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The importance of the Chinese Information Technology industry in changing the image of the "Made in China"

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TABLE OF CONTENT

INTRODUCTION

The present work focuses on analysing the role and the importance that the Chinese Information Technology industry has had and keeps having in shaping and modifying the negative stereotypes linked to the "Made in China" label. As a matter of fact, it is evident that, especially in Europe and in the US, the common perception of Chinese-manufactured goods is that of low-quality cheap products. However, I believe that such bias is currently undergoing a conceptual transformation, thanks both to governmental policies, aimed at switching the focus of the Chinese manufacturing industry from big quantities of low value-added products to the production of high-quality innovated goods, and to the fast and impressive development that the Information Technology industry is experiencing, promoted by such governmental policies themselves as well.

More in detail, in the first chapter there will be a thorough analysis of the "Made in China" label, of its perception both in China and overseas, and of the factors that contributed to give shape to such negative stereotypes. The tight link between the "Made in China" and the perception of low quality goods at low prices needs to be routed back to the development path of China's manufacturing industry and to the consequent depiction of the country as "the world's factory". Therefore, as different marketing theories like the Country of Origin effect and the Product-country Image effect explain, all Chinese-manufactured products have been receiving a common negative and biased treatment, that consequently shapes the consumers' purchase decisions as well. However, since such attitude has been experiencing a slow transformation, especially because of specific economic policies introduced by the Chinese government with the specific aim of changing such a negative image of the country, the chapter will move to the presentation of the most important one of such policies, the "Made in China 2025" strategic initiative. Its aim is, indeed, that of letting China switch from being the "world's factory" to become an innovated high-technology powerhouse.

The second chapter will then move to the presentation of the Chinese Information Technology industry. Such industry is, as a matter of fact, among the ten key industries that the "Made in China 2025" project focuses on and, because of its recent impressive growth, has been playing a pivotal role in changing the image of Chinese-made products.

After giving a broad presentation of the characteristics of the Information Technology industry in general, as well as its current global situation, the chapter will move to a detailed analysis of the Chinese case. There will be an analysis of the historical and political drivers that pushed the industry's fast growth, a description of the governmental policies aimed at its development, as well as a presentation of the most important High-Tech Industrial Development Zones were the industry is most active. The chapter will then move to the description of the current situation of the Chinese Information Technology industry, supported by relative official data that show the state of the industry in the global market place, before presenting the specific targets set by the "Made in China 2025" plan for the Information Technology industry to meet over the next few years. It will then end with the analysis of the condition of the export trade of Chinese Information Technology products to international markets.

Finally, the third chapter will focus on more concrete examples. The chapter will be composed of two case studies on two of the most important and successful Chinese Information Technology firms: Huawei and Xiaomi. The analysis of the companies' business and marketing strategies, as well as of their internationalization path used to enter foreign markets and, especially, the European one, will provide a practical example of how Chinese firms have managed to overcome the burden of a "Chinese-sounding" brand name and of the negative image of Chinese products in a highly sceptical market like the European one. More in detail, Huawei has implemented a "cost-innovation" strategy and has shaped its marketing and promotional strategy in order to conquer the loyalty and trust of European customers. Xiaomi, on the other hand, has managed to be successful in Europe mainly thanks to the work and support of a very loyal fanbase, that, through the use of word-of-mouth publicity, has contributed strongly to the establishment of the company's business in the western markets. However, even though both firms have had to adapt their business plans to such a different and culturally distant market, they managed to become respectively the second and the fourth biggest smartphone manufacturer and retailer in the world and to compete with the most famous firms of the world, like Apple and Samsung.

前言

本论文的目标是分析中国信息技术行业在塑造和修正与"中国制造"标签相关的负面成见方面所起的作用和重要性。事实上，很明显，消费者对中国制成品的普遍看法是低质量廉价格产品，尤其是欧洲和美国的消费者。然而，从我来看，这种偏见正在经历一个观念上的渐变，这是由于政府的特殊政策，其目的是将中国制造业的重点从大量低附加值产品转向高质量的创新生产，以及由于信息技术产业也被政府政策推动快速的发展。几年来，中国的信息技术行业的水平增长得很快，让中国信息技术产品名扬四海，特别是中国制造的手机和笔记本电脑。这些产品不但是创新高质量的，而且它们的可支付性比其他品牌强得多。

更详细地说，在第一章中，将对"中国制造"的标签、它在中国和海外的认知以及形成这种负面成见的因素进行透彻的分析。"中国制造"与低质量、低价格的观念之间的紧密联系，需要追溯到中国制造业的发展道路上，并由此将中国成为"世界工厂"，特别是因为中国的便宜劳动力全世界的很多国家选择把自己的生产线搬移到中国。这样做，中国的创造者有机会把国外的高技术和经营模式进入中国，来加快全国家的发展。因此，正如不同的营销理论，如原产地效应和产品国家形象效应所解释的那样，所有中国制造的产品都受到了一种普遍的消极和偏见的对待，从而影响了消费者的购买决策。然而，这种态度正在经历缓慢的转变，不但在中国，进而在欧洲和美国。这特别是由于中国政府为改变这种消极形象而采取的具体经济政策。 本章特殊将介绍最重要的一项政策，"中国制造2025"战略倡议。李克强总理 2015 年提出 "中国制造 2025"，着眼于十大重点产业的提升，力争在 2025 年前，使中国成为世界上最强大的高科技国家之一。它效仿了日本和德国等国而，事实上，它与德国的 "工业 4.0" 工业计划有许多相似之处。事实上，建议的目标就是让中国从 "世界工厂" 转变为创新技术强国。为了实现这个目标，该计划希望促进 "自主创新"，即让国家减少原材料进口而同

时加强自给自足的能力，以及 "智能制造"，即加强制造业与信息技术和互联网相结合的能力，实现制造业的智能化和整体改善。

第二章接着详细地介绍中国信息技术产业，它的特点和重点。事实上，这类产业就是"中国制造 2025"项目重点关注的十大重点产业之一，而，由于其近期的快速增长，在改变中国制造产品形象方面发挥了举足轻重的作用。本章先将介绍信息技术行业是什么，它的产品类别、主要生产线以及行业的发展过程。后来，在概括介绍了信息技术产业的特点及其全球现状之后，本章将对中国的案例进行详细的分析。本章将分析该行业快速增长的历史和政治驱动因素，以及旨在发展该行业的政府政策，比如邓小平进行的改革开放或者该行业最活跃的地区：中国高新技术产业开发区的建立。另外，本章将介绍"中国制造 2025"规划为未来几年信息技术产业所设定的具体目标。在战略计划中，还有一项技术路线，来确定中国制造 2025 建议中十大行业的具体发展目的，特别是信息技术行业的。最后，本章在分析中国信息技术产品出口贸易状况之前，将在相关官方数据的支持下，对中国信息技术产业的现状进行描述。事实上，现在中国信息技术行业就是全世界上最成功最活跃的行业之一。

最后，第三章把重点放在更具体的例子上。本章将由两个案例组成，分别针对中国最重要和最成功的两家信息技术公司：华为和小米公司。本章将分析两家公司的商业和营销战略，以及他们进入国外市场，特别是欧洲市场，的国际化道路。在这个方面上，本章将提供一个实际的例子，说明中国企业如何在欧洲这样一个高度怀疑的市场上，克服有中国名字的品牌和中国产品的负面形象的负担。更详细地说，华为在欧洲市场实施了"成本创新"战略，并制定了营销和促销战略，以赢得客户的忠诚和信任。事实上，说到华为手机的话，现在消费者都会想到高质量的产品而很便宜的价格。另一方面，小米在欧洲市场的成功主要得益于一个非常忠诚的粉丝群的工作和支持，"米粉"粉丝群。他们在世界各地通过口碑宣传，为公司在市场上的业务建立和成功做出了巨大贡献。从小米公司来看，粉丝群的角色重要得在欧洲小米先成立粉丝群，然后才开始出口产品。

然而，两家公司都不得不调整他们的商业计划，以适应这样一个不同文化背景的市场。比如说，华为公司需要把大部分利润投入研发上，并发展为欧洲消费者特殊有针对性的一些促销活动。同样小米公司在欧洲开始通过具体零售店销售它的产品，而在中国、东南亚和印度市场本公司有机会只通过电子商务平台做生意。尽管两家公司都不得不改变自己的商业计划，但他们都成功地成为了世界上第二和第四大智能手机制造商和零售商，并竞争与世界上最著名的公司，如苹果和三星。

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CHAPTER 1

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"MADE IN CHINA": FROM WORLD'S FACTORY TO INNOVATION CENTRE

1.1 The Chinese manufacturing industry: the world's factory

The Chinese manufacturing industry is widely acknowledged to be today as large as to be called "the world's factory", however it is also famous not to be technologically strong or innovated enough. China is indeed the world's largest producer in a growing number of manufacturing value chains, as mobile phones, computers, air conditioners, tv sets, refrigerators, ships, and automobiles, as firms of many world's countries tend to outsource their production to Chinese factories. Nonetheless, in most cases, China only enters the so-called "downstream stages", managing only labour-intensive production and assembly lines, causing the share of Chinese domestic value added in many industries to be rather low.[1]

We can affirm, therefore, that the "world factory" phenomenon is the result of many years of massive capital investment promoted by the Chinese government together with import or acquisition of foreign technology used in the assembly of final goods to be later shipped around the world.

1.1.1 The Chinese development path over the last three decades

"In the past three decades, China has transformed itself from an agriculture-based economy to an industrial machine, which processes or assembles 90% of the manufactured goods in the world."[2] From 1980 to 2015, China's economy grew at an

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[1] What the MIC 2025 Means for the Chinese Economy https://www.ispionline.it/it/pubblicazione/what-mic-2025-means-chinese-economy-21108

[2] LI Ling, "The path to Made-in-China: How this was done and future prospects", College of Business and Public Administration, *International Journal of Production Economics,* Elsevier, 2013, p.5

average annual rate of 8.7 percent[3], leading the country to become the "most significant manufacturing miracle since the industrial revolution began".[4]

As a matter of fact, since the introduction of China's economic reform and opening in 1979 the country has experienced such a rapid growth in foreign trade and investment that it has been regarded as a miracle. More in detail, China's rank as an exporter rose from 24th in 1978 to 3rd in 2004, surpassing the United States to become the world's largest recipient of Foreign Direct Investment (FDI) in 2002.[5]

China's miraculous economic growth over the last three and a half decades was supported by different key factors, but the main source can be identified as the combination of "market-oriented policy reforms" and "economic fundamentals". The policy reforms were aimed at letting market-determined output prices and factor prices replace administrative prices, at introducing and strengthening property rights and at reducing barriers to international trade and investment. With economic fundamentals we tend to define a favourable demographic structure and a low initial level of labour cost[6], the combination of which makes China different from most countries in the world and one of the most attractive countries for outsourcing.

In order to understand the strategy that China adopted in order to become a manufacturing powerhouse it can be helpful to divide the country's 30-year's economic development into three major phases: the Incubation Years (1978-1991), the Navigation Years (1992-2001) and the Dynamic Years (2002-present).

- The Incubation Years are characterized by the introduction of the 改革开放, namely the "policy of reform and opening", by the Chinese leader 邓小平 Deng Xiaoping. Such reforms were aimed at lifting China out of poverty and consisted in an almost paradoxical approach of combining central planning, typical of socialist economies, with free market principles inspired by capitalist systems. As a result, the processing trade carried out over this period mainly consisted of foreign

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[3] WEI Shangjin, XIE Zhuan, ZHANG Xiaobo, "From "Made in China" to "Innovated in China": Necessity, Prospect, and Challenges", *Journal of Economic Perspectives,* Volume 31, Number 1, 2017, p.49
[4] LI Ling, "The path to Made-in-China: How this was done and future prospects", College of Business and Public Administration, *International Journal of Production Economics,* Elsevier, 2013, p. 4
[5] SUNG Yunwing, "Made in China: From World Sweatshop to a Global Manufacturing Center?", Department of Economics, Chinese University of Hong Kong Shatin, 2007, p. 43
[6] WEI Shangjin, XIE Zhuan, ZHANG Xiaobo, "From "Made in China" to "Innovated in China": Necessity, Prospect, and Challenges", *Journal of Economic Perspectives,* Volume 31, Number 1, 2017, p.51

investors setting up manufacturing facilities and infrastructure in China to process or assemble raw materials imported from other countries, and then re-export the finished goods.

- The Navigation Years started with the establishment of the Shanghai Pudong New Zone in 1992. The goal of the creation of such a special zone was to let the Chinese manufacture evolve from production of low-cost, low-technology content products to hight-tech oriented products by attracting foreign investment. In those years, the Chinese manufacturers played an important role in exporting China-manufactured or China-assembled products and absorbing advanced manufacturing processing technologies from abroad. Developed nations started outsourcing their production to China, encouraged strongly by the country's low labour costs. This led to the introduction of advanced processing technology and helped the Chinese manufacturers improve the quality of products as well as their manufacturing knowledge. Moreover, as China entered the World Trade Organization (WTO) in 2001, its role in the global manufacturing value chain became more and more fundamental.

- Lastly, the Dynamic Years are characterized by a deep change in the pattern of industrial competition that moved from static to dynamic and by the consequent growth in the Chinese GDP. Over this period new technologies, new products and new markets emerged constantly, leading China's manufacturing industry to experience a significant internal growth. The most noticeable phenomenon of the Dynamic Years is that China started slowly moving away from low-tech content manufacturing towards high-tech processing manufacturing.[7]

As a matter of fact, the global economic competition in the 21st century is no longer simply a matter of low-cost production but has evolved into a "soft power capabilities" competition. What matters the most now is talent, human resources, intellectual properties and, most of all, innovation. Therefore, in order to keep up with this new and developed style of market competition and to move from being a world's assembly line to an innovation powerhouse, China found itself in need to adopt a growth model that

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[7] LI Ling, "The path to Made-in-China: How this was done and future prospects", College of Business and Public Administration, *International Journal of Production Economics,* Elsevier, 2013, pp. 5-8

focused more on innovation and productivity increase.[8] For this reason, the Chinese government in 2015 decided to launch the "Made in China 2025" initiative, along with many other governmental plans, with the aim of changing the focus of the "made in china" paradigm from large production to high quality and innovation.

1.2 Consumers' perception of products "made in China": poor quality at low prices

Beginning to expand to international markets after 1980s, China has become the first country that businesses outsourced to for achieving cost advantage. Especially during 21st century, the production of both the highest-quality brands and also the worst quality products in the market has begun to take place in China.[9] Consequently, products made in China have begun to be approached negatively by consumers, that started to link all "Chinese sounding" brands and products with a negative image.

Western countries' consumers and Chinese consumers themselves shared a common negative feeling about Chinese-made products, thus adapting their purchasing behaviour and decision-making process to such stereotypes. Chinese brands were, therefore, perceived as inferior to their western counterparts and the perception of the value of the product was deeply influenced by the so-called "country of origin effect".

1.2.1 The Country of Origin effect and the Product-Country Image

The Country of Origin effect refers to a psychological effect that describes how consumers' attitude, perceptions and purchase intentions are influenced by the products' country of origin, as it highlights the relationship between product and the overall image of a nation.[10] The Country of Origin (COO) can be defined as "the country which a brand belongs to as perceived by its consumers", as it sometimes differs from the Country of Manufacturing (COM) and from the Country of Assembly (COA) of the same product.

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[8] WEI Shangjin, XIE Zhuan, ZHANG Xiaobo, "From "Made in China" to "Innovated in China": Necessity, Prospect, and Challenges", *Journal of Economic Perspectives,* Volume 31, Number 1, 2017, p. 68
[9] UYAR, Ahmet, "A Study on Consumers' Perception About Chinese Products and Their Willingness to Buy", *International Journal of Eurasia Social Sciences*, Vol: 9, Issue: 32, 2018, p.1122
[10] WU Mengting, "COO-effect on European Consumers' Quality Perception of Mobile Phone", EMBS, 2018, p. 6

However, in the common usage of the term, Country of Origin is generally referred to as the country in which the product was manufactured, so the country that produces such product and to which the product is consequently linked.

There has been extensive research both within the marketing and consumer behaviour field that shows how the country of origin has a substantial impact on consumer products evaluation, since it provides the consumers with essential information about the product, such as quality.[11] What the effect tries to explain is that the more general evaluations or impressions people have of foreign countries, which tend to be formed over time, can serve as stereotypes or judgement shortcuts in their consideration of a product purchase or in the shaping of their attitude toward a given product.

Consumers, as a matter of fact, tend to generalize the quality of all products that come from the same country and link them to a specific image or attitude. As Ditcher (1962) stated, "a product's origin may have a tremendous influence on the acceptance and success of products". As a matter of fact, a positive country image is usually correlated with perceptions of product integrity, pride of ownership, products satisfaction, willingness to buy from specific countries and general product knowledge. Additionally, consumers who have little product knowledge tend to rely more heavily on COO information to judge products than do people with more product-related knowledge. [12]

The country where a product originates from has been found to influence consumers' decision making in two main ways: in the perceptions of the product's quality and in the perception of the purchase value. Consumer metrics studies show that one important consumer products quality criterion is the price that the consumer pays for a product: a low price is usually perceived to be a synonym lower quality, and vice versa. Moreover, customers are more likely to perceive quality of products based on price when other information is not readily available. Equally important as price criteria to the consumer in a purchasing decision is the product's life, or "durability", as it has been demonstrated that product durability is a primary factor that influences repeat purchases. Consequently,

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[11] ANDERSSON, Emelie, "Attitudes towards products "Made in China": The importance and challenges of country of origin", Sodertorn University, 2015, p.21

[12] HAN Gang, WANG Xiuli, "From Product-Country Image to National Image: "Made in China" and Integrated Valence Framing Effects", *International Journal of Strategic Communication*, 2015, p. 64

the concept of "product value" is often a ratio of price and some other dimension of quality, like, for instance, durability.[13]

More in detail, the COO influences the product evaluation of the consumer from three main aspects: cognitive, affective, and normative.

