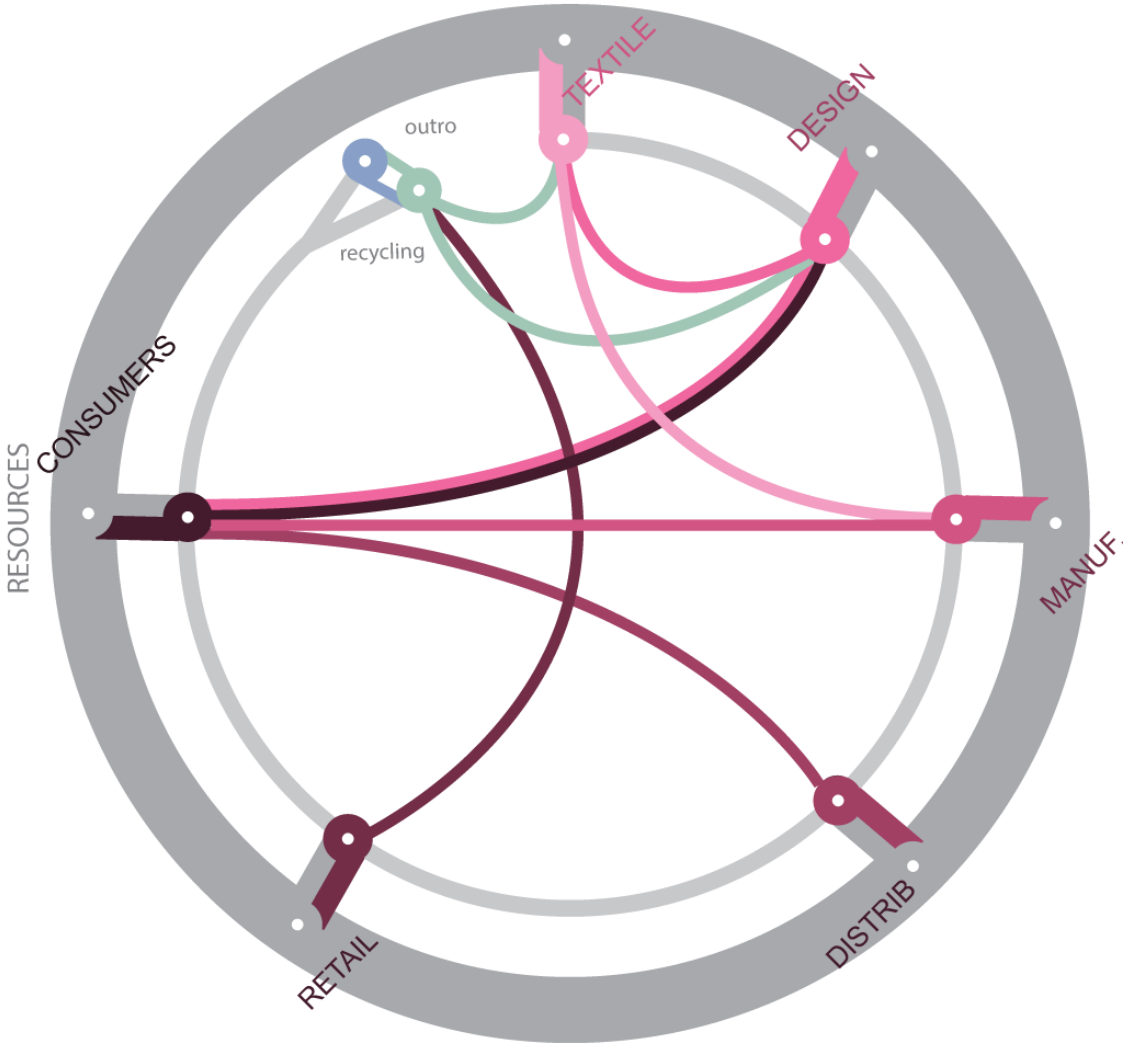
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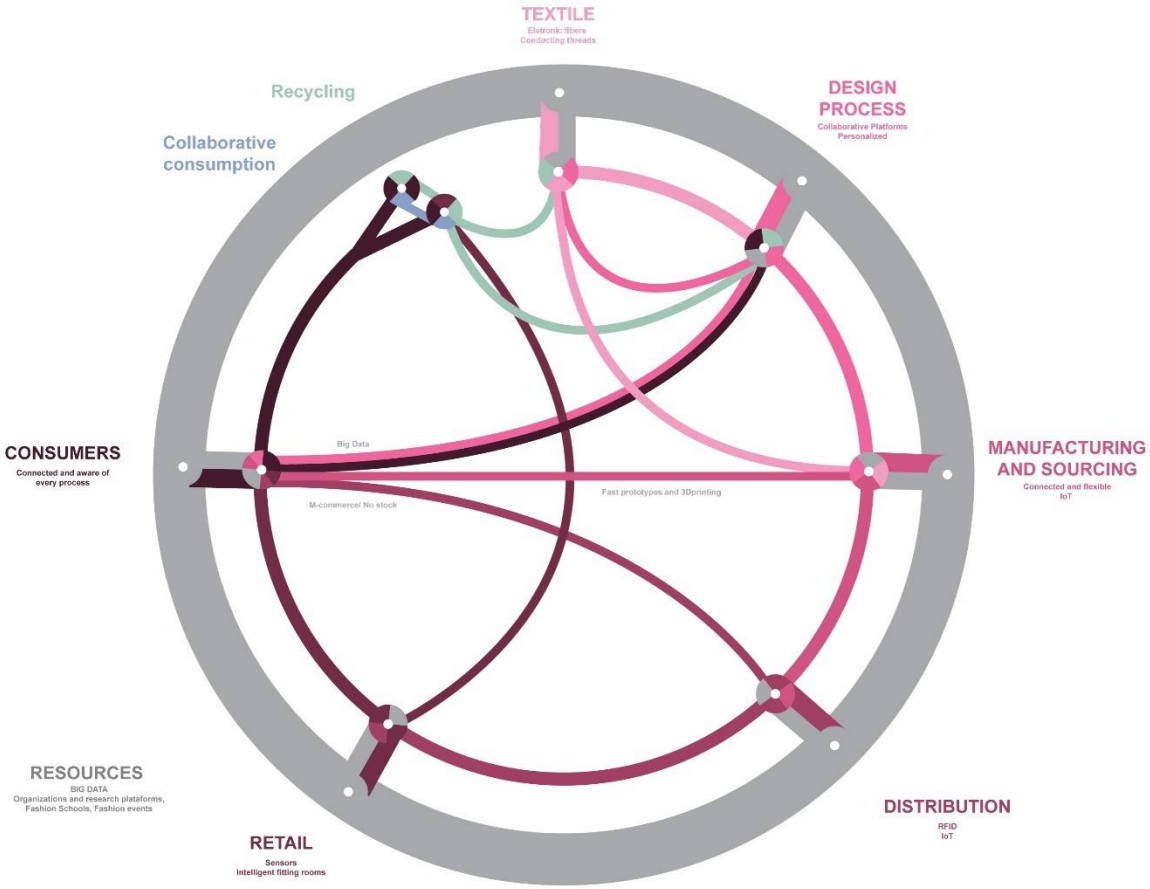
TEXTILE
Eletronic fibers
Condacting threads
Recycling
Collaborative consumption
DESIGN PROCESS
Collaborative Platforms
Personalized
CONSUMERS
Connected and aware of every process
Big Data
M-commerce/ No stock
Fast prototypes and 3Dprinting
MANUFACTURING AND SOURCING
Connected and flexible
IoT
RESOURCES
BIG DATA
Organizations and research plataforms, Fashion Schools, Fashion events
RETAIL
Sensors
Intelligent fitting rooms
DISTRIBUTION
RFID
IoT