- The cognitive aspect of the Country of Origin gives information about the product's quality, telling the consumer about specific product attributes, like reliability and durability.
- In the affective aspect, the Country of Origin assumes a symbolic and emotional value, linking the product to emotional benefits like social status or national pride.
- Through the normative aspect, lastly, the consumer tend to hold a certain degree of social and personal norms related to the Country of Origin. They will, therefore, consider "correct" to purchase domestic products because it would be considered as supporting the domestic economy, or to avoid buying products of countries with objectionable activities or regimes. [14]

As mentioned previously, consumers tend to generalize and transfer the image of a certain country to its output products quality, creating the so-called "product-country image[15]" (PCI). The product-country image, often linked with the "Made in" label, can be defined as the more general perception of a country that consumers form solely based on their prior perceptions of the country's products or marketing. [16] It is composed of a range of dimensions, such as innovation (technology, industrialization level), design (elegance, style) and workmanship (reliability, durability, skills of national manufacturers). Moreover, such a product-country image serves as a "mid-point" as it connects the people's perceived image of a product or brand on one hand and the perceived overall national image on the other hand, reflecting in this way commonly shared stereotypes. For instance, French-sounding brand names usually have a negative influence on the

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[13] SCHNIEDERJANS, Marc J., QING Cao, OLSON John R., "Consumer Perceptions of Product Quality: Made in China", *Quality Management Journal*, 2004, p.10
[14] WU Mengting, "COO-effect on European Consumers' Quality Perception of Mobile Phone", EMBS, 2018, pp.6-7
[15] "Image" refers to an overall opinion or to the total impression an entity makes on the minds of others.
[16] HAN Gang, WANG Xiuli, "From Product-Country Image to National Image: "Made in China" and Integrated Valence Framing Effects", *International Journal of Strategic Communication*, 2015, p. 64

evaluation of cars and computers, while are synonym of good quality for products like wine and perfume. [17]

Additionally, product-country image contains general impressions which are left by the origin country to the consumers in their previous direct or indirect experiences with products from that country. For instance, if the consumers perceive that the production of high-quality technical devices requires highly skilled and well-educated workforce, they will perceive products produced in developed countries as more suitable.

Besides signalling function of product quality, consumers may prefer products from certain countries due to emotional or symbolic associations they have with such them. These associations may be formed either directly through experience or indirectly through education or social media. Through the purchase and usage of specific products, consumers express their feelings related to the Country of Origin and form their self-image, associating themselves with a certain group, role, or self-image.

As purchasing goods from a country is generally considered to be a way of supporting its economy, consumers tend to express their feelings towards a country's politics by deciding to buy or avoid products from that certain country. For instance, the willingness of Chinese consumers to buy Japanese products was negatively affected by the tense political relationship the two governments had in the past.

Another phenomenon that affects purchasing decisions in relation to the Country of Origin is the "consumer ethnocentrism". It is defined as the tendency to consider it morally appropriate to support one's own country by buying domestically manufactured goods rather than buying foreign countries' products. However, sometimes it is the governments themselves, as well as labour unions or industry groups, who call on the citizenship to mainly buy domestic, as happened for instance when President Trump announced the import tariffs on Chinese products.[18]

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[17] WU Mengting, "COO-effect on European Consumers' Quality Perception of Mobile Phone", EMBS, 2018, p.7
[18] Ivi, pp.8-9

1.2.2 Informational cues

Research shows that consumers tend to base their purchasing decision on so-called "informational cues", which can be either intrinsic or extrinsic.

Intrinsic informational cues are the product's inherent attributes which can be objectively evaluated before and after consumption and include appearance, taste, texture, colour, design, etc. Extrinsic informational cues, on the contrary, are lower level cues and can be defined as any piece of information that is related to the product but that is not physically part of the product itself. They include price, country of origin, branding, outlets, and information provided at the point of sale and on packaging which seeks to influence and to reinforce consumer choice. The relative importance of internal versus external cues varies across product categories and at different stages of the purchase process.

Each cue provides the consumer with a base for developing different impressions regarding the product. Olson and Jacoby (1972) found that a consumer could use up to 4-7 different product attributes as criteria in brand choice decisions. Moreover, consumers are likely to use both intrinsic and extrinsic information cues when evaluating a product but are more likely to use the extrinsic information cues when there are no intrinsic ones available.

Furthermore, is has been demonstrated that intrinsic cues generally tend to be more accurate indicators of quality rather than the extrinsic ones, making them more effective when judging quality. However, the quality expectations that the consumer has of a product at the moment of purchase is usually based both on the perceived intrinsic information cues as well as on the extrinsic ones, as the final expectation is the result of a visual impression based on both of these factors.[19]

As mentioned in the previous paragraph, brand name can be used as an indicator of product quality as it is, like price and country of origin, an extrinsic cue. In order to reduce the importance of country of origin and avoid the overestimation of its effects it is important the support of other extrinsic informational cues in the consumer evaluation process. Such cues may be brand name itself, price, or product warranty, that happens to

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[19] ANDERSSON, Emelie, "Attitudes towards products "Made in China": The importance and challenges of country of origin", Sodertorn University, 2015, pp. 24-25

be useful in the compensation of possible negative country stereotyping like in the case of China.

1.2.3 The Valence Framing effect

Another effect related to the perception of the quality of products made in a certain country is the Valence Framing effect. It explains the role that the media have in creating a specific image of a country in the consumer's mind through the affective nature (valence) of their coverage.

As mentioned earlier, the overall image that people perceive of a country can be determined both indirectly and directly, by mediated or personal experiences. In the indirect creation of the product-country image, mass media certainly play an pivotal role, especially in the influence of the perception of consumers with no direct experience.

In particular, when mass media talk about a foreign country, they tend to feature a specific aspect or a particular event related to it, rather than presenting the country as a whole. Consequently, the strategy that media adopt in covering a certain country-related topic or issue will certainly contribute in shaping how people view such country as a whole. In today's globalized world, where there is an abundance of foreign products and brands, people are often exposed to considerable positive or negative media coverage (the valence frame) regarding the products made in a certain country, that subsequently serves as a factor in forming the people's perceived overall national image.

The valence frame, that implicitly bears positive or negative attributes, highlights opposite aspects of parallelly identical situations or objects, such as gain or loss, advantage or disadvantage, favour or disfavour, thus leading to specific framed evaluations and assessments among the audience. It eventually influences also the people's perception, judgment and decision-making in other various sub-fields of communication.

In conclusion, we can affirm that it is the valence of news frames embedded in media coverage that determines the nature of the product-country image, that can also activate, immediately or in delay, the perception of related overall national image.

1.2.4 How Chinese products are perceived overseas

The commonly held belief in western countries is that China is primarily a source for low value added, labour intensive manufactured goods, usually of questionable quality. As a matter of fact, the "Made in China" label is generally associated with cheap, poor quality, non-durable products especially by European and American people[20].

Consequently, a persistent problem that Chinese manufacturers and exporters constantly have had to face is the negative perception of the quality of made in China products[21]. The origin of such a reputation can be linked to three main reasons.

Firstly, it must be sourced back to China's rapid and nearly unstoppable economic growth, pushed by Deng Xiaoping's gradual opening policy introduced in 1978. Much of what enabled this incredible growth was, in fact, the country's great availability of cheap, plentiful labour that resulted in China's primary manufacturing output being low value-added goods, such as apparel. Data show that, by 1989, the US imports from China were largely dominated by apparel manufacturing products and miscellaneous manufactured commodities making up respectively for 23.96% and 18.4% of the total exports to the US. Both the categories represent labour intensive, low value-added manufacturing sectors.[22]

Since China became popular, initially, as a source of these types of low-cost goods, its competitive advantage was necessarily in low prices, and the idea that such prices were representative of poor quality began to spread.

The second reason is that China has had some questionable quality practices in the past, as its past performance has not been quality-oriented at all but presented a limited interest in quality control practices and fraudulent presentation of the product characteristics. The Chinese government in the past has tried to work towards the institution of some quality control practices that, however, focused mainly on classic inspection and were always in line with the country's strong ideological practices. Research suggests that the main issue was that workers in Chinese factories did not fully

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[20] UYAR, Ahmet, "A Study on Consumers' Perception About Chinese Products and Their Willingness to Buy", *International Journal of Eurasia Social Sciences*, Vol: 9, Issue: 32, 2018, p. 1125
[21] "Made in China" – Quality and Perception: Background of Chinese Production and Exports
https://www.chinaperformancegroup.com/2019/02/made-china-quality-perception-background-chinese-production-exports/
[22] Ibidem

comprehend modern quality management techniques that, consequently, were never widely practiced in China.[23]

As mentioned earlier, China has historically tried to compete in the global market minimizing purchasing prices rather than focusing on physical product quality, thus leading to Chinese low cost and counterfeit products entering the international market and defining the country's production as a whole. This strategy seems to have been successful in making Chinese exports grow, as the share volume of business that China does globally shows. What should not be underestimated, however, is the importance of quality in the long run and its potential effect of consumers purchasing behaviour and decision-making process.

The third and last reason is linked to a series of consumer product safety issues that involved Chinese products in 2007. According to the US Consumer Product Safety Commission (CPSC), in 2007 alone, 67% of all consumer product recalls, and 98% of product recalls from the toy industry, were of goods that had been manufactured in China. Serious health and safety concerns were being raised by such products, leading the negative perception of Chinese product quality to reach its peak in the following years.[24]

Some of the most famous products recalls of 2007, also known as "The Year of China Recalls", include adulterated pet food, melamine contaminated milk products, toothpaste containing chemicals causing kidney failure, and children sunglasses, toys and crayons with evidence of lead poisoning or choking hazards.

The US Department of State argued that the problem arose from China growing too fast: the regulatory environment was unable to keep up with the pace of expansion that Chinese manufacturing was experiencing.

However, after the peak of product recalls of 2007, the number of recalls experienced a significant decline over the subsequent three years. Indeed, China's quality assurance body, the General Administration of Quality, Supervision, Inspection and Quarantine

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[23] SCHNIEDERJANS, Marc J., QING Cao, OLSON John R., "Consumer Perceptions of Product Quality: Made in China", *Quality Management Journal*, 2004, p.9

[24] "Made in China" – Quality and Perception: Background of Chinese Production and Exports
https://www.chinaperformancegroup.com/2019/02/made-china-quality-perception-background-chinese-production-exports/

(AQSISQ), reported that in the first half of 2011, quality complaints from the European Union regarding Chinese imports declined by 45% from the previous year.[25]

Numerous studies were carried out in western countries in order to analyse how consumers perceive Chinese products. According to a study conducted in 2011, consumers perceive products of Chinese origin to be of lower quality than others, as the average Chinese product quality scored 2 out of 10. Another research shows that European consumers tend to mind the brand more than the "Made in China" label and happen to not recognise Chinese brands if they have a western-sounding name, that thus makes them more appealing and powerful in European markets.[26]

For instance, a Uyar (2018) survey shows that when Chery automobile, a Chinese brand, is manufactured in the United States, about 43% of consumers would want to buy it, while only 33% would if the car were produced in China. Likewise, when the Lenovo branded laptop is manufactured in the US, about 54% of the surveyed consumers would want to buy it, compared with 44% when the same product is produced in China. As for the Huawei phones, 39% of consumers would want to buy them when the production is in the US, while only 35% prefer the Chinese production.

The same study also measured the general approach of consumers to Chinese products. According to the data obtained, about 66% of consumers finds the products produced in China "useless or inferior", while 72% of them considers products manufactured in China to be "harmful to health". On average, the most negative attitude towards Chinese products is when there are concerns about health, while other consumers simply do not trust or find Chinese products useless.[27]

1.2.5 How Chinese products are perceived by Chinese consumers

European and American consumers are not the only ones that are concerned about the quality of Chinese-manufactured goods and that have a negative perception of their performance reliability. Chinese consumers also share a common concern about Chinese

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[25] Ibidem

[26] UYAR, Ahmet, "A Study on Consumers' Perception About Chinese Products and Their Willingness to Buy", *International Journal of Eurasia Social Sciences*, Vol: 9, Issue: 32, 2018, p. 1126

[27] Ivi, pp. 1131-1132

products, thus Chinese manufacturers have had to switch their focus on quality also for the products aimed at their domestic market.

According to a Gallup survey[28], in year 2004 the perception of the quality of domestic manufactured products shared by Chinese consumers was on average "poor" or "only fair"; while the quality of products made in foreign countries, even though less familiar to Chinese consumers, was more likely to be seen as "excellent" or "very good".

The prevailing attitude towards Chinese manufactured products was for many years a negative one, despite the strong patriotism and loyalty to the country that characterizes the Chinese people. As Mark Tanner, the director of China Skinny, a Shanghai-based consumer research firm reports, "any self-respecting Chinese consumer would not be seen dead with a local brand" up until the last decade.

However, while the negative attitude in Europe and United States seems to be much more deeply rooted, needing a stronger effort in order to be modified, a revolution in the Chinese consumer sentiment seems to have been spreading over the last ten years. As Chinese brands have begun to emerge, some of which catching up with their more established foreign rivals and even surpassing them in China, the "Made in China" label started to no longer inherently mean cheap, inferior and unfashionable to Chinese consumers.

As data[29] show, in 2011 70% of smartphone sales in China originated from three famous foreign brands: Nokia, Samsung and Apple. At that time, in China there was a big presence of local electronics manufacturers and nascent domestic brand that, in comparison with the stronger foreign ones, were thought to be just a cheap, lacking in quality alternative. Chinese consumers also believed that domestic brands did not carry the same social-proof and status as the expensive and trendy foreign ones.

Together with the evolution of Chinese brands like Huawei, Xiaomi and Oppo, such a stereotyped attitude has already started to change, as at the moment Chinese brands are no longer seen as inferior alternatives to the foreign ones. According to a recent McKinsey

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[28] How Chinese Consumers View "Made in China" https://news.gallup.com/poll/102979/how-chinese-consumers-view-made-china.aspx
[29] How 'Made In China' Became Cool, Shepard W. https://www.forbes.com/sites/wadeshepard/2016/05/22/how-made-in-china-became-cool/#7129d96a77a4

report, 62% of Chinese consumers now prefer Chinese brands over foreign ones if the quality and price are perceived to be equal.[30]

Such a drastic change in Chinese consumer behaviour can be linked to four main factors:

- First of all, many Chinese brands are found to be drastically improving the quality of their products. After initially filling their niche in the world's markets with low cost products, they are now focusing on sophisticated, cutting-edge and high-quality items, leading consumer sentiment, firstly in China and then worldwide, to adjust accordingly.

- Chinese consumers are starting to be more confident about the social value of domestic brands. As some high-end Chinese products are no longer inferior to their foreign competitors according to their functionality, such foreign brands do not represent anymore a way of showing off wealth, sophistication, and cosmopolitanism in China. Brands like Apple and Samsung are now becoming just a normal part of the market landscape, comparable to the large amount of options to choose among many others. According to Tanner[31], the new generation of Chinese consumers no longer need a foreign brand to show their social status.

- The purchase of Chinese brands is increasingly seen as a patriotic act. Chinese consumers' desire to support domestic brands is growing and increasingly represents an idealistic or patriotic choice. Such a phenomenon has also been influenced by key opinion leaders like the first lady Peng Liyuan who declares to only wear Chinese fashion. As Chinese consumers tend to blindly follow and trust the example of people like the First Lady, what has been defined as the "Peng Liyuan effect" has been bringing Chinese brands back into the forefront in the domestic market.

- Lastly, the strong influence of the domestic cinema that paves the way for a renaissance of Chinese culture. The growth of domestic cinema is helping the contemporary Chinese culture use its soft power to promote Chinese brands in the same ways that Hollywood promotes brands like Starbucks of Nike. At the same time, many Chinese brands are starting to have a more advanced understanding of their country's complex market and are adopting more efficient sales and

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[30] Ibidem
[31] Ibidem

marketing strategies, targeting their products to specific market segments and even using famous spokespeople to make their products more attractive to the new generations.

In conclusion, as the focus of Chinese manufacturing is shifting from large amount of products as fast and cheap as possible to high-quality and innovation, Chinese consumers' behaviour has been following accordingly, leading also to a strengthening of Chinese people's national pride and support for local brands.

1.3 Changing the attitude towards "made in China" in western countries

As mentioned above, a common negative attitude towards products made in China can be found amongst western countries' consumers. It is thought to be linked to a deeply rooted belief that China only manufactures low-quality and low-cost products and, therefore, causes consumer to sometimes reconsider their purchase of Chinese-made items.

However, it is evident that over the last few years such an attitude towards Chinese products is experiencing a change even if at a slower pace than that of Chinese consumers.

One big reason for that is that some Chinese brands, especially in the technology field, are slowly making a name for themselves in the international markets and even surpassing their famous western counterparts. Brands like Huawei, Haier and Lenovo in technology have become internationally recognized, perhaps a sign of China's image becoming renewed and transformed. Consequently, western consumers are starting to consider Chinese brands as equally valuable and functional as the western, most famous ones.[32]

Accordingly, the negative "Made in China" myth is slowly being dispelled by the growing success of such Chinese brands, that lately started to focus their manufacturing strategy on innovation and their sales strategy on effective and tailored marketing plans.

Relative data show that Chinese brands like Huawei, Lenovo and Xiaomi have derived more than half of their income from overseas markets. Huawei, the Chinese telecom equipment manufacturer has become the world's third largest smartphone manufacturer. It is evident that electronics and Information-technology products are playing a pivotal

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[32] MADE IN CHINA：Are consumers changing their attitude to Chinese-made products? http://www.business-circle.com.au/en/?p=3152

role in shaping the new identity of "Made in China" products, as their development and innovation is moving at a much faster pace than that of other sectors.[33]

An even bigger role in the realization of such a switch in perspective has been played by the Chinese government itself. As a matter of fact, the government, in order to rebrand the "Made in China" label and to make Chinese brands and products dominate the international markets meeting its strict quality demands, has been implementing some dedicated economic plans and raising its quality control practices. The aim of such initiatives is to put a focus on both the quality of products coming from China as well as the sophistication of those products and the processes used for the industries involved.[34]

For what concerns the improvement of quality control practices we can observe that, as China increasingly tries to dominate the global markets, the demands for a higher focus on quality assurance tend to grow accordingly. The Chinese government is thus trying to stimulate and control Chinese manufacturers focusing more and more on quality assurance practices like inspections, supplier evaluations and testing. Such an initiative is certainly new for a country like China, where, as mentioned earlier, quality control and testing were never considered to be a priority in the manufacturing practices and were not easily absorbed by the Chinese culture.

More in detail, certified quality control providers in China currently must comply with the requirements of the ISO17025 management system, which is recognized by the China National Accreditation Service for Conformity Assessment (CNAS). The CNAS is a member of the International Laboratory Accreditation Cooperation (ILAC), making testing and inspecting results issued by the certified Chinese quality control providers recognized internationally. Consequently, the quality of "Made in China" products increasingly depends on international market requirements, getting closer to that of many other international brands.[35]

Manufacturers themselves are also starting to understand the importance of quality control and inspection, as the higher the level of products quality and technical strength

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[33] Ibidem

[34] "Made in China" – Quality and Perception: Background of Chinese Production and Exports https://www.chinaperformancegroup.com/2019/02/made-china-quality-perception-background-chinese-production-exports/

[35] A New Perspective for "Made in China" Products https://www.hqts.com/new-perspective-made-in-china-products/

the higher the possibility of buyers' satisfaction. Moreover, the proper application of quality management practices helps to avoid the reworking of finished products, the refusal of entry at port, or the recall of the products after they are sold on the market. The improvement and strict application of quality control practices is, therefore, not only a top-down initiative, but also a way for manufacturers to increase their costumers' trust.

1.3.1 Governmental plans

For what concerns the economic plans implemented by the Chinese government in order to switch the focus of manufacturing from quantity to quality, we can observe a series of initiatives formally included in the Chinese 12th and 13th "Five-Year plans"[36].

The 12th Five-Year plan, released in March 2011 and covering the period from 2012 to 2017, formally solidified the government commitment to increase China's global position in both quality and technology. It can be defined as an important step towards what will become a fundamental structural shift for the manufacturing and exporting strategy of the country. Among the most relevant initiatives included in the plan we can find major investments in the so-called "Strategic Emerging Industries" (SEI), a program that will be carried out also throughout the 13th Five-Year plan.

In the mid-2000s, the central government began to repeatedly and publicly declare its intent to upgrade the economy away from traditional industries that relied only on low-skilled labour. Since then the central government policy, funding, tax, and innovation efforts have consistently emphasized the goal of developing a more advanced and technology driven economy. To accomplish this goal, Chinese policymakers created in 2006 the concept of the Strategic Emerging Industries (SEI): seven innovative industries that were just beginning to develop in China and whose expansion could potentially drive China's broader growth as an internationally competitive economy. [37]

The seven Strategic Emerging Industries were, as stated by the government:

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[36] Five-Year Plans are a method of planning economic growth over limited periods through the use of quotas, used first in the Soviet Union and later in other socialist states like China. This method was firstly used in China in 1953, and still today characterizes the formal planned economy strategy of the country.
[37] USCBC, "China's Strategic Emerging Industries: Policy, Implementation, Challenges, & Recommendations", The US-China Business Council, 2013, p.2

1. Energy efficient and environmental technologies

2. Next generation information technology (IT)

3. Biotechnology

4. High-end equipment manufacturing

5. New energy

6. New materials

7. New-energy vehicles (NEVs)

Such an initiative anticipates the intent of moving China away from being a default source of cheaply made, low-value added goods and deploys resources in the creation of high-value added products instead. The goal is to keep being the "World's factory" for the time being, while shifting towards investments in a newly emerging manufacturing environment. As shown by official data, the government was prepared to spend over 4 trillion Renminbi on the above listed industries within the defined five years period, aiming at increasing the SEI contribution to the GDP from 5% to 8% by 2015 and to 15% by 2020.[38]

As the 12th Five-Year plan was coming to a close, the goals of the new 13th plan started to be defined. The 13th plan includes an even bigger initiative, that formally aims at changing the nature of the Chinese manufacturing industry and position in the global markets, namely the new "Made in China 2025" (中国制造 2025) strategic initiative.

Although it is important to affirm that the Made In China 2025 program is formally a departure from the "Strategic Emerging Industries" initiative, the latter is smaller in scope, centred on upgrading advanced technologies to secure the position of the seven strategic emerging industries. Both public and private research and development initiatives would allow Chinese companies to develop cutting-edge technologies in key sectors, accumulate intellectual property and gain access to foreign intellectual property in exchange for access to the Chinese market.

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[38] "Made in China" – Quality and Perception: Background of Chinese Production and Exports
https://www.chinaperformancegroup.com/2019/02/made-china-quality-perception-background-chinese-production-exports/

Comparing the two developmental plans, it appears that the SEI is a narrower, state-driven initiative, featuring regulatory scrutiny over foreign investments in the strategic industries, mergers, joint ventures, access to foreign IP, and agreements between the government and foreign entities for "strategic assets to remain in China or under the control of a Chinese company."

Although there is an overall departure from the SEI initiative, the Made In China 2025 plan does fall in line with China's 13th Five-Year plan by seeking "to advance indigenous innovation and build global champions through linkages with other plans".[39]

1.4 "Made in China 2025"

"Made in China 2025" (MIC) is a governmental initiative launched by the Chinese Prime Minister Li Keqiang (李克强) in 2015, aimed at modernizing China's industrial capability.

It is a ten-year, comprehensive strategy that focuses on developing intelligent manufacturing in the following ten key sectors:

- new information technology (IT)
- numerical control tools
- aerospace equipment
- high-tech ships
- railway equipment
- energy saving
- new materials
- medical devices
- agricultural machinery
- power equipment.

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[39] WUBBEKE Jost, MEISSNER Mirjam, ZENGLEIN Max J., IVES Jaqueline, CONRAD Bjorn, "MADE IN CHINA 2025: The making of a high-tech superpower and consequences for industrial countries", Mercator Institute for China studies, n.2, 2016, p. 7

The plan essentially wants to transform the Chinese industry from large to strong, to encourage the gradual replacement of foreign technologies with Chinese ones and to prepare the ground for Chinese technology companies entering international markets.[40]

The prime objective of the MIC 2025 plan relies on China securing its position as a global powerhouse in hight-tech industries such as robotics, aviation and new energy vehicles, while ensuring Chinese manufacturers' competitiveness against the new emerging low-cost producers, such as Vietnam. The focus is, therefore, on the transition to the so-called "smart manufacturing", that is a new innovation-driven growth model for China. China has, in fact, the ambitious plan to lower its dependency on imported technology by developing its own.

Accordingly, the plan involves replacing China's reliance on foreign technology imports with its own innovations and creating Chinese companies that can compete both domestically and globally, upgrading production technology across the entire industry: large- and small-scale, state-owned and private enterprises. There is, therefore, a very clear shift from a low-cost production focused on quantity to a high-quality technological innovation and smart manufacturing. If the plan happens to be successful, China will move up the value-added chain, positioning itself from a low-cost manufacturer ("the World's sweatshop") to be a direct competitor to countries like South Korea, Japan and Germany[41].

The Plan was drawn up by more than 150 scientists and scholars in 2014 under the strict supervision of the Ministry of Industry and Information Technology, along with twenty other cabinet-level entities that included, for instance, the National Development and Reform Commission, the Chinese Engineering Academy as well as the ministries of science, technology and finance. [42]

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[40] Ibidem
[41] Made in China 2025, Institute for Security and Development policy (2018), p. 2
[42] 'Made in China 2025': is Beijing's plan for hi-tech dominance as big a threat as the West thinks it is? https://www.scmp.com/business/china-business/article/2163601/made-china-2025-beijings-plan-hi-tech-dominance-big-threat

1.4.1 The example of Japan

It is important to stress that China is not the first country to launch such an initiative to dominate in the global market, nor it is the first country whose products suffered from bad reputation that influenced its ability to gain market share.

Over the years 1950s and 1960s, as a matter of fact, Japanese products were, like the Chinese ones in modern days, synonymous of bad quality at low prices.[43] Moreover, the Japanese government, similarly to the Chinese one, also decided to implement some strategies and economic policies in order to develop the country's manufacturing industry and to change the reputation of its products.

The Made in China 2025 plan, as matter of fact, shares many similarities with the Japanese industrial policies introduced in the so-called Golden Sixties. In the 1960s, indeed, the Japanese government introduced a series of industrial policies aimed to transition away from labour-intensive industries and climb the value-added chain realizing import substitution.[44] The goals of the Japanese industrial policy were to enhance the country's economic growth by better allocating its resources over specific key industries which received a special treatment, providing them with a comprehensive, coordinated package of policy instruments. When Japan introduced its industrial policy, the country was just coming out of the devastating Second World War and it needed to rebuild the economy from its roots. Not only it recovered the country's economy, but also managed to reach a superfast GDP growth during the second phase of the policy from the mid-1950s to 1973. Both China and Japan have pursued a massive state-run development and heavy industrialization through subsidiaries and investment in key industries. In both cases, state agencies have succeeded in aligning business incentives to collective outcomes, making long-term goals prevail over short-term economic gains.

The industrial policy played and important role in the reconstruction of the Japanese economy, leading what was a low-income, developing country to become the second largest economy in the world in the 1970s, before China overtook its position in more recent days.

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[43] Made in China: From Scary Bad to Scary Good, Part one: China's exploding middle class drives improvement https://www.qualitydigest.com/inside/management-article/made-china-scary-bad-scary-good-052918.html
[44] What the MIC 2025 Means for the Chinese Economy https://www.ispionline.it/it/pubblicazione/what-mic-2025-means-chinese-economy-21108

However, there are also many differences between the two development plans. First of all, in Japan the government limited itself to provide a vision and administrative guidance and did not intervene directly or provide massive incentive programs like the Chinese government did. Moreover, the Japanese one was essentially an industrial and export-promotion policy based on competition among private actors, who were invited to coordinate especially during the phases of economic slowdown. There were not, as a matter of fact, state-run enterprises that contributed to the implementation of the plan. Unlike in China, in addition, foreign direct investments (FDI) were discouraged and very few, resulting in Japanese companies and private groups attacking foreign markets after having gained a consolidate share of the domestic one. The Japanese long-term industrial development, also depicted as "the Japanese economic miracle", was thus established through the growth of the private sector by introducing regulations and protectionism and only later switched to trade expansion.[45]

1.4.2 "Made in China 2025" and Germany's "Industry 4.0"

"Made In China 2025" also draws inspiration from Germany's "Industry 4.0" (I40) developmental plan. Industry 4.0 is a public-driven national strategy launched in 2013 to "consolidate German technological leadership in mechanical engineering". It is based on the German government's High Tech 2020 Strategy and is one of 10 key projects within the 2020 Strategy. Over a 10 to 15-year period, the plan aims to "drive digital manufacturing forward by increasing digitization and the interconnection of products." This involves adopting information technology and the internet of things to connect its small and medium-sized companies to global production networks, in turn making them more efficient and competitive.

The heart of the "Industry 4.0" idea is Intelligent Manufacturing, namely the idea of applying the tools of information technology to production. In the German context, this primarily means using the Internet of Things [46] to connect small and medium-sized companies more efficiently in global production and innovation networks so that they

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[45] Made in China: From Scary Bad to Scary Good, Part one: China's exploding middle class drives improvement
https://www.qualitydigest.com/inside/management-article/made-china-scary-bad-scary-good-052918.html
[46] Internet of Things can be defined as "the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data".

could not only more efficiently engage in mass production but just as easily and efficiently customize products. The name 4.0 also follows the natural development of the German manufacturing industry, that has already experienced three other industrial revolutions in the past[47].

For what concerns the differences and similarities between the two governmental plans, we can affirm that, even though both projects belong to a national manufacturing industry development strategy, they differ in the national history, strategy implementation and in the specific content of the strategic planning.

The national history of the two countries brought the two plans to be implemented for two different reasons. The German manufacturing industry has always enjoyed a strong competitive advantage in the global market, therefore the "Industry 4.0" plan aims at maintaining its leading position in the development of the global manufacturing. On the contrary, China's manufacturing is still in a state of development and needs to obtain a stronger position in the global arena, thus "Made in China 2025"'s main goal is to develop the Chinese manufacturing and to improve its global position.[48]

However, the main difference between Made in China 2025 and the German Industry 4.0 is that the Chinese plan is a top-down strategy, where the leadership imposes its policy priorities and strategic vision to the development of the manufacturing industry. On the contrary, in the German Industry 4.0 strategy the initiative of the single enterprises has a very important and pivotal role, as the process in basically bottom-up.

Regarding the common trends, we must consider that the "Industry 4.0" and "Made in China 2025" share a similar, although not identical, range of action. They are both under the wave of "re-industry", that follows the new round of industrial revolution, and focus on digitization and network intelligence. As intelligent manufacturing is the main focus of the German project, the Chinese government has also put forward the strategic plan of merging Internet and Industry, aiming at creating the basis for the utilization of the internet to realize manufacturing quickly and without boundaries. Both plans also share

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[47] Cfr. Par. 1.4.5
[48] WANG Lele, "Comparative Research on Germany "Industrie 4.0" and " Made in China 2025", School of Economics and Management, Beijing Jiaotong University, published by Atlantis Press, Beijing, 2016, p. 29

what can be identified as the "time dimension", as they both expect to reach the planned results in a period of time going from ten to fifteen years.[49]

1.4.3 The strategic goals of "Made in China 2025"

The prime objective of the Made in China 2025 strategic initiative is to help China become a leading "Manufacturing Superpower" (制造强国) and "Internet Superpower" (网络强国).[50] The goal is essentially to build an economic structure and capabilities similar to that of Germany and Japan and to become a strong industrial country based on a robust and innovative manufacturing industry.

In order to realize such objectives, China needs to implement "indigenous innovation" （自主创新）and "self-sufficiency" (自主保障)[51]. The government, therefore, seeks to end its reliance on international technology and to upgrade its industrial capability and Smart Manufacturing by ensuring innovation, product quality, efficiency, and integration drive over manufacturing across ten key industries. Further aims involve developing brand awareness of Chinese companies and meeting green development targets. The focus on branding and product quality has international expansion and competitiveness as its main targets. For example, in the agriculture sector, the goal is to establish up to three recognizable brands and up to five internationally competitive companies.[52]

Reducing the reliance on foreign technologies involves creating and developing companies that can innovate through Research and Development (R&D), dominate domestically, and produce competitive exports. The "goal of raising domestic content of core components and materials to 40 percent by 2020 and 70 percent by 2025" will contribute to obtain self-sufficiency and the final goal of localizing the entire manufacturing process.

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[49] Ivi, p.30

[50] WUBBEKE Jost, MEISSNER Mirjam, ZENGLEIN Max J., IVES Jaqueline, CONRAD Bjorn, "MADE IN CHINA 2025: The making of a high-tech superpower and consequences for industrial countries", Mercator Institute for China studies, n.2, 2016, p. 16

[51] Ivi p. 20

[52] Made in China 2025, Institute for Security and Development policy (2018), p. 4

More in detail, as the Chinese government itself officially explains, the MIC plan is to be achieved through the following "Three Steps", each of the duration of ten years and with its own specific goal.[53]

- The first step aims at turning China into a major manufacturing power by 2025 with a focus on the digitalization of manufacture. The goal is to improve the overall quality of manufacturing, to enhance the innovation capacity, to increase the overall labour productivity, and to allow the integration of Information-Technology into the industry to reach an advanced level. During this phase, China will focus on developing several multinational enterprises and industrial clusters with strong international competitiveness, improving significantly the position of China in the global division of labour and the global value chain.

- The second step aims at making China reach an intermediate level among world manufacturing powers by 2035, realizing comprehensive industrialization and increasing greatly China's global competitiveness.

- Lastly, the third step will last until 2049, the centennial of the founding of the New China. Its goal is to allow China's comprehensive manufacturing sector status to become more consolidated in order to let China become the leader among the world's manufacturing powers and reach the world's top list.

1.4.4 Implementing the "Made in China 2025" plan

For what concerns the implementation of the plan, the Chinese government is putting out regulatory changes and introducing specific standards for the ten key industries while setting a policy direction to pursue innovation and development. These standards aim at reducing foreign competition in China and at providing access to technology from abroad. Essentially, while Chinese high-tech companies enjoy massive state banking, their foreign competitors in China face a large number of barriers to market access and obstacles to their business activities.

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[53] MA Huimin, WU Xiang, YAN Li, HUANG Han, WU Han, XIONG Jie, ZHANG Jinlong, "Strategic Plan of Made in China 2025 and Its Implementations, Analysing the Impacts of Industry 4.0 in Modern Business Environments", IGI Global, 2018, p. 3-4

At the same time, central and provincial governments, as well as state-run entities are cooperating to implement supply-side policies to allow companies better develop their manufacturing processes. This includes the creation of 40 national and 48 provincial innovation centres to facilitate partnerships and innovations. Amongst the most substantial tools of financial support for key initiatives, we can find, for instance, a semiconductor fund for Xiaomi, with the function of helping the company develop its first smartphone processor. The government has also introduced various targets for companies, as, for example, an increase in Research and Development as a percentage of sales from 0.95% to 1.68%.

Regarding intellectual property regulations, permits and licenses are being granted to Baidu and other companies to test their self-driving vehicles, while Baidu itself has launched "Project Apollo", a platform that provides hardware and open source code for other manufacturers to develop their own vehicles. The government has also instructed businesses to develop their international brand awareness and become "more familiar with overseas cultures and markets", with the aim of encouraging international investments and acquisitions. International partnerships and acquisitions, with significant public funding, are indeed the primary tool for accessing foreign intellectual property, which is then used to further enhance the capabilities of Chinese companies.

Consequently, Beijing is changing the traditional business relationship of Chinese companies, encouraging investment, consolidation, and access to foreign intellectual property and state-owned entities have begun to merge, particularly with those that overlap with the MIC 2025 target sectors. This, combined with large multinationals already implementing the government's development strategy, will eventually help with the creation of national champions that can more effectively compete with international multinationals.[54]

Since the desire to be a tech superpower is bound up by President Xi Jinping's "Chinese Dream" idea, it is also filled up with strong nationalistic pride. Since the unveiling of the plan in 2015, almost every Chinese province and city have immediately converted every development plan into a "Made in China 2025" initiative.

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[54] Made in China 2025, Institute for Security and Development policy (2018), p. 5-7

Moreover, a Leading Group for Building National Manufacturing Power was also established in 2015 under the leadership of vice-premier Ma Kai, with the goal of coordinating the planning and implementing MIC2025 policies nationwide. This was also followed by a technology "road map" published a few months later that gave even more specific targets for the industries involved in the plan.[55]

1.4.5 Smart Manufacturing

"Smart Manufacturing", as well as "Industrial Internet" and "Industry 4.0", are different labels that can identify the upcoming transformation pursued by the "Made in China 2025" strategic plan. Smart Manufacturing refers to the use of automation and digitization technology in industrial production and organization.[56]

Historically, we can observe that the industrial development has already undergone three major revolutions:

- The first revolution in the late 18th century (Industry 1.0), where mechanical production was driven by steam and waterpower
- The second revolution in the late 19th century (Industry 2.0), characterized by the electrification of machines and mass production
- The third revolution in the 1970s (Industry 3.0), with the development of industrial robots, programmable logic controllers and IT-based production management.