APPENDIX 3

Compiled data of the core specialization of each country and creative process of construction of the world maps.

Material Providers (core production)

* Cotton: China, India, USA, Pakistan, Brazil
* Synthetics: China, India, Turkey, USA
* Wool: Australia, China, India, Iran, New Zealand, Russia, United Kingdom, South Africa, Uruguai
* Cashmere: Pakistan, Mongolia, New Zealand, Australia, Iran, China and India
* Silk: China, India, Japan, Thailand, Middle East and Brazil
* Leather: China, Brazil, Italy, Russia, India, Argentina
* Denin: Turkey

Creativity Providers (most influent countries)

- **France**
- **United States**
- **United Kingdom**
- **Italy**

- *Spain*
- *Germany*
- *Japan*

Manufacturing Providers (core production)

- China: Cheap workforce, technology, shoes
- India: Cheap workforce, handwoven, embellished fabric, embroidery
- Ski Lanka: Cheap workforce, embroidery
- Bangladesh: Cheap workforce
- Taiwan: Cheap workforce
- South Africa: Cheap workforce
- Mexico: Geographically close to the USA
- Carribean: Geographically close to the USA
- Eastern Europe: Geographically close to the EU
- Brazil: Beachwear and shoes
- Italy: Leather goods, shoes and tailoring
- United Kingdom: Knitting
- Spain: reshoring
- United States: Sportswear and reshoring


WINE-ROUTE
Sasolburg
R57
Heilbron
R57
Petrus Steyn
R707
Lindley
Arlington
R707
Senekal
Rosendal
Welcome to
THE HEART
of the Free State
RIEMLAND
WILDLIFE
ROSENDAL
ACCOMMODATION
SASOLBURG
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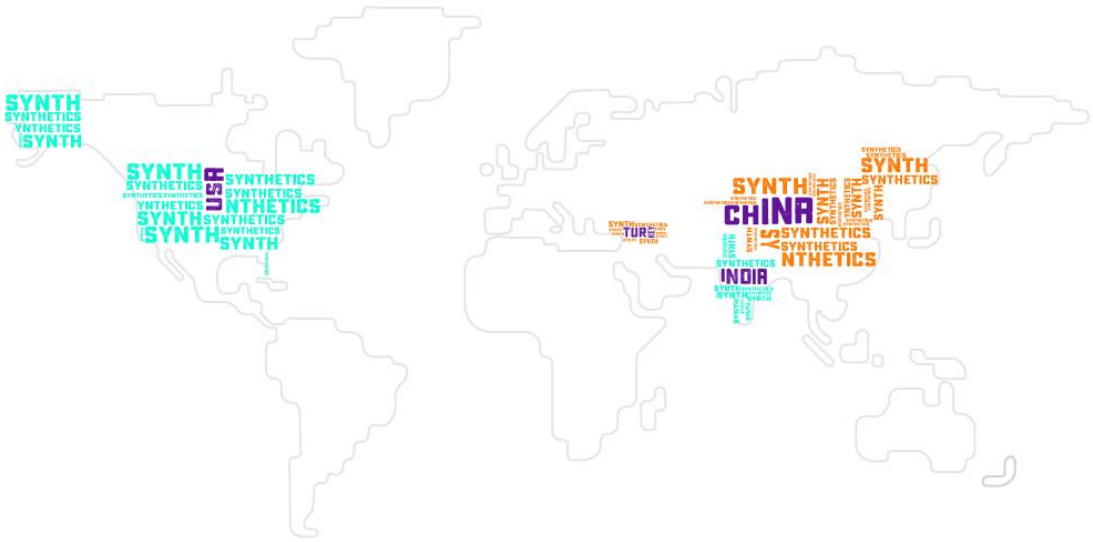
UNITED STATES
CANADA
MEXICO
RUSSIA
CHINA
BRASIL
PERU
BOLIVIA
ARGENTINA