Recently, we are witnessing a potential fourth revolution in global manufacturing, often called "Industry 4.0" or "Industrial Internet". The technological change realized by this revolution is characterized by the combination of advanced internet and communication technologies, as well as embedded systems and intelligent machines.[57]

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[55] 'Made in China 2025': is Beijing's plan for hi-tech dominance as big a threat as the West thinks it is? https://www.scmp.com/business/china-business/article/2163601/made-china-2025-beijings-plan-hi-tech-dominance-big-threat
[56] WUBBEKE Jost, MEISSNER Mirjam, ZENGLEIN Max J., IVES Jaqueline, CONRAD Bjorn, "MADE IN CHINA 2025: The making of a high-tech superpower and consequences for industrial countries", Mercator Institute for China studies, n.2, 2016, p.13
[57] Ibidem

However, since the Chinese industry currently is just starting to adopt the tools and systems of the third revolution, the Chinese definition of "smart manufacturing" often mixes the third industrial revolution with Industry 4.0 and the Industrial Internet. It includes technologies of the third revolution, such as industrial robots, industry software and computerized machine tools, as well as new top-quality production technologies, like wireless sensor networks, intelligent robots, and integrated software processes.

Governments and industries around the world see this fourth potential technological change as a way to reshape the dynamics and rules of the global competition and China itself is recognising this global race as an opportunity to catch up technologically and economically with industrially developed countries. The Chinese government, as a matter of fact, recognises that the country's future economic progress cannot be based on backward production strategies and tools. Therefore, through its political initiative of the MIC 2025 program, the government is providing a large amount of resources to support the technological upgrading of its local enterprises.[58]

1.4.6 Secondary innovation

As already mentioned before, the aim of the "Made in China 2025" plan is to help the country become an innovation-oriented country, strengthening its ability for endogenous innovation and, therefore, reducing its dependency on foreign technology. The typical catch-up path implemented through the plan is the so-called "secondary innovation", that, although based on foreign imported technology, is different from simple imitation and adaptation of imported technology.[59]

First of all, it is important to highlight the fundamental role of innovation. There is, as a matter of fact, a shift in the focus of production from big quantities of low-quality products to small quantities of high value added, technology intensive products. Innovation is, by definition, also a way of raising a company's productivity growth as it can take various forms: creation of new products, new ways of using existing products, new designs, new processes for producing existing products that are more efficient and cost-effective, new

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[58] Ivi, p.11

[59] WU Xiaobo, MA Rufei, SHI Yongjiang, RONG Ke, "Secondary innovation: the path of catch-up with 'Made in China'", *China Economic Journal*, 2009, p.93

ways of organizing business, and new ways of branding and marketing the products or services[60].

In order to improve its endogenous innovation capability, China is working towards enhancing also its ability for original innovation, integrated innovations and re-innovation after the introduction and absorption of advanced foreign technology. Endogenous innovation, in fact, does not limit to the form of original innovation, but also includes secondary innovation.

> "Unlike original innovation, secondary innovation is the specific innovation process, especially in latecomer firms from developing countries, that begins with foreign technology acquisition, especially from pioneer firms from developed countries, and further develops along the imported technology's existing trajectory within an established technological paradigm"[61].

According to Mathews' (2002) definition, the latecomer firm is one that meets the following four conditions[62]:

- It is a late entrant to an industry, not by choice but by necessity
- It is initially resource poor as it lacks technology and market share;
- It has "catch-up" as its primary strategic intent
- It has some initial competitive advantages, such as costs, which it can use to leverage its position in the industry of choice.

Secondary innovation is fundamentally different from simple imitation or adaptation of foreign technologies, as it requires high levels of organizational change aimed at increasing the firm's productivity and competitiveness. The one implemented by Chinese firms is the so-called "imported technology-based secondary innovation process", in which, in contrast with the traditional technological learning model, the interrelations and interactions between acquired technology and local technological environment and

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[60] WEI Shangjin, XIE Zhuan, ZHANG Xiaobo, "From "Made in China" to "Innovated in China": Necessity, Prospect, and Challenges", *Journal of Economic Perspectives,* Volume 31, Number 1, 2017, p. 57
[61] WU Xiaobo, MA Rufei, SHI Yongjiang, RONG Ke, "Secondary innovation: the path of catch-up with 'Made in China'", *China Economic Journal*, 2009, p.93
[62] MATHEWS, John A., "Competitive advantages of the latecomer firm: A resource-based account of industrial catch-up strategies", *Asia Pacific Journal of Management,* 19, no. 4: 467-88, 2002

domestic market environment have a fundamental role. Such interrelation can also be called "understanding".

As basic assimilation simply means utilizing a specific technology involving imitation and some part of adaptation, the mastery of foreign technology can be identified as the last phase of the basic assimilation process, while it represents the first step of secondary innovation.

Secondary innovation, as a matter of facts, is made up of four stages:

1. duplicative imitation
2. creative imitation
3. exploitative innovation
4. explorative innovation

The first stage consists in basic assimilation, with the mere absorption of imported technology. In the creative imitation stage, also knows as "structural understanding", there is an interaction between foreign imported technology and endogenous technological capability (localization). The exploitative innovation stage implements a functional understanding, namely the interaction between localized foreign technology and domestic user requirements (differentiation). Lastly, the explorative innovation stage involves the "conceptual understanding" through the interaction between the emerging foreign technology and a new product concept. The last phase is the one in which value innovation is fully implemented, however, it requires high-level R&D capabilities and advanced production and marketing capabilities.[63]

To explain the effectiveness of secondary innovation, we can refer to a study based on the data contained in the *China Statistical Yearbook on Science and Technology* that computes and compares the investments made by Chinese firms in:

a) Importing and digesting foreign technologies
b) Buying and digesting technologies from other domestic firms
c) Developing their own in-house technological improvement

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[63] WU Xiaobo, MA Rufei, SHI Yongjiang, RONG Ke, "Secondary innovation: the path of catch-up with 'Made in China'", *China Economic Journal*, 2009, pp. 95-96

In year 2000, according to the study, the surveyed firms collectively spent nearly 20% of their technology improvement budget on (a) importing and digesting foreign technologies, about 2% on (b) buying and digesting technologies from other domestic firms, and 78% on (c) developing their own in-house technological improvement.

Over time, however, with the introduction on the secondary innovation-based catch-up path, the share of the first two items expanded. By 2014, in fact, the surveyed firms collectively spent only 11% of their technological improvement budget on (a), about 5% on (b) and 84% on (c).[64]

These numbers show in an indirect way the improvement of China's domestic innovation capacity over the last two decades.

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[64] WEI Shangjin, XIE Zhuan, ZHANG Xiaobo, "From "Made in China" to "Innovated in China": Necessity, Prospect, and Challenges", *Journal of Economic Perspectives,* Volume 31, Number 1, 2017, p. 58

CHAPTER 2

THE CHINESE INFORMATION TECHNOLOGY INDUSTRY

2.1 The Information Technology industry: an overview

In today's globalized world, the continuous creation of new and high technologies, made possible by the rapid development of the Information Technology industry, is promoting the restructuring, optimization and upgrading of the global industry and market, also bringing on profound changes in human lifestyles as well as in production patterns. The constant evolution and popularization of the IT products, that we witnessed since the beginning of the 21st century, has been having a significant impact on the economic, political, social, and cultural development of many countries and, consequently, of the entire world.[65]

2.1.1 What does Information Technology mean?

According to the common usage of the term, Information Technology (IT) refers to all computer-based technologies of human communication. [66]

Information Technology can be said to have begun in 1943 in the UK, with the building of the "Colossus" computing strategic machine used during the Second World War. By the late 1950, computers were already introduced in all major banks in the UK and were later used within the account departments of many big enterprises. Up to this point, however, the technologies used were limited to routine activities of data computation rather than the communication of information. Later, following the development of more powerful, interactive and smaller computers, used together with effective software systems, Information Technology started to spread throughout several different industries, before stretching even further to people's homes and leisure activities.[67]

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[65] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, p.3
[66] ICT Definition https://techterms.com
[67] Ibidem

Among the most recent and substantial developments of Information Technology we can find the digital integration of information and telecommunication technologies, such as fax machines, electronic mail, and, finally, smartphones. With the virtual erosion of the divide between information and communication technologies that followed such developments, it is important to take into account another type of technologies that are tightly linked to IT, namely the Information and Communication Technologies (ICT). [68]

ICT refers to all technologies that provide access to information through telecommunications. It is similar in scope to Information Technology (IT) but focuses primarily on communication technologies. These include the Internet, wireless networks, cell phones, and other communication mediums. In the past few decades, information and communication technologies have provided society with a vast array of new communication capabilities. For example, the ability of communicating in real-time with people in different countries using technologies such as instant messaging, voice over IP (VoIP), and videoconferencing. Social networking websites like Facebook allow users from all over the world to remain in contact and communicate on a regular basis. [69] However, since the two types of technologies are very similar and the difference between the two has not been clearly defined yet, the terms IT and ICT will be used interchangeably throughout the present work.

The development of Information Technology-based systems, like software and hardware, realized through the application of processes of system engineering, is the main scope of the Information Technology industry today.

2.1.2 The Information Technology industry

The McGraw-Hill Dictionary of Scientific & Technical Terms defines the Information Technology industry as "the field of engineering involving computer-based hardware and software systems and communication systems, to enable acquisition, representation, storage, transmission, and use of information."[70] The term, therefore, can be applied quite

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[68] Ibidem

[69] Ibidem

[70] Information technology industry. (n.d.) McGraw-Hill Dictionary of Scientific & Technical Terms, 6E. (2003). https://encyclopedia2.thefreedictionary.com/Information+technology+industry

broadly, as it identifies all the Information Technology oriented organizations. It is mainly used to refer to all organizations or departments that work in the development, maintenance or operation of Information Technology systems.

For what concerns the main Information Technology organizations, they can refer to the following segments, but each organization can have a presence in multiple segments at the same time[71]:

1. Product Companies. Such companies can be defined as the ones that work on products meant to serve a specific use for a customer. Among the most famous product companies, therefore, we can find "pure software product companies", like Adobe Systems, or "hybrid product companies", which work both on hardware and software, like Google, Apple or Microsoft.

2. Services Organizations, that develop IT services and provide them to their customers. Such companies can specialize in providing services only to product companies or can choose to provide a wider range of services, comprising network maintenance, system support, application development, or business process outsourcing.

3. In-House IT Departments. Lastly, we can find that since some of the largest organizations have a wider IT function, they need an in-house centre that provide IT services to the main business.

Generally speaking, there are two main kinds of Information Technology industries, the hardware-based IT, that primarily focuses on manufacturing and is strongly protected by Intellectual property (IP), especially concerning patents; and software-based IT, that provides services either separate or combined with the manufacturing sector and is only partially protected by IP and patent systems.[72] The two sectors of the industry are strongly intertwined, as the manufacturing sector produces equipment or devices (namely hardware) that is later needed for the development of IT services. On the other hand, the service sector of the IT industry has the ability to connect certain networks or

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[71]The Information Technology Industry, PMSoft Consultancy https://pmsoft.com/the-information-technology-industry/
[72] LIU Kung-Chung, RACHERLA Uday S., "Innovation, Economic Development, and Intellectual Property in India and China", Singapore Management University, Part 2 chapter 1, 2019, p.71

software to customers in either industrial or consumer market thanks to the support of IT produced hardware.[73]

The Information Technology industry is, thus, concerned with the realization of improvements in a variety of human and organizational problem-solving situations through the design, development, and use of technologically based systems and processes. Such systems are expected to improve the efficiency of information in several different strategic, tactical, and operational circumstances. It also supports the flow of information, like information systems, allowing the connection of organizations and societies and giving rise to an increasing interdependency on global networks, including the Internet.

2.1.3 The main sectors of the Information Technology industry

As mentioned before, the Information Technology industry broadly comprises companies that produce software, hardware, as well as semiconductor[74] equipment, but can also refer to companies that provide internet or internet-related services.

We can, therefore, identify three main industry groups, that can also be further divided into sub-industries: software and services, technology hardware and equipment, and semiconductors and semiconductor equipment.[75]

The Software and Services industry group can be divided in companies providing Internet services, software services or IT services. Companies providing internet services are the ones that develop and market internet software or provide services like online databases, interactive services, or even online advertising. For what concerns IT services, we can identify two sub-industries: IT consulting, that involves companies providing systems integration services like IT consulting or information management; and Data Processing and Outsourced services, that refers to companies providing services like back-office automation services. Lastly, the software services group can be divided into Application software, System software, and Home Entertainment software. Application software

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[73] Ivi, p.77

[74] Semiconductors are substances that can conduct electricity under some specific conditions and are characterized by a peculiar electrical conductivity that makes them ideal for controlling electrical currents. They are, therefore, widely employed in the manufacture of various kinds of electronic devices.

[75] Information Technology Sector: Overview and Funds, ValuePenguin
https://www.valuepenguin.com/sectors/information-technology

refers to companies producing software for business or consumer use, including enterprise applications and technical software. System software refers to the development and production of database management software and systems. The Home Entertainment software sector includes all companies that produce software like videogames or educational systems for consumer use. Among the most famous companies providing Software and Services we can identify Google, eBay, Facebook, Adobe, Microsoft, PayPal etc.[76]

The Technology Hardware and Equipment industry group can also be divided into three sub-industries: Communication Equipment, Technology Hardware, Storage and Peripherals, and Electronic Equipment, Instruments and Components. The companies that produce Communication Equipment are the ones marketing local area networks (LAN), routers, telephones, and switchboards, but not the ones producing cell phones. The Technology, Hardware, Storage and Peripherals industry includes companies producing cell phones, PCs, servers, electronic computer products and peripherals like monitors, keyboards, and printers. The third industry, the Electronic Equipment, Instruments and Components, can be further divided into four sub-industries: the Electronic Equipment and Instruments sub-industry that refers to companies manufacturing electronic equipment like scanners, lasers, point-of-sale machines, cash registers and security systems; the Electronic Components one includes companies that produce components like resistors, electronic coils, and connection devices; the Electronic Manufacturing Services group refers to companies that make electronic equipment as an Original Equipment Manufacturer [77] (OEM); lastly, the Technology Distributors sub-industry includes all companies that engage in the distribution of hardware and technology equipment to other companies, but that do not produce such equipment nor directly sell it. Examples of companies in the technology hardware and equipment industry are Apple, HP, Motorola, Dell, Huawei, SanDisk, Cisco System etc.[78]

The third, and last, industry group is the Semiconductors and Semiconductor Equipment one. This industry group includes companies making semiconductors, including solar

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[76] Ibidem

[77] OEM refers to any company producing parts or components that are then used in the assembly of another company's end product.

[78] Ibidem

modules and cells, and companies making peripheral equipment for semiconductors, including raw materials and equipment used in the solar power industry.

2.1.4 The importance of the Information Technology industry and the challenges it faces

As already mentioned earlier, the evolution that the Information Technology industry has been experiencing from the beginning of the current century has been crucial in influencing the economic, political, social, and cultural development of many countries in the world. Such a phenomenon has been possible for several reasons.

First of all, we can affirm that Information Technology is the "frontier of scientific and technological innovation" [79], as it represents one of the most rapidly evolving, widely used and pervasive technologies in the world today. Since it already pervaded every discipline and field, the Information Technology industry can be said to give a strong contribution to the economic and social development. The level of a country's IT development, moreover, can be considered as an index of its innovation capability. This is particularly true thanks to the ability of IT in effectively integrating hardware manufacturing with software development, goods production with service management, as well as the real and the virtual economy. The promotion of the interconnection of different disciplines, as well as the widespread use of the Internet, can be said to have encouraged the accumulation and dissemination of knowledge, creating also the conditions for any future breakthrough in the scientific and technological fields. [80]

In addition, Information Technology is already one of the leading industries in many national economies, as it is characterized by a rapid growth rate, fast technological advances, high profit, and close association with other industries. [81] It is important to highlight that IT can be defined as a general-purpose technology (GPT), meaning that it is characterized by a great potential for technological improvement, multiple uses, wide applicability in most economic fields, and, most importantly, mutual complementarity

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[79] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, pp. 4-5
[80] Ibidem
[81] Ivi, pp. 6-7

with other technologies. The combination of IT with more traditional technologies can create the conditions needed to strengthen the whole national economy. IT also has the potential of improving the quality and benefits of economic growth, thanks to its ability of creating new path for the growth as well as new derivative industrial sectors.[82]

Another reason for Information Technology industry's importance is that it can be said to be a major force in the promotion of sustainable development. Being information a production factor virtually available for limitless use, it has the ability of always producing incremental benefits, of expanding sources of growth and of promoting a sustained economic growth. Technology, knowledge, and other new types of production factors can, thanks to the development and use of information, fully and increasingly contribute to the economic development. [83]

Furthermore, the development of Information Technology, just like any other major technological revolution, has had a profound impact in shaping and changing the production patterns and people's lifestyles. As we can observe, the widespread use of Information Technology can help people walk away from their past reliance on the traditional means of communication and transportation, also expanding their range of development and contacts. IT has improved conventional mechanized and automated production, transforming rigid production patterns into flexible ones, leading to the improvement of the ability of enterprises to adapt to changes in the marketplace. Besides, the development of IT has also raised people's standard of living as it is evident from the level of convenience brought by services like online shopping, remote medical services, videophones, smartphones, video on demand, and e-mail.[84]

Lastly, the Information Technology industry has become the strategic high ground in the international competition arena. The more the competitive pressure in the global marketplace intensifies, the more international competition in the IT industry becomes complex. Some of the most important developed countries have been able to expand their influence over developing countries through the establishment of their control over core technologies and online information resources, which basically means gaining advantages in IT and information resources. Accordingly, many developing countries are putting their

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[82] Ibidem
[83] Ivi, pp. 9-10
[84] Ibidem

efforts towards catching up with developed countries, improving their investment environments, promoting industrial transformation, absorbing advanced foreign technologies and are, therefore, pursuing an acceleration of the development of their IT industries. For the same reason, multinational companies are trying to strengthen their position in the global competition field by controlling core technologies standards. [85]

For what concerns the challenges that many countries' Information technology industries are facing, we can affirm that they can are tightly linked to the fact that such industry is amongst the youngest in the world. IT products and services, thanks to the fast and increasingly reliable connectivity that characterizes them, are able to overcome geographical limitation easily. They, indeed, not only will have to face domestic competition, but also a stronger and fiercer global one. Another challenge is represented by the so-called "Rate of Obsolescence" [86], that refers to the fact that the IT industry tends to re-invent itself, as well as its own technical infrastructure, every few years. Accordingly, the rate of adaptation of modern IT companies needs to be very high in order to keep up with the competitors in the market. Moreover, the development of IT products and, most of all, services as enabling technologies has disrupted the traditional business models of many businesses, making it more difficult for companies to find their share and to be effective in the market. Lastly, as IT becomes more and more rooted in traditional products and businesses, problems regarding quality and security become increasingly critical as the responsibility given to technological products and services is increasing too. Global companies relying on IT services and supports need to be sure of their correct functioning if they do not want to risk their entire business.[87]

2.1.5 The global development trends of the Information Technology industry

As already mentioned earlier, the Information Technology industry has become the main arena of the global competition, making it essential for every country and firm to develop and innovate in this sector in order to keep up with global competitors. As we can observe,

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[85] Ivi, p. 12

[86] The Information Technology Industry, PMSoft Consultancy https://pmsoft.com/the-information-technology-industry/

[87] Ibidem

indeed, the countries that lead the world in producing advanced technologies and digital economies are the ones that have obtained and can maintain a global dominance as well as a strategic competitive advantage in the marketplace. As a consequence, in recent years, the development level of digital technologies and Information Technology products has become a critical determinant of a country's economic growth, national security, and international competitiveness. This led the digital economy to have a profound influence on the world's development trajectory and on people's welfare accordingly, as it affects every aspect of the economy, from resource allocation to income distribution and growth.[88]

Accordingly, from the 1990s onward, the development of the world's Information Technology industry has been oriented toward high performance and innovation, wide scope and multiple usage, and has also promoted an orientation towards digitization, integration, and production of more intelligent and network-based goods.[89]

On a general basis, the so-called digital economy comprises goods and services that were either produced using digital technologies or that include such technologies. [90] The Information Technology and Information-Communication Technology industries stand at the centre of these activities, serving as the root of the digital economy and serving it for the development of its performance. Several studies have explained how the Information Technology industry and IT-enabled industries have made and continue making important contributions to economic growth, as well as the link between such growth and IT industry investments. Research estimates that between 1995 and 2010, IT and ICT have contributed substantially to the economic growth of developed, developing and emerging countries. More in detail, data show that "the digital economy is worth 11.5 trillion US dollar globally, the equivalent of 15.5% of the global GDP, and has grown two and a half times faster than the global GDP itself over the past fifteen years".[91] We can affirm that the adoption of rapidly developing technologies, like cloud computing, machine learning, robotic automation, artificial intelligence (AI), the internet of things[92],

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[88] Trends in the Information Technology sector https://www.brookings.edu/research/trends-in-the-information-technology-sector/

[89] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, p. 13

[90] Trends in the Information Technology sector https://www.brookings.edu/research/trends-in-the-information-technology-sector/

[91] Ibidem

[92] Cfr. chapter 1

and 5G technologies can promote a fast and ongoing growth of the IT sector as well as the national economy as a whole.

For what concerns the investments in IT and ICT assets, namely computer hardware, software, internet, and broadband infrastructures, studies explain that growth in such investments are the main reason for increases in GDP growth in advanced economies and country-specific global competitiveness. The impact of IT and ICT assets can be measured as the value of IT and ICT capital services as a percentage of the national GDP. [93] Looking at the main trends in the global marketplace and observing the levels of capital brought by IT assets to the GDP growth, we can safely affirm that countries like India and China have recently emerged as leaders in such field. This can be explained also by the transformation that has been occurring in the IT industry, where a shift from the manufacturing sector to the It service sector, so from hardware to software, has been taking place. This kind of transformation has been particularly pronounced in developing countries, like India and China, thanks to their deeper and wider mobile-cellular networks, as well as the greater accessibility among internet users and the affordability of portable devices like smartphones. These two countries have also benefited from prior investments in the IT sector, which developed internet infrastructure and mobile operating platforms at a very fast pace.[94]

Moreover, it is important to highlight that investments in the IT sector, as well as in R&D innovation, have brought a significant boost to labour productivity, leading to a deeper integration of IT and ICT with the rest of the economy. India and China, as a matter of fact, have made substantial R&D investments, with China's investments increasing more than tenfold, leading to a substantial transformation in their economic models.[95] More in detail, targeted investments in 5G technologies and infrastructure have been demonstrated to contribute to the growth of the digital economy and in the diffusion of its effects to less technologically intensive sectors as well. Furthermore, policy-guided investments, typical of countries like China, have also had a strong impact in the contribution that IT investments have on the national GDP, boosting also labour productivity as a result.[96]

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[93] Trends in the Information Technology sector https://www.brookings.edu/research/trends-in-the-information-technology-sector/
[94] Ibidem
[95] Ibidem
[96] Ibidem

For what concerns the global development speed of the IT industry, we can affirm that, while in the 1990s it experienced an extraordinary fast growth, it has returned to a reasonable level at the beginning of the new century. In recent years, the growth of the Information Technology industry has become steadier, experiencing longer cycles and smaller amplitudes in relation to the more general rate of increase in the global GDP.[97]

More in detail, according to the US Bureau of Economic Analysis (BEA) figures that examine the growth patterns of the sub-industries making up the IT industry, we can observe that the broadcasting and telecommunication industry is the largest in size but also the one that generated the lowest growth rate among all sub-groups, representing only 14% of the total IT industry growth between 2007 and 2017. On the contrary, the data processing, internet publishing and other information services sectors, including the software sector, experienced massive growth rates.[98]

Future projections forecast that the speed at which IT is applied and spread will increase, leading also to a consequent expansion of the related market. Accordingly, many countries in the world are giving their IT industries more attention and support and are also improving their IT policies and regulations. Such initiatives are expected to improve the industry from a global perspective and to promote its sustained growth for the upcoming future, giving a contribution to the acceleration of the upgrading and updating of IT products and services, as well as to the expansion of the demand for information services. This will certainly have an even greater impact on the global economic growth. [99]

Moreover, projections also expect that the enterprise software sector will be the predominant driver of growth in the overall IT spending, followed closely by IT services. On the contrary, the devices sector, represented mainly by the mobile phone market, will experience a moderate growth, while data centres and communication services will even experience a decline in growth. [100] For what concerns emerging technologies, namely Artificial Intelligence (AI), Internet of Things (IoT), and blockchain, they are expected to continue influencing the growth of the IT industry into 2022. Summing up, while the

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[97] Ibidem

[98] Ibidem

[99] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, pp. 15-16

[100] Trends in the Information Technology sector https://www.brookings.edu/research/trends-in-the-information-technology-sector/

growth in expenditures on traditional technologies, namely hardware, software, services, and telecom, is forecasted to maintain a single digit growth rate, the development of advanced technologies will be much more prolific, representing an increasingly great share of the total IT spending. What it is expected is that, as the expenditure on traditional technology systems declines, the growth of the industry will be driven especially by the new key platforms: cloud, mobile, social and big data, and analytics.[101]

The fast growth that the Information Technology industry is experiencing worldwide has also received the influence of the global economic restructuring and is leading to the formation of a series of highly concentrated industrial bases, or clusters. Such bases have the responsibility of guiding the direction of the global IT industry's development. The need for such industrial clustering is tightly linked to the short life cycle that characterize IT products and to the detailed division of labour typical of the IT industry. The time, quality, cost, and service (TQCS) demands of IT users and consumers are relatively high and, as a consequence, the industry accordingly needs a higher geographical concentration of all related enterprises.[102]

Such industrial clustering is also helpful in reducing production and transaction costs, leading to the improvement of the economies of scale and of the overall collaborative capability, which also influences the layout of the world's IT as a whole. As a matter of fact, each firm that gives a contribution to the production chain can focus on its own production process, but can also represent a link in the division of labour and collaborate with other enterprises from the same production chain in a geographically concentrated area. Furthermore, IT influences other industries and gives a steady contribution in upgrading of traditional ones, in creating new technological fields, management styles and business models, and in impacting the entire national economy as a result.[103]

Finally, we should not underestimate the importance of Information Technology intellectual property (IP), as the number of IT patent applications of a country can be considered as a useful index of the country's competitiveness and development level in the IT industry. As a matter of fact, many countries in the world have increased their

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[101] Ibidem
[102] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, pp. 17-18
[103] Ibidem

investment in R&D and adopted specific strategies aimed at obtaining a substantial amount of IT intellectual property.[104]

As we can observe from the table presented below (Table 1), the number of IT patent application in countries like China and Japan, whose IT industry has been rapidly developing in the past few years, have grown considerably from the year 2000 to 2006. On the contrary, the data regarding the US and EU, which have developed earlier and now experience a slower and steadier growth, register a slow increase for EU or even a slight decline for the US.

A common trend amongst large multinationals has been to acquire smaller firms that own some degree of patented technology or even to form intellectual property and patent exchange alliances, thus expanding their own patents and maintaining a competitive edge. Such a phenomenon can be explained by the fact that many multinationals have begun to understand that acquiring IT intellectual property has become the only way to gain and maintain a competitive advantage in the global marketplace.[105]

Table 1: Comparison of IT PCT patent applications in China, the US, Japan, and the EU

	Year						
	2000	2001	2002	2003	2004	2005	2006
US	17,246	15,721	14,395	14,953	14,525	14,077	16,427
EU	11,927	12,508	12,082	12,207	12,016	12,845	12,549
Japan	4525	4994	5934	7288	8658	11,031	11,250
China	221	303	478	723	1078	1075	1853

Source: "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* 2008

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[104] Ivi, p.19
[105] Ibidem

2.2 The development of the Chinese Information Technology industry

As opposed to most industrial countries that have developed through the traditional route made up of the agricultural, light industries, heavy industries, high-tech industries and then IT-oriented industries steps, China's economic development pattern has been characterized by a much faster switch from phase to phase, making the country skip almost directly from the agricultural stage to the high-tech and then IT-oriented industries one.[106] At the moment, China's development route appears to be experiencing a turning point, transforming from the existing quantitative-scale based fast growth to a qualitative-innovation based one, as stated also by the "Made in China 2025" strategic plan's main goal.[107]

The development of the Chinese Information Technology industry over the years has constantly seen a strong intervention of the Chinese government, that, with the introduction and implementation of several guiding policies and reforms, has been shaping and orienting the evolution of the industry. Since the introduction of the Reform and Opening up policies, as a matter of fact, the country's IT industry has expanded very rapidly, especially in the past two decades. In this period of time, the industry has taken a path that has been strongly characterized by governmental guidance, market orientation and open development. This contributed in leading the country's IT industry become an important part of the global economy and market.[108]

2.2.1 The development of the Chinese Information Technology industry: historical and political drivers

In the first years that followed the establishment of the People's Republic of China (RPC) in 1949, the electronic and technology industry was mainly focused on military application. Therefore, it was focused especially on the development of communication devices, radar, computer, surveillance, and electronic warfare equipment to be employed

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[106] LIU Kung-Chung, RACHERLA Uday S., "Innovation, Economic Development, and Intellectual Property in India and China", Singapore Management University, Part 2 chapter 1, 2019, p.73
[107] Cfr. chapter 1
[108] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, p. 21

for military usage. [109] After the Reform and Opening up policy, introduced by Deng Xiaoping in the late 1970s, the industry's orientation switched towards a more civilian use. As a consequence, many Chinese enterprises modified their business strategies and started to produce consumer electronic products like TV sets, video tape recorders, hi-fi equipment. Such a swift from military to civilian application is to be considerate as necessary for the formation of the technical and material foundation for the country's IT industry as a whole.[110]

In 1978, the Chinese premier Deng Xiaoping managed to introduce the innovative policy of the Reform and Opening up, aimed at bringing China away from poverty and at pursuing its fast and sustainable development. In the previous years, indeed, China appeared as a poor, agricultural-based, isolated country. The new plan's goal was to open up certain areas of the country to a more market-oriented economy, allowing them to develop and to attract foreign technologies and managerial know-how, in order to obtain the development and economic growth of the entire country later. Deng Xiaoping's idea was that, through the introduction of targeted reforms, China would have kept its socialist influence and guidance but would have also reached a higher development level that was needed to compete with the developed countries in the world.

The opening up strategy was pursued mainly through the creation of Special Economic Zones (SEZs), where foreign trade and investment were encouraged as opposed to the rest of the country. This appears to have been fundamental for the introduction of advanced technologies, for the pursue of the so-called "secondary innovation"[111] and for the development of the Chinese Information Technology industry later. The official goal was to attract foreign technologies and foreign direct investments in such "Special Zones" through incentives and favourable treatment to then absorb them and utilize them in the rest of the country for its development. The economic model adopted in such areas of the country was, differently from the traditional socialist orientation, a market-oriented model, much more similar to that of capitalist countries.

It is important to highlight that, under these circumstances, the electronic industry represented one of the first sectors to undergo such a market-oriented reform. After

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[109] Ivi, p. 28
[110] Ibidem
[111] Cfr. chapter 1

operating under a strict planned economy for the first years of the RPC, in 1986, the electronic industry took the lead in the realization of a reform in the planned management system leading to the creation of a "socialist market economy" in 1992. [112] The objective of such reform was to realize a gradual shift of the management of the industry from the government to the enterprises themselves. As a result, the government administration and enterprise management were separated, enterprises of the central government were decentralized, and firms were given more decision-making power over their business decisions and operations. Consequently, a large number of domestic firms started to rapidly spring up, giving a strong contribution to the improvement of micro development mechanisms. [113]

Furthermore, we can affirm that the IT industry has always represented a strategic sector for the country's national economy, and, for this reason, its development has always been the objective of many governmental policies and measures. In 1983, as a matter of fact, the Chinese government, following the traditional path of economic planning, decided to speed up the development of the electronics industry, setting as an objective to octuple the industry's gross output value between 1980 and 2000. [114] Moreover, among the "electronics industry's development tasks for the foreseeable future" made at the national working meeting of heads of departments and bureaus of the electronics industry of 1984 it was also stated that "major products and production technologies should reach the level advanced industrialized countries will have reached around 1990, with certain technologies reaching the advanced world level prevailing at that time". [115] The aim, indeed, was to let the electronics industry get at least ten years ahead of the rest of the national economy.

More in detail, in the 1990s the government designated the electronics industry as a pillar of the national economy and the consumer electronics sector as a development priority, under the strategic thinking of promoting informatization. It even implemented a specific project to produce colour TV sets and digital program-controlled telephone exchanges only domestically. Data show that by 1990 the output value of consumer electronics was

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[112] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, p. 24
[113] Ivi, p.25
[114] Ivi, p. 22
[115] Ibidem

more than 50% of the entire electronic industry's gross output value, that, earlier than forecasted by the governmental plan, was already almost eight times that of 1980.[116]

Lastly, it is also important to highlight that the electronics industry was one of the first sectors to use foreign capital in China, introduced thanks to the implementation of the above mentioned Opening up policy. Such choice effectively promoted the adaptation of the industry's business models to the international ones and to the international division of labour mechanisms.[117] Nonetheless, being the Information Technology industry always in need of capital, technology, and knowledge, accelerating its opening up was needed in order to reduce the domestic shortage of funds and to improve the weak technological capabilities that then characterized the industry's firms. The opening up of the industry was realized initially with the introduction of advanced technologies, of processing trade, that consisted in processing or assembling foreign imported materials, and of compensation trade. As a result, the foreign business in the country increased every year and helped China become the largest IT industry base in the world.[118]

2.2.2 The Chinese High-Tech Industrial Development Zones

As mentioned before, the Chinese central government has played an important role in shaping and guiding the development of the country's Information Technology industry. One feature of its intervention that is important to take into consideration is certainly the establishment of the so-called National-level High-Tech Industrial Development Zones (国家高新技术产业开发区), or Technology parks. These areas can be defined as high-tech zones approved by State Council and, therefore, supported by the national government with the aim of developing the country's High-Tech and Information Technology industry through incentives like tax reduction and better infrastructure and access to talent, both features that contributed in the attraction and development of numerous domestic and foreign enterprises.[119]

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[116] Ivi, p. 23
[117] Ivi, p. 26
[118] Ibidem
[119] List of China High-Tech Zones, Slater M https://www.chinacheckup.com/blogs/articles/china-high-tech-zones

In the 1980s, the Chinese Ministry of Science and Technology implemented the so-called "torch program", a plan aimed at developing the country's high-tech industry. Its objective was to facilitate the combination of industry and technology and to develop high and new technology industries. An important part of such program was, as a matter of fact, the creation of the high-tech development zones. The first group of technology areas was made up of 54 zones, established gradually during the 1980s and 1990s, and then expanded to today's amount of 169. These zones have ended up being a core carrier of China's high-tech industry development and a strategic ground for self-dependent innovation, integrating functions of R&D and innovation, entrepreneurial incubation, industrial development, and high-end services.[120]

As the director of the research centre on China's high-tech zones at the academy's Institutes of Science and Development recently stated: "After 30 years, the high-tech zones have successfully fulfilled their mission of pioneering China's innovation systems, driving socioeconomic development, leading high-tech industries' growth and radiating their positive influence to the nation and the world."[121]

As a matter of fact, according to a 2018 evaluation report published by the Institutes of Science and Development of the Chinese Academy of Sciences, in 2017, the national high-tech zones that provided data reported a total of RMB 9.51 trillion yuan (1.38 trillion US dollar) in goods and services, representing 11.5% of the total national GDP. These zones also registered a net profit of around RMB 2.14 trillion yuan and exported goods and services for a value of 478 billion US dollar. Some of the zones' most profitable high-tech fields included electronics and telecommunications, biomedicine, mechatronics, new materials, new and efficient energy, environmental protection, and space technologies, and also gave a great contribution in Research and Development. In 2017 alone, companies from those zones spent more than RMB 616 billion yuan in R&D, making up around 35% of the country's total R&D expenditure.[122]

Amongst the most important Chinese High-Tech Industrial Development Zones we can find the Beijing Zhongguancun Science Park, the Xi'an High-Tech Industries Development

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[120] YANG Yuecheng, GAO Chuan, "High-tech Zones (Science & Technology Parks) and China's Urbanization", Torch High Technology Industry Development Center, Ministry of Science and Technology of the People's Republic of China, 2013
[121] China's high-tech zones advance in innovation https://www.nationthailand.com/noname/30361395
[122] Ibidem

Zone, the Tianjin Economic-Technological Development Area (TEDA) and Binhai High-Tech Industrial Development Zone, and the Shenzhen High-Tech Industrial Zone, also commonly known as "the Silicon Valley of China".

Beijing Zhongguancun Science Park (中关村科技园区)

The Beijing Zhongguancun Science Park is amongst the first High-Tech Industrial Development Zones established at the beginning of the 1980s and is located in the Haidian district, northwest of Beijing. Amongst the key industries of the area we can find electronic information, biomedicine, energy and environmental protection, new materials, advanced manufacturing, aerospace, R&D and service.[123]

During the two decades that followed its creation, the park has gathered almost 20,000 new and high-tech enterprises, like the world-famous Lenovo and Baidu, and has managed to form an industrial cluster for the above-mentioned sectors. Moreover, during the past ten years, the Zhongguancun Science Park has maintained an annual average economic growth rate of 30%, with a utilized foreign direct investment amount of 3.26 billion US dollar. Many "World top 500"[124] companies have joined Zhongguancun, among which more than 20 have set up research centres in the Park. Indeed, today, the number of listed companies in the zone adds up to 189, comprising of 113 domestic and 76 foreign companies, famous for having obtained a large number of technological breakthroughs over the years. As many as 38 of such enterprises have also been listed on the Chinese Growth Enterprise Market.[125]

The Zhongguancun Science Park is composed of the Haidian Development Area, the Fengtai Development Area, the Changping Development Area, the Electronics Town Science and Technology Development Area, and the Yizhuang Science and Technology Development Area.[126]

More in detail, the Haidian Development Area, composed of seven sub-development areas, is characterized by strong infrastructure facilities and a good service system in the fields of investment, guarantee, consultancy, education and training, and property right

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[123] List of China High-Tech Zones, Slater M https://www.chinacheckup.com/blogs/articles/china-high-tech-zones

[124] The "World Top 500" or "Fortune Global 500" is an annual ranking of the top 500 corporations worldwide as measured by revenue, compiled and published by the Fortune magazine and recognized worldwide.