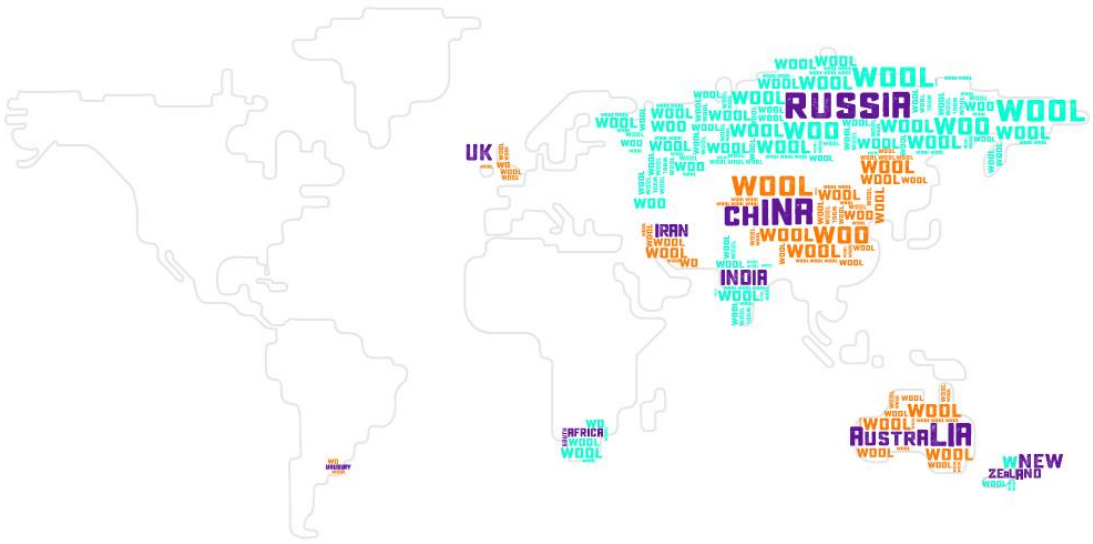
Material Providers (core production)

Synthetics: China, India, Turkey, USA



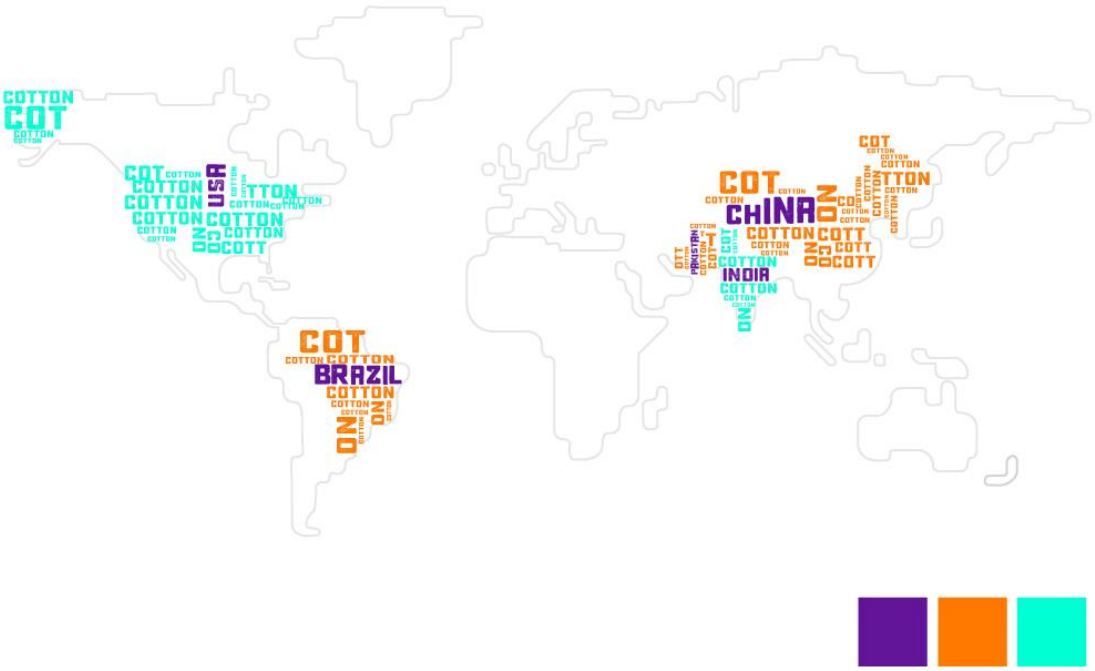
Material Providers (core production)

* Wool: Australia, China, India, Iran, New Zealand, Russia, United Kingdom, South Africa, Uruguai



Material Providers (core production)