[125] Zhongguancun Science Park http://english.visitbeijing.com.cn/a1/a-XCWF2B5544D24DF4EB8D53

[126] Introduction to Beijing Zhongguancun Science Park http://www.by-cpa.com/html/news/20082/1315.html

transactions.[127] The number of high-technology enterprises located in the area, like Lenovo, Founder and Tsinghua Tongfang, has reached over 7,000. Amongst the seven sub-development areas, it is important to highlight the Zhongguancun Software Development Area, China's largest state-level software research & development centre, that also meets the highest international software development standards. Two other important areas are the Shangdi Information Industrial Base, a comprehensive high-tech industrial area with the Information Industry as the major business sector, and the Yongfeng High and New Technology Industrial Base, focused on fields like nano materials and information technology.[128]

Lastly, the Electronics Town Science and Technology Development Area is a multi-functional and comprehensive high-tech development area mainly engaged in the electronic information industry. It forms a high-tech industrial group composed of businesses that engage in the production of software, communication, display, digital AV products, and new-type components.

Xi'an High-Tech Industries Development Zone (西安高新技术产业开发区)

The Xi'an High-Tech Industries Development Zone was established in 1991, along with the first group of state level high-tech zones designated by the State Council. It focuses mainly on the development of four pillar industries, namely electronic information, advanced equipment manufacturing, bio-pharmaceutical and modern service (software development). In 2017, the Xi'an Hi-tech Zone has generated a gross revenue of RMB 1.45 trillion yuan. Currently, there are about 60,000 enterprises registered in the zone, 50,000 of which only in the software sector. It counts the presence of a large number of renowned international and domestic companies, including over 100 "World Top 500" companies, such as Samsung, Siemens, Honeywell, GE, Emerson, IBM, etc. Many important Chinese companies, such as Huawei, Fast Gear, China Digital etc. have also established their R&D or manufacturing bases in Xi'an Hi-tech Zone.[129]

For what concerns the software sector, one of the four pillar industries of the development zone, a software park, entitled "New Software Town" was established there.

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[127] Ibidem
[128] Ibidem
[129] Xi'an Hi-tech Industries Development Zone https://www.amcham-shanghai.org/en/industrial-park/xian-hi-tech-industries-development-zone

Its strength must be linked mainly to the joint development of the software and information services industry with the multi-cultural environment of Xi'an High-Tech Zone. As a matter of fact, the total income of the development zone in the software and information services sector has reached RMB 240 billion yuan, with an average growth of 20%. Besides, the development of the High-Tech Zone and of the Software Park has been mainly promoted by the high supply of talented software programmers present in the city. In 2017, indeed, there were almost 180,000 people working in the software and information services sector in Xi'an, with an average annual increase of 10,000 people.[130]

For these reasons, the Xi'an High-Tech Industries Development Zone has been depicted as one of the most successful among all the development zones for comprehensive innovation. According to the evaluation made by the Ministry of Science and Technology in 2016, the Xi'an High-Tech Industries Development Zone is ranked third in high-tech knowledge creation and technological innovation and fourth in sustainable development among the other Chinese Development Areas. [131]

Tianjin Economic-Technological Development Area (天津经济技术开发区) and Binhai High-Tech Industrial Development Zone (天津滨海高新技术产业开发区)

The Tianjin Economic-Technological Development Area (TEDA) was founded in 1984 by the State Council of China. Since its establishment, it has experienced a rapid growth in economy, trade, investment, and high-tech industries, thanks to favourable local contributions together with preferential economic policies.[132]

TEDA has undergone three development stages over the years: the first, from 1984 to 1994, was characterized by investments in primary goods with little value added or technological content; the second stage, from 1994 to 2004, saw continuous upgrading and restructuring, leading the high-tech industries to become the leading force in TEDA; lastly, since 2004, as TEDA became part of the Binhai New Area, it started to focuse mainly on specialization and cooperation across regions.[133]

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[130] LIU Kung-Chung, RACHERLA Uday S., "Innovation, Economic Development, and Intellectual Property in India and China", Singapore Management University, Part 2 chapter 1, 2019, pp. 81-82
[131] Ibidem
[132] "White Paper on Environment for Investment in Tianjin Economic-Technological Development Area", Deloitte China, 2017, p.1
[133] "Building Engines for Growth and Competitiveness in China: Experience with Special Economic Zones and Industrial Clusters", The World Bank, chapter 3, 2010, p.88

Generally speaking, the Tianjin Economic-Technological Development Area has been focusing on the development of the high-tech industry, with information and communication technologies representing its leading force. The main objective of TEDA is to attract foreign direct investment for the development of the high-tech industry, whose rapid growth demonstrate the effectiveness of the project. As of the end of 2007, TEDA already included 218 high-tech enterprises and 46 certified software enterprises. Currently, having received also major funding from multinational companies, TEDA counts six high-tech industrial clusters: the electronic information cluster, represented by companies like General Semiconductor, Mitsui, Motorola, Panasonic, and Samsung; the optical, mechanical, and electronic integration cluster, with Honeywell and Merlin Gerin; the biomedicine cluster, with Novo Nordisk and Smithkline Beecham; the new material cluster, with BBA and PPG; the new energy cluster, with Energizer and Tong Yee; the machinery cluster with leading companies such as SEW, SMG, and Toyota; and the environmental protection cluster, with Veolia Water and Vestas.[134]

TEDA can also be defined as the largest, fastest-growing and most profitable among the 57 state-level economic and technology development areas founded in the 1980s. As shown by official data, the area has had a 2007 gross regional product of RMB 93.87 billion yuan, a gross industrial output of RMB 335.067 billion yuan and a total import and export value of 335.01 billion US dollar. Furthermore, as of 2007, the enterprises located in the park have obtained 2,520 patents, 1,029 of which are invention patents and 1,790 of which are owned by domestic enterprises.[135]

For these reasons, TEDA has become the flagship of the Tianjin Binhai High-Tech Industrial Development Zone for which it also represents the main free market zone and has contributed significantly to the economic growth of the city of Tianjin.

The Binhai High-Tech Zone was established in 1988 by the Tianjin CPC committee and municipal government and it was approved by State Council in 1991. Its core area became the first national high-tech zone in 2006, jointly founded by the Ministry of Science and Technology and the Tianjin municipal government, to then become one of the pilot

[134] Ivi, pp.94-95
[135] Ivi, p.88

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innovative Science and Technology Parks under the Ministry of Science and Technology in 2009.[136]

The overall strategy of the Tianjin Binhai High-Tech Industrial Development Area is to create and guide the development trend of the high-tech industry through a high concentration of global innovation elements, together with the establishment and improvement of an international innovation environment and innovation networks.[137] Its core industries include new energy, information technology, and energy saving and environmental protection.[138]

The number of companies engaged in Science and Technology, as well as the overall quantity of innovation of the area, have experienced a steady growth over the years. Currently, the area alone counts 392 technology enterprises whose value exceeds RMB 100 million yuan, with an amount of high-tech enterprises and listed companies accounting for a quarter of the total companies in Tianjin. In 2016, the GDP of the entire area exceeded RMB 150 billion yuan and the general budget revenue reached the milestone of RMB 10 billion yuan. [139]

Shenzhen High-Tech Industrial Zone (深圳市高新技术产业园区)

The Shenzhen High-Tech Industrial Zone has been established by the Shenzhen Municipal People's Government in 1996, with the approval of the State Science and Technology Commission. Its foundation was based on the "management system of one-park for several estates", as the park included the existing Shenzhen Science and Technology Industrial Park, China Science and Technology Development Council, and Jingshan Nongovernmental Science and Technology Industrial Village.[140] The zone currently ranks among the five state-level high-tech industrial parks that receive special support by the Chinese Central Government and has been certified as a "High-tech Products Export Base"

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[136] Tianjin Binhai Hi-Tech Industrial Development Area http://subsites.chinadaily.com.cn/tianjin/binhai/2018-02/12/c_145594.htm

[137] Ibidem

[138] List of China High-Tech Zones, Slater M. https://www.chinacheckup.com/blogs/articles/china-high-tech-zones

[139] Tianjin Binhai Hi-Tech Industrial Development Area http://subsites.chinadaily.com.cn/tianjin/binhai/2018-02/12/c_145594.htm

[140] Shenzhen High-tech Industrial Park
http://www.cistc.gov.cn/englishversion/China_ST/China_STAdd4.asp?column=162&id=1028

and as a "China APEC High-tech Industrial Park".[141] The park has benefited largely from the special economic policies destined to China's Special Economic Zone. As a matter of fact, Shenzhen was among the first five SEZs established in the country and underwent such a fast development that was designated as the Special Economic Zone model, that all the other Chinese cities should have followed.

Among the park's core industrial fields, we can find electronics, information technology, bioengineering, new materials and optical mechanical-electronic integration technologies and products. [142] The development park follows the development orientation of cultivating "independent development capacity", and focuses on keeping the high-tech industries' own intellectual property and on introducing big international companies for technological exchanges.[143]

The success of the Shenzhen High-Tech Industrial Development Zone can be demonstrated by data regarding its economic output. As a matter of fact, in 2012, the park realized a gross industrial output of RMB 486.5 billion yuan, while its value-added industrial output reached RMB 131.5 billion yuan, 26% of Shenzhen's total.[144] Moreover, the output of products with self-owned intellectual property represent over 50% of the total output of the area, with most of the products, like computers, cell-type switchboards and network systems, enjoying a big share of the Chinese and global market.

The high-tech zone is, indeed, the headquarter of many large domestic IT firms, like Huawei, ZTE, Kingdee, and Skyworth, while having also attracted investments from many multinational companies, like IBM, Philips, Compaq, and Thomson. Finally, with the introduction of a Software Park in the Shenzhen High-Tech Development Zone in 2001, by the end of 2012 over 750 firms had already set up their operations there, giving an even stronger contribution to the development of the industry. Amongst the most

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[141] Shenzhen High-tech Industrial Development Zone https://hkmb.hktdc.com/en/1X09WO9R/hktdc-research/Shenzhen-High-tech-Industrial-Development-Zone
[142] High technology and development zones in China http://www.lehmanlaw.com/resource-centre/links/high-technology-and-development-zones-in-china.html
[143] Shenzhen High-tech Industrial Park
http://www.cistc.gov.cn/englishversion/China_ST/China_STAdd4.asp?column=162&id=1028
[144] Shenzhen High-tech Industrial Development Zone https://hkmb.hktdc.com/en/1X09WO9R/hktdc-research/Shenzhen-High-tech-Industrial-Development-Zone

important software developing firms based in Shenzhen, we can find Tencent, MCM, Kejiang, and Aspire-tech. [145]

2.2.3 China's path of Internet development

Necessary for the effective development of the Information Technology industry and for the right application of new and high technologies, the development and governance of the Internet has always represented an important area of interest for the Chinese government. As a matter of fact, over the last 23 years of Internet development, the country has been able to find an effective path of Internet governance "with Chinese characteristics".[146]

Such a path has been represented by the following features:

- The leadership of the Chinese Communist Party in all cyberspace and Internet affairs. Even in the development of the Internet, the role CCP is that of decision-maker, planner, organizer, developer, and promoter of the country's access to the web as well as of the construction and administration of the network.[147]

- The commitment to a people-centred development path. Over the last 23 years, the Chinese government has been following the idea of developing the Internet to benefit its people, as the web has not only become a place for people's study, work and everyday life, but also a platform for receiving public services. As a consequence of the government efforts, the country has been speeding up the coverage of information services, reducing the application costs and meeting the needs of the people at the same time.[148]

- Innovation as the main driver of development. In developing the Internet and Internet-related industries, China is following the "Five development concepts". Such concepts are innovation, coordination, greenness, openness, and sharing, with innovation always at the first place. The country is, indeed, speeding up its innovation capability in system and mechanisms, ideas, technology, and culture

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[145] Ibidem
[146] "Report on China Internet Development 2017", Cyberspace Administration of China (CAC), p. 17
[147] Ibidem
[148] Ivi, p. 18

through the application and use of the Internet itself. The country is also attracting a large number of Internet entrepreneurs and firms, which then contributes to enhancing the employment of new technologies and new industries.[149]

- The combination of opening-up and self-reliance. For what concerns the development of new technologies, China is trying to implement self-dependent innovation, self-reliance, and self-improvement, while also cooperating with other countries in developing fundamental, general and core technologies. As a matter of fact, the country is trying to maintain the introduction of advanced technologies from outside, making the Chinese Internet development always able to keep up with the world's trends and standards. This way, the government also hopes to develop game-changing technologies and breakthroughs in R&D for cell phones, computers, servers and searching technologies.[150]

- Finally, the implementation of related policies and regulations. For what concerns the development of the Internet and Internet-related industries, the Chinese government has formulated a series of policies and strategies aimed at supporting the enterprises engaged in such fields. Accordingly, the country has worked towards speeding up the examination and approval practices, improving the funding and patent systems, establishing a unified market, reducing the burdens for enterprises, and creating a favourable environment for their development.[151]

2.3 The state of the Chinese Information-Technology industry today

2.3.1 The achievements of the Chinese IT industry

As previously shown, over the last two decades, the Chinese Information Technology industry has undergone an impressive growth, becoming one of the key industries in the country's economy. More recently, the increasingly growing demand in the communications market has promoted an even more rapid development of the IT infrastructure and communications equipment manufacturing, also facilitating

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[149] Ibidem
[150] Ivi, p.19
[151] Ibidem

breakthroughs in the wireless, landline, exchanges, and transmissions fields. The figure below (Figure 1) describes the impressive growth that the Chinese IT industry has experienced between 1989 and 2007 in terms of value added to the country's total GDP. In only eighteen years, as a matter of fact, the value added by the Chinese IT industry to the GDP has grown almost seventy times bigger, moving from RMB 19.5 billion yuan to RMB 1,308.3 billion yuan.

Figure 1: IT industry value added in China
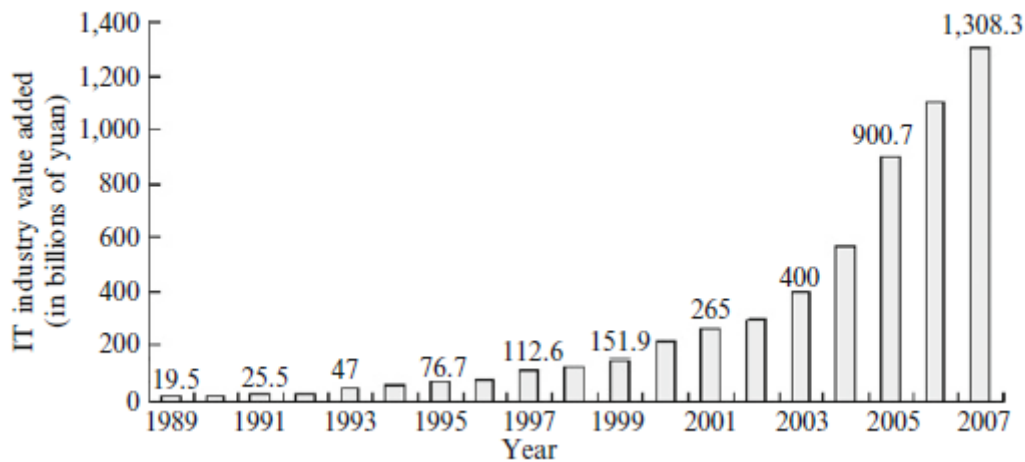
Source: "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University*, 2008

Besides, it is important to highlight that the Information and Communication Technology (ICT) market is among the most dynamic ones in the Chinese economy. It is expected to reach 8.1 trillion US dollar in terms of value added, representing almost 55% of the total Chinese GDP.[152]

In terms of spending, the Chinese Information Technology market is the fourth largest one in the world, only after the US, Japan and Germany. Moreover, China ranks as second largest software-outsourcing destination next to India and its IT industry is expected to grow at an annual average of 15% over the next five years.[153]

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[152] China - Technology and ICT, ExportGov https://www.export.gov/apex/article2?id=China-Technology-and-ICT

[153] China IT industry and the software sector in Beijing, Shanghai, Shenzhen https://www.allianceexperts.com/en/knowledge/countries/asia/the-it-industry-in-china/

Moreover, as shown by the graph below (Figure 2), in 2016, China's electronics industry ranked first in the world for market size. Its market size, indeed, was already of 1,551.7 billion euro, almost three times that of the US that reached 575.1 billion euro.

Figure 2: Leading countries in the electronics industry in 2016, based on market size (in billion euros)
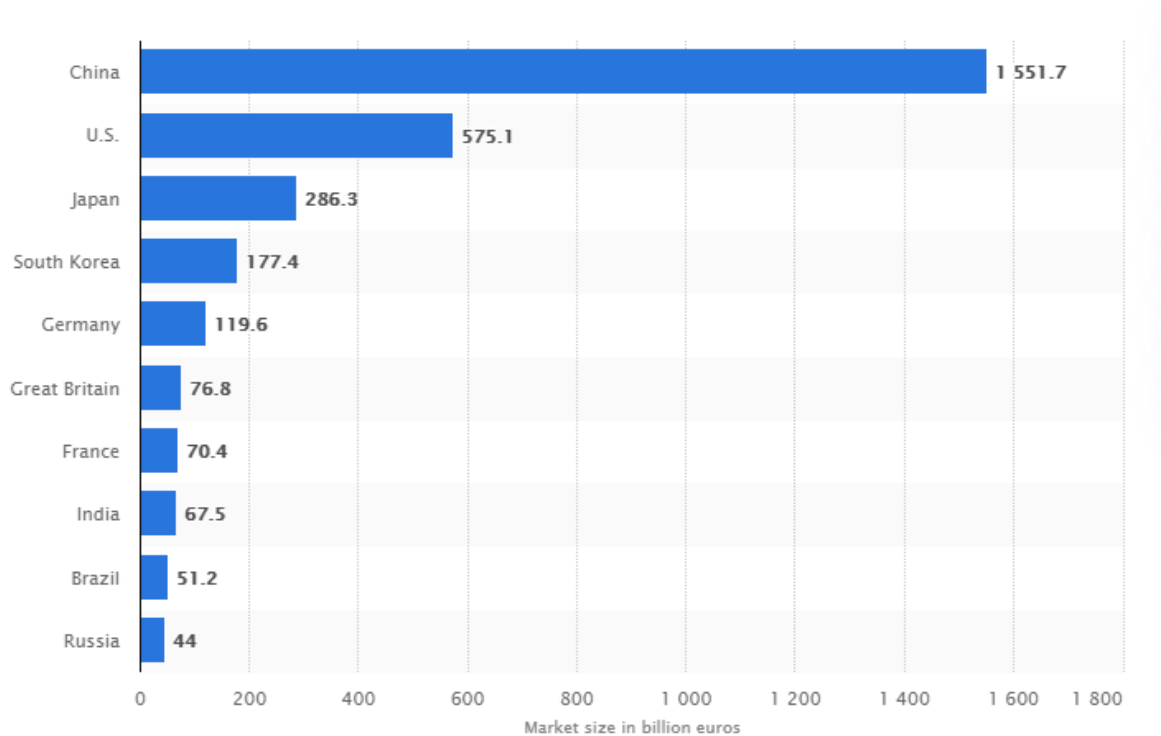
Source: Statista research department, 2020

More in detail, looking at the main sub-industries of IT, in 2019, China was the world first producer, consumer and exporter in the hardware and consumer electronics sector, according to official data of the Chinese Ministry of Industry and Information Technology (MIIT). It ranked as world's largest producer of mobile phones, computers, and televisions, producing respectively 90%, 90% and 70% of such devices in the world in 2018.[154] On the other hand, the software and IT services sector, according to the MIIT official data, have shown an annual growth of 15% in 2019, with a total revenue of RMB 3.28 trillion

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[154] China remains world's largest producer, consumer, exporter of consumer electronics
http://en.people.cn/n3/2019/0409/c90000-9564908.html

yuan.[155] As a matter of fact, Chinese IT enterprises are still mainly hardware-based and focus on manufacturing of technological equipment, while the software sector is still smaller than the hardware one, despite developing fast.

This is especially evident in the smartphone industry, in which China appears as particularly strong and competitive. According to data analysing the trends of the global smartphone industry from 2018 to 2020, Chinese brands like Huawei and Xiaomi ranked amongst the world's five most successful smartphone producers, together with Apple and Samsung.

Table 2: Worldwide Top 5 Smartphone Company Unit Market Share (%)

Quarter	2018Q1	2018Q2	2018Q3	2018Q4	2019Q1	2019Q2	2019Q3	2019Q4	2020Q1
Samsung	23.5%	21.0%	20.3%	18.8%	23.0%	23.0%	21.8%	18.8%	21.2%
Huawei	11.8%	15.9%	14.6%	16.2%	18.9%	17.7%	18.6%	15.2%	17.8%
Apple	15.7%	12.1%	13.2%	18.3%	11.8%	10.2%	13.0%	19.9%	13.3%
Xiaomi	8.4%	9.5%	9.5%	6.7%	8.9%	9.7%	9.1%	8.9%	10.7%
vivo	5.6%	7.9%	8.3%	6.9%	7.4%	8.6%	8.4%	7.7%	9.0%
Others	35.0%	33.6%	34.1%	33.1%	30.0%	30.8%	29.1%	29.5%	28.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: IDC corporate

According to the above table (Table 2), in the second quarter of 2018, Huawei had already surpassed Apple in terms of market share and still maintains the second position worldwide, only after Samsung. Xiaomi, another Chinese brand, has been ranking fourth worldwide over the last two years. Moreover, both brands have been experiencing a relatively steady growth over the years.

In terms of the state of China's network infrastructure, it has been constantly upgrading and evolving, as it has been recognised as a new type of public infrastructure with a great potential in promoting the economic and social development of the country. As stated by the Chinese president Xi Jinping himself, "China should strengthen network infrastructure

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[155] China's software, IT service sector report double-digit revenue growth
http://english.www.gov.cn/archive/statistics/201908/03/content_WS5d4523c9c6d0c6695ff7e297.html

construction and in-depth information resource integration, and open up the 'main artery' of information for economic and social development".[156] Accordingly, China has been implementing the "Broadband China" strategy, aimed to facilitate a faster and more affordable connection. The main objective is to promote the construction of new network infrastructure and to improve the capacity of broadband access, as well as the Internet service quality and application. Such a strategy has already obtained some tangible results, as in 2017, the number of Internet broadband access ports has already reached 739 million, with 1.36 billion users of mobile communication, 890 million of which used 4G technologies.[157]

Looking at breakthroughs in Internet Information Technologies in detail, by the end of 2016, China had already 227,365 new inventions patents for the production of computers and other communication and electronic equipment. Such numbers have led China to become the leader in the world in terms of international patent registration four times in five years. Moreover, China has been having a strong influence in the formulation of international telecommunication technology standards, contributing to the completion of IETF standards[158] in the fields of interconnection, cyber security, routing protocols and development of next-generation core technologies.[159]

One other important sector in which the Chinese Internet service and IT industry has been making numerous and remarkable achievements is the digital economy. As a matter of fact, China is in the forefront for what concerns e-commerce, information service, network terminal equipment, Internet finance, and sharing economy. Chinese e-commerce, the most active field amongst all the above mentioned, involved already 467 million online shoppers in 2016, with a transaction volume of RMB 5.2 trillion yuan in the same year.[160]

Finally, China is also considered a pioneer country in the field of Artificial Intelligence (AI). Many Chinese companies are, indeed, experimenting greatly with artificial intelligence. For instance, the Chinese software company Baidu has recently financed the establishment of the world's first AI park in Beijing, and last year the Chinese government

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[156] "Report on China Internet Development 2017", Cyberspace Administration of China (CAC), p.3
[157] Ibidem
[158] The Internet Engineering Task Force (IETF) is an international standard developing organization, focused mainly on Internet and Internet protocol suite (TCP/IP) standards.
[159] "Report on China Internet Development 2017", Cyberspace Administration of China (CAC), pp. 4-5
[160] Ivi, p.5

actively promoted efforts in the implementation of AI aimed at surpassing all Western countries. Currently, China is the second largest investor in AI enterprises, after the US, and aims at becoming the global leader by 2030.[161]

2.3.2 The strategic areas of future development for the Chinese IT

As the Information Technology industry covers many areas and categories, the Chinese government has encouraged the speeding up of the development of a limited number of key basic industries as the direction of the IT industry's future evolution path. Such key areas are microelectronics, computers, software, key components, and new materials, but also the industries in which the country is already competitive internationally, like broadband mobile communications, next-generation networks, and information services.[162]

Microelectronics is considered to be the foundation of the IT industry and it is currently characterized by a growing market demand and a great amount of investment. For China it is important to plan an effective implementation strategy for original innovative R&D in microelectronics, focusing mainly on high-end design technologies, key processing techniques, specialized equipment, and key materials in order to realize the independent innovation that the country is pursuing.[163] One important sector of the microelectronics field is that of key manufacturing equipment and measuring instruments, as they are necessary for the evaluation of the development level of a country's microelectronics industry. Electronic measuring instruments are especially important in testing the performance of all electronic materials, products, equipment, and systems. In addition, electronic measuring instruments are also applied in different sectors of the national economy, therefore China considers the speeding up of the development of measuring instruments, as well as R&D on trial production of digital audio and video products, as essential for the future of the IT industry.[164]

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[161] How China is leading the world in tech innovation
https://www.telegraph.co.uk/connect/better-business/business-solutions/china-technology-innovation/
[162] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, p. 35
[163] Ivi, p. 36
[164] Ivi, p. 38

For what concerns the development of computers, it is important to highlight the pivotal role that the computing technology has in the IT industry. The improvement of high-performance computing will, indeed, strengthen the country's IT as a whole, increasing, as a result, the overall information processing efficiency of the country.[165]

Even more important is to speed up the development of the software developing sector, as it has been defined as the soul of IT. The development of the software industry comprises the improvement of basic software as well as that of embedded software. Basic software can be defined as the foundation for all kinds of application software, essential for any support software system. Embedded software refers, on the other hand, to the integration of hardware and software. The Chinese strong hardware manufacturing industry offers a favourable market condition for the development of embedded software and the efficient integration of hardware and software will possibly create unique and practical product series, increasing the growth potential of the entire industry.[166]

Finally, the development of networks and network infrastructure also plays an important role for the future of the Chinese IT. As a matter of fact, it has the potential for enhancing independent innovation, safeguarding the national information security, as well as transforming and upgrading the IT industry. Following the recent transformation of the network industry, that now promotes the integration of telecommunications, computer and radio/cable TV networks, the country needs to adapt its development accordingly. Therefore, China especially needs to carry on investments in R&D on next-generation network and wireless broadband technologies.[167]

2.4 The Information Technology industry in the "Made in China 2025" strategic plan: the role of governmental policies

The introduction of policies like the "Made in China 2025"[168] for the development of the Information Technology industry is a strategic initiative implemented by the Chinese government aimed at meeting international competition, accelerating industrial development, and promoting the modernization of the domestic industry at the same

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[165] Ivi, pp. 39-40
[166] Ivi, pp. 42-43
[167] Ivi, p. 43
[168] Cfr. chapter 1

time.[169] Historically, the Chinese government has always had a strong influence in guiding and defining the path of the country's development, for which has contributed in clarifying the strategic orientation, formulating rules for the marketplace, improving systems and mechanisms, and strengthening laws and provisions aimed at the creation of favourable industrial environments.

The IT industry is no exception, as we can safely say that in the electronics industry field the government has given a strong contribution in recent years and has indicated clear strategic paths for its development. This is especially visible in the "Made in China 2025" strategic plan, introduced in 2015 with the objective of making China a strong technological superpower by 2049. Amongst the ten key industries targeted by the plan, indeed, the Information Technology industry and, more precisely, the next generation IT, play a very important role. The ten key industries, as a matter of fact, are not all pursued at the same intensity, but China has made clear its intent to prioritize emerging industries and other fields that are conducive to the country's digital and high-tech ambitions.[170] Amongst the strategic objectives of the "Made in China 2025" plan we can find the realization of indigenous innovation through smart manufacturing [171] and the development of high-technologies. This way, the country hopes to move away from the diffused negative perception of "made in China" products and to become a globally recognized innovated high-tech manufacturer.

As shown by the below graph (Figure 3), the new generation IT industry, especially in 2017, has represented the target of a substantial number of national-level actions and development plans, in comparison to the other industries involved in the project. When it comes to such emerging technologies and digitalization, as the Central Committee of the CCP and the State Council jointly also issued in an "Outline of the National Innovation Driven Development Strategy (国家创新驱动发展战略纲要) in 2016, China's aspiration is to overtake its foreign competitors.[172]

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[169] "Development of Our Country's IT Industry in the New Period", *Journal of Shanghai Jiaotong University,* No.10, 2008, p. 50

[170] ZENGLEIN, Max J., HOLZMANN Anna, "Evolving Made in China 2025: China's industrial policy in the quest for global tech leadership", Mercator Institute for China Studies (MERICS), 2019, p.21

[171] Cfr. chapter 1

[172] ZENGLEIN, Max J., HOLZMANN Anna, "Evolving Made in China 2025: China's industrial policy in the quest for global tech leadership", Mercator Institute for China Studies (MERICS), 2019, p. 23

Figure 3: Number of national-level action and development plans
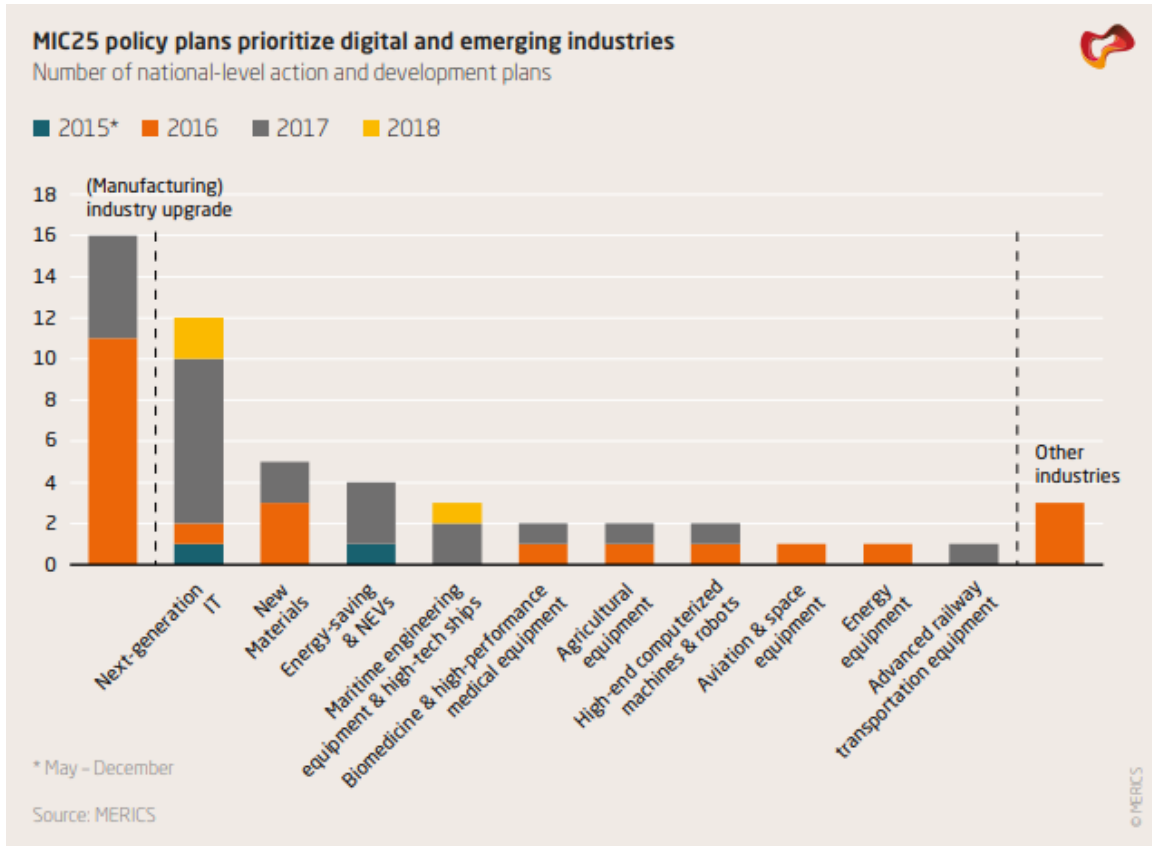
Source: "Evolving Made in China 2025: China's industrial policy in the quest for global tech leadership", Mercator Institute for China Studies (MERICS), 2019

Accordingly, the main focus of the development of next generation IT has been put on smart manufacturing and Artificial Intelligence (AI). We can observe that in China more than 500 smart manufacturing industrial parks have already been founded, many of which focus on big data, new materials, and cloud computing. AI, on the other hand, covers a wide range of interconnected fields that could virtually refer to everything from hardware to software and tech applications such as facial recognition or interconnected vehicles.[173]

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[173] Ivi, p. 22

2.4.1 The Technology Roadmap: industry-specific targets and goals

The planners of the "Made in China 2025" strategy have changed and improved the goals and priorities of the plan several times since its introduction in 2015. For what concerns its tech ambitions and goals, a "Key Area Technology Roadmap" has been released in 2015 and then updated in 2018 by the National Manufacturing Strategy Advisory Committee (NMSAC, 中国制造强国建设战略咨询委员会). The document was drafted by more than 400 academic and industry experts and it was given political weight by the Chinese vice-premier Ma Kai himself.[174]

The Technology Roadmap sets priorities for the domestic Science and Technology field in response to China's ever greater need for autonomy and self-development. Overall, the roadmap stresses the need for the "smartification" (智能化) of aspects such as new materials and manufacturing equipment, in order to upgrade the ten core industries listed in the plan. Moreover, strong emphasis is put on Chinese products with their own intellectual property rights, which reflects the focus on strengthening China's endogenous innovation capabilities.[175]

More in detail, the Key Area Technology Roadmap sets specific targets for the domestic production localization for each of the key industries of the plan. We will now focus on the targets for the New Information and Communication Technology (ICT) industry.

In the document, the new ICT industry is divided into four different sub-sectors, namely Integrated Circuits, ICT Equipment, Operating System and Industrial Software, and Intelligent Manufacturing Core Information Equipment.[176]

For what concerns the Integrated Circuits sector, the targets comprise the increase by over 20% of the average profits for the industry by 2025. Domestic technologies are expected to reach a leading international level in fields like Internet communication, cloud computing, the Internet of Things, etc. Moreover, key equipment materials should be included in the international procurement system, together with the establishment of an advanced, "secure and reliable" industrial system of integrated circuits. By 2030, the main

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[174] Ivi, p.32

[175] Ivi, p.33

[176] "Unofficial USCBC Chart of Localization Targets by Sector Set in the MIIT Made in China 2025 Key Technology Roadmap", the US-China Business Council, 2016

sectors in the integrated circuits industrial chain should reach a leading international level, with a rapid development and integration of Chinese companies.[177]

The ICT Equipment sector refers to Wireless Mobile Communication, New Generation Network, and High-Performance Computer and Service. The targets for the first sub-sector are to allow domestic ICT equipment, terminals, and chips respectively cover 80%, 80%, and 40% of the domestic market, and 40%, 45%, and 20% of the international market by 2025. Those of the New Generation Network claim that the domestic fibre optic communication equipment should gain 60% of the international market share by 2025. Of this, 25% of the international market should be dominated by domestic routers and switches. Lastly, for the third and last sub-sector it is expected that by 2025 domestic high-performance computers and servers cover 40% of the international market, and more than 80% of the domestic one. Within this 80% coverage, the Chinese produced high-end servers are supposed to cover 50% percent of the market, while the share of domestically produced brand servers should be higher than 30%.[178]

For what concerns the Operating System and Industrial Software sector, the goal is to achieve breakthroughs in most of the "key technologies," and to formulate an indigenous and controllable operating system and industrial software and standards system by 2025. Of these, indigenous software is expected to gain over 50% of the domestic market, while Internet Plus Smart Industrial Clouds are supposed to reach a penetration rate of more than 60% in all key industries.

Finally, the Technology Roadmap sets specific targets for the Intelligent Manufacturing Core Information Equipment sector as well. The desired results are the creation of an indigenous, controllable, safe, and reliable intelligent manufacturing core information equipment production environment, together with a new technology system. Moreover, related domestic products should manage to obtain a leading position in the domestic market. Such products are also expected to cover 60% of the domestic market, and to be of advanced international quality.[179]

[177] Ibidem
[178] Ibidem
[179] Ibidem

2.4.2 Reducing the dependence on foreign technology: Chinese tech suppliers

Being the realization of indigenous innovation and the reduction of the reliance on foreign imports one of the core objectives of the "Made in China 2025" plan, the still high dependence of the country on foreign high-tech products and components represents a problem for the effective application of the strategy. As a matter of fact, China still imports the vast majority of the advanced components and machinery used for the manufacture of its products, as explained by the Chinese National Bureau of Statistics.[180]

This is especially true for what concerns the components needed for the production of IT goods, like computers and telecommunication devices, as explained by the graph below (Figure 4).

Figure 4: Strong dependence results in negative trade balance (in bn USD)
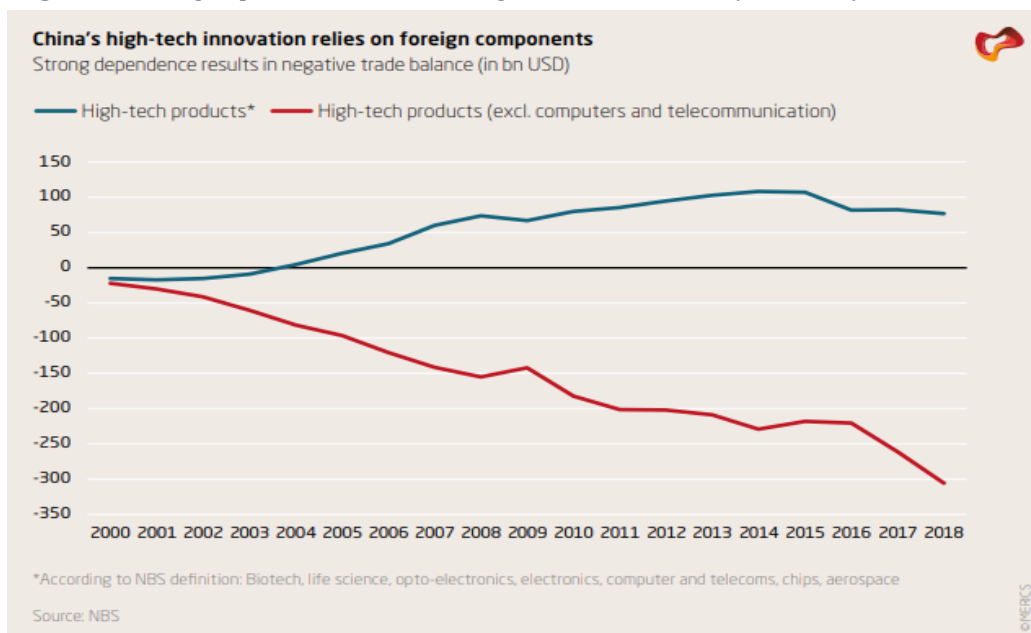
Source: "Evolving Made in China 2025: China's industrial policy in the quest for global tech leadership", Mercator Institute for China Studies (MERICS), 2019

What is evident is that the strong dependence on foreign components results in a negative trade balance. However, while the dependence of High-Tech products has been always relatively high over the years, that of High-Tech products with the exception of computers and telecommunication devices has been reducing greatly. This highlights the weigh that

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[180] ZENGLEIN, Max J., HOLZMANN Anna, "Evolving Made in China 2025: China's industrial policy in the quest for global tech leadership", Mercator Institute for China Studies (MERICS), 2019, p.24

such product categories have in determining the negative effect of the dependence on foreign components. The development of domestic technological components and of Chinese tech-suppliers, therefore, represents a basic prerequisite for the effective improvement of the country's IT industry and for the implementation of the smart manufacturing revolution.

Currently, the Chinese industry has a huge demand for technologies like high-end machine tools and smart sensors, but the Chinese tech-suppliers do not possess the necessary abilities to serve the domestic market and to let the industry enter the indigenous innovation era.

For this reason, one other objective of the Made in China 2025 plan is to reduce the technology gap between foreign and domestic suppliers, in order to substitute foreign supplies with domestic ones completely by 2025. Accordingly, domestic tech suppliers have been receiving a strong support from both national and local governments in the form of tax rebates for high-tech enterprises and software developers, as well as direct capital injections from government funds. [181] Such aid is intended to strengthen the possibility of establishing a Chinese smart manufacturing industry, leading eventually to the creation of a fast developing market with a large number of domestic players. [182]

2.5 The export of Chinese IT products

The modern revolution in the mobile telephone sector, experienced recently by most developing countries has continued to drive the global trade demand in information technology goods, field in which China ranks as top trader for all categories.[183] As a matter of fact, in the last two decades, the global IT trade has been experiencing important transformations. The IT goods trade was, in fact, dominated by the US, Europe, and Japan up until the mid-1990s, but since then new emerging countries, like China, started to overtake their position as global trading leader, especially for what concerns the exports. In addition, the 1990s were also characterized by trade liberalization in IT goods,

[181] WUBBEKE Jost, MEISSNER Mirjam, ZENGLEIN Max J., IVES Jaqueline, CONRAD Bjorn, "MADE IN CHINA 2025: The making of a high-tech superpower and consequences for industrial countries", Mercator Institute for China studies, n.2, 2016, p. 39
[182] Ibidem
[183] Global imports of information technology goods approach $2 trillion, UNCTAD figures show, UNCTAD https://unctad.org/fr/pages/newsdetails.aspx?OriginalVersionID=692

implemented by the World Trade Organization (WTO) through the Information Technology Agreement (ITA).[184]

The ITA agreement was signed by 29 participants in Singapore in 1996 but, since then, its members have grown to a number of 82, representing about 97% of the world trade in IT products. The participation of China to the Agreement was possible only after its entry in the WTO in 2001. The objective of the Agreement was to completely eliminate trade tariffs on the products it covered, commonly referred to as "ITA IT goods".[185]

Together with the impressive growth and development of China's IT industry, the exports of Chinese high-tech and IT products grew accordingly, making China a "high-tech export giant", with high-tech exports representing about 31% of the country's total exports already in 2009.[186] As a matter of fact, if we look at the trend of China's high-tech exports from 1995 and 2009, we can observe an average growth of 30% annually. In the same year, computer and telecommunication equipment and electronics already represented the majority of China's high-tech exports, with computer and telecommunication equipment registering a total value of 283 billion US dollars, almost 75% of the total high-tech exports, and electronics registering a value of 51 billion US dollars. The two categories combined accounted for almost 90% of the total Chinese high-tech exports.[187]

Currently, IT products such as mobile phones, smartphones, laptops, tablets, integrated circuits, and other technological components, still make about 11% of the total global merchandise trade. UNCTAD official data also show the central position that China occupies in the IT global trade landscape (Table 3). As a matter of fact, in 2012, IT goods made up for as much as 27% of China's total exports and China represented the main world exporter in all categories of IT goods.[188]

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[184] KIRIYAMA Nobuo, "Trade in Information and Communications Technology and its Contribution to Trade and Innovation", *OECD Trade Policy Working Papers*, No. 115, OECD Publishing, 2011, p.8
[185] Information Technology Agreement, World Trade Organization
https://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm
[186] XING Yuqing, "China's High-tech Exports: Myth and Reality", GRIPS Policy Research Center, 2011, p.1
[187] Ivi, p.4
[188] Global imports of information technology goods approach $2 trillion, UNCTAD figures show, UNCTAD
https://unctad.org/fr/pages/newsdetails.aspx?OriginalVersionID=692

Table 3: Top 20 exporters of ICT goods in 2012 (million USD)

Top 20 exporters		
Economy	2012	Market share
China	554'310	30%
China, Hong Kong SAR	207'900	11%
United States of America	139'447	8%
Singapore	115'985	6%
China, Taiwan Province of	101'029	6%
Korea, Republic of	94'036	5%
Japan	73'052	4%
Malaysia	63'460	3%
Germany	62'514	3%
Mexico	62'497	3%
Netherlands	56'569	3%
Thailand	36'809	2%
Czech Republic	22'730	1%
France	22'728	1%
United Kingdom	20'386	1%
Hungary	17'912	1%
Philippines	15'326	1%
Slovakia	13'402	1%
Poland	12'639	1%
Sweden	12'471	1%
Rest of the world	117'485	6%

Source: Unctad.org

Looking at the total export produced by the People's Republic of China in 2019, it exported goods for a value of 2.499 trillion US dollar around the globe. Of these, about 49% was shipped to other Asian countries, while 20.1% and 19.9% were sold respectively to US and European clients. It is important to highlight that, of all the Chinese exported goods, IT products like electrical machinery and equipment, as well as technological machinery including computers, represent the product categories with the highest dollar value, registering respectively 26.9% and 16.7% of the total Chinese exports.[189]

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[189] China's Top 10 Exports http://www.worldstopexports.com/chinas-top-10-exports/

Finally, if we look at the EU trend for the import of high-tech products, more than half of the imports from non-EU countries came from China and the US in 2019, with China representing 32.5% of the total imports. China, indeed, ranks amongst the top six EU partners for IT products imports, and the value of the Chinese IT goods exported in the EU increased from 56 billion euro to 118 billion euro from 2009 to 2019, with electronics-telecommunications products representing the largest category in the EU imports.[190]

All of the above data confirm the pivotal role that China is having in the international trade of Information Technology goods, as well as that of the Chinese IT industry in promoting the steady development of the country's economy. While in the past the majority of China's high-tech exports were represented by assembled and outsourced products, today a large number of the exported goods are manufactured by Chinese-founded IT companies, like Huawei, Lenovo and Xiaomi. Such firms are contributing strongly to the innovation of the IT industry and shaping the perception of Chinese-made products all over the world.

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[190] Production and international trade in high-tech products https://ec.europa.eu/eurostat/statistics-explained/index.php/Production_and_international_trade_in_high-tech_products#EU_imports_of_trade_in_high-tech_products

CHAPTER 3

STRATEGIES TO SUCCESS OF CHINESE INFORMATION TECHNOLOGY FIRMS IN FOREIGN MARKETS.

CASE STUDIES: Business and Marketing Strategies for the internationalization of Huawei and Xiaomi

3.1 Huawei: the importance of a "cost-innovation" strategy

3.1.1 Company profile: history, mission and values

Huawei Technologies Co. Ltd. (华为) was founded in 1987 by Ren Zhengfei in Shenzhen, China, as a distributor for phone switches. It is now the world's largest Information and Communications Technology (ICT) solutions and services provider.[191] It is a private company, partially owned by its employees, as the firms itself officially declares. It counts a total of more than 180,000 employees and operates in more than 170 countries around the world.[192]

Its founder, and current president, Ren Zhengfei was a former member of the People's Liberation Army (PLA) engineering corps, and therefore was able to transfer the skills he acquired in the military field to his new telecommunications firm.[193] He, at the end of 1987, following the push for telecommunications switch technology, decided to start Huawei Technologies.

As a matter of fact, Huawei was founded in a peculiar historical time, the days of China's Opening up and Reform policy. In that period, the Chinese telecommunications infrastructure appeared as particularly weak and, for this reason, the Chinese government decided to introduce a strategy that encouraged the import of foreign equipment, the

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[191] GUANG Chong, "Chinese telecommunication giant Huawei: strategies to success", Nanyang Technopreneurship Case Centre (NTCC), p.1

[192] DEL MAR, Maria, RAJAWAT, Abhishek, "A Case Study on Huawei Technologies", *Journal of The Community Development in Asia (JCDA)*, 2019, p. 30

[193] AHRENS, Nathaniel, "China's competitiveness, case study: Huawei", Centre for Strategic and International Studies (CSIS), 2013, p.2

establishment of joint ventures (JV) and JV equipment manufacturing, and indigenous research and development (R&D). one of the initial products that such a strategy was focusing on was "stored program-controlled switches", that many Chinese core research groups, including the military, started to develop.[194] At the time of its establishment, indeed, Huawei manufactured this kind of phone switches.

As declared by the company's president himself, Huawei's mission is "to enrich life through communication" and to "bring digital to every person, home and organization for a fully connected, intelligent world."[195] Its core values are, as stated, the following:

- Customers first. The founder of Huawei himself has repeatedly highlighted the importance of Customer Centricity as a goal. Customers demand is, as a matter of fact. The driving force behind the firm's development, that, accordingly, works to create long-term value for its customers by always being responsive to their needs.
- Inspiring Dedication. This value is considered as the path through which the firm achieves the goal of customer centricity, as customers' trust and respect is obtained mainly through dedication. Dedication includes both the effort towards the creation of value and towards the improvement of the firm's capabilities.
- Continuous Improvement, or Perseverance. It is required in order to become better partners for the customers, to improve as a company and to grow as individuals.
- Openness and Initiative. Openness is considered as the key factor for the continued success of a truly international company, as Huawei likes to define itself. Initiative is mainly driven by customers' need and requirements and is the push for the realization of customer centric innovations.
- Integrity, in the sense of behaving honestly and keeping promises in order to maintain the customers' trust and loyalty.
- Teamwork. Amongst the firm's foundations we can find successful cross-cultural collaboration, streamlined inter-departmental cooperation, and efficient processes.

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[194] Ibidem
[195] DEL MAR, Maria, RAJAWAT, Abhishek, "A Case Study on Huawei Technologies", *Journal of The Community Development in Asia (JCDA)*, 2019, p. 30

Lastly, Huawei, after its international expansion and the establishment of its presence in almost every country of the world, describes its corporate culture as a unique one combining and merging together both Western and Eastern characteristics.

3.1.2 Main product categories

Currently, Huawei operates in three main products and service segments, namely operator carrier networks, consumer products and services, and enterprise solutions.

The operator carrier networks segment is engaged in the development and manufacture of wireless networks, fixed networks, telecom software and core networks, as well as in providing services solution to telecommunications operators. Such segment still includes the product category of telecommunications switches, the one that Huawei started its business with.[196]

The second segment, the consumer products and services one, is related to the production of mobile broadband devices, home devices, tablets, smartphones, and all the applications need for the functioning of such products. the segment can be further divided into mobile broadband devices, handsets, and home convergence devices. Huawei's mobile broadband devices include data cards, wireless routers and modules; handsets include smartphones and feature phones; home convergence devices include fixed or wireless access devices, set-top boxes, digital photo frames, and tablets.[197] Since 2012, Huawei have switched its investment focus, starting to invest heavily in the consumer market segment, in order to make its mobile devices compete with market leaders like Apple and Samsung. This switch was mainly represented by the launch of Huawei's flagship Ascend smartphones and then with the rollout of more middle and high-end devices, like the Ascend P1, Ascend D1 Quad, and Honora.

Finally, the third segment, the enterprise business one, mainly develops and manufactures ICT products and solutions that include enterprise network infrastructure, cloud-based data centres, enterprise information security, but also unified

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[196]   GUANG Chong, "Chinese telecommunication giant Huawei: strategies to success", Nanyang Technopreneurship Case Centre (NTCC), p.1

[197] DEL MAR, Maria, RAJAWAT, Abhishek, "A Case Study on Huawei Technologies", *Journal of The Community Development in Asia (JCDA)*, 2019, p. 30

communication and collaboration solutions for government entities, public utilities and energy, power, transportation, finance and other industries.[198]

3.1.3 Development strategy

For what concerns the development of Huawei, it has been already mentioned that, at the beginning, the company engaged primarily in the development of telecommunications switches. However, it is important to focus on what made Huawei stand out amongst other Chinese telecommunication firms in terms of products development.

When the company was founded, China relied almost completely on imports for the acquisition of telecommunications equipment. For this reason, many international telecommunications firms established their presence in the country. Ren Zhengfei's idea, at that time, was to create a domestic competitor to such international companies. As a matter of fact, the first years of Huawei's operations where characterized by the reselling of public branch exchange switches and fire alarms imported from a Hong Kong firm named Kangli. By 1990, however, Huawei had already started developing its own simple switches. What made the firms really stand out and distinguish itself from the competitors is that it decided to develop a large-scale switch system, which no multinational enterprise was willing to transfer to Chinese firms, and, most importantly, it decided to do it completely in-house.[199]

This is among the firm's most important strategic decisions for its development. As a matter of fact, Ren decided not to take the international joint-venture (JV) route, chosen by most of its domestic competitors like Shanghai Bell, for the acquisition of foreign technology. He believed that it would have been unlikely that foreign firms transferred advanced technologies to China, because it would not have been advantageous for them in the long-term. On the contrary, Huawei decided to focus on its own R&D from the beginning. Starting with a very low technological base and almost no outside technology, the firm invested in R&D and started developing first simple switches and then more

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[198] Ivi, p. 31
[199] AHRENS, Nathaniel, "China's competitiveness, case study: Huawei", Centre for Strategic and International Studies (CSIS), 2013, p.3

complex large-scale ones. Data show that the company's R&D/employee ratio was very high already at the beginning, with 500 R&D staff to 200 production staff.

In 1993, Huawei realized its first major product development in-house, producing the C&C08 program-controlled switch, a large-scale switch of un-heard capacity in China. moreover, thanks to the fast popularization and employment of such product, Huawei managed to secure a contract with the PLA for the development of the first national telecommunication network. The proceeds from this project led Huawei increase even more its investments in R&D, expanding them to new areas like optical network transmission systems and, later, mobile telecommunication systems.

It is important to highlight that, at the beginning, it was difficult for Huawei to raise capital as it was not a State-owned Enterprise (SOE) but a private one. Unlike most SOEs that enjoyed loans from the government-owned banking system, private companies in the 1990s did not receive any kind of state support. Huawei had to borrow funds from other large enterprises at interest rates as high as 20% or 30%, funds that the company decided to invest almost entirely on R&D.[200]

Another important strategic decision that lied the foundations for the company's development, was that of focusing firstly on rural areas rather than on more technologically developed cities. As a matter of fact, when Huawei began its business, many foreign telecommunications companies had already penetrated the Chinese market of the major economically advanced cities but had neglected the rural areas where conditions and profit margins were both poor. Huawei decided to fill this gap and saw a great development opportunity in servicing and supplying its telecommunications switches to such areas.[201] As the supply of variable power in rural China required high levels of network customization, this represented not only a sales strategy, but also a product one. Huawei started with the establishment of its business in the Heilongjiang province, with the employment of people that lived and worked in the province and were, thus, able to better understand and serve such a peculiar market. In order to do so, the firm formed JVs and other forms of partnership with local bureaus of posts and telecommunications that encouraged the purchase of Huawei's equipment. This way, the

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[200] Ivi, p.4
[201] GUANG Chong, "Chinese telecommunication giant Huawei: strategies to success", Nanyang