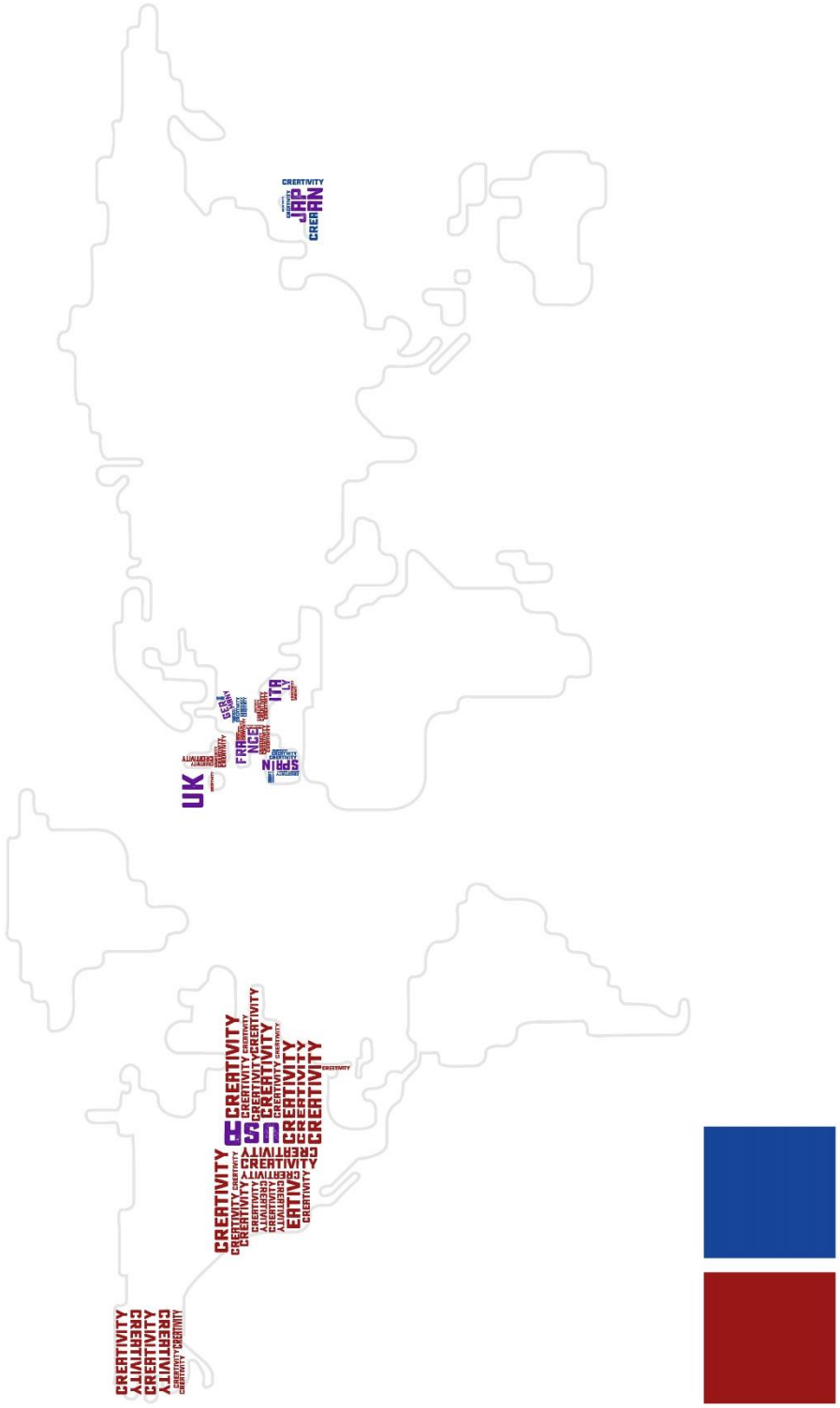
China, India, USA, Pakistan, Brazil

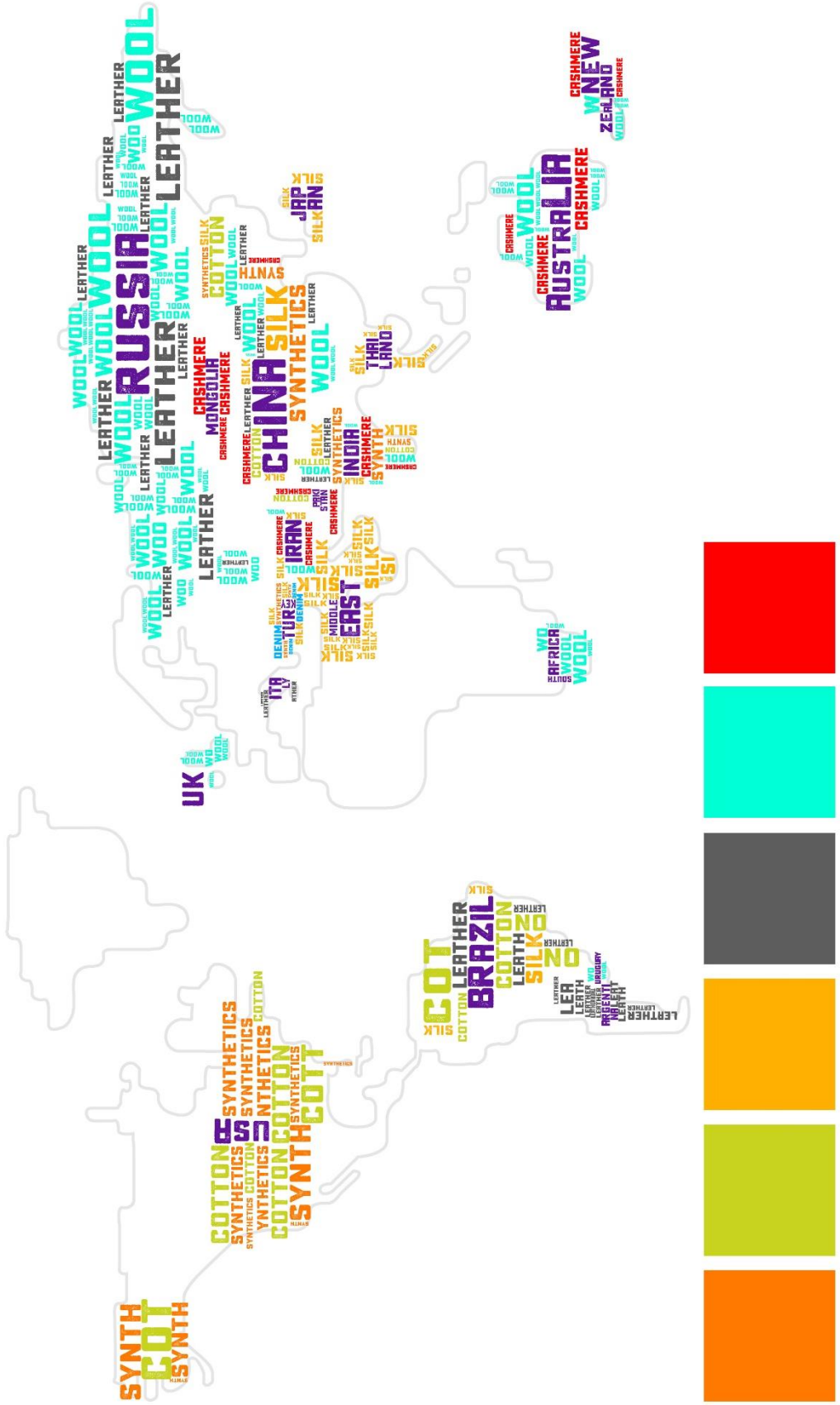


Material Providers (core production)

APPENDIX 4

Geographic Maps of Specialization in big scale.




RUSSIA
WOOL
LEATHER
CHINA
SILK
SYNTHETICS
AUSTRALIA
CASHMERE
NEW ZEALAND
BRAZIL
COTTON
INDIA
IRAN
EAST
UK
SOUTH AFRICA
SYNTH
COT


SHOES
TECHNOLOGY
CHEAPWORK
SHOES
CHINA
CHEAPWORK
TECHNOLOGY
SHOES
CHEAPWORK
TAIWAN
CHEAPWORK
BANGLADESH
CHEAPWORK
CHEAP GIRL
WORK LANKA
CHEAPWORK
EMBELLISHED
EMBELLISHED FABRIC
INDIA
EMBROIDERY
EMBROIDERY
CHEAPWORK
CHEAPWORK
SHOES
CLOSE TO THE USA
GEOGRAPHICALLY CLOSE
EASTERN
EUROPE
TO THE UE
ITALY
SPAIN
KNIT
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CHEAPWORK
SOUTH
AFRICA
CHEAPW
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SHOES
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GEOGRAPHICALLY CLOSE TO THE USA
CLOSE TO THE USA
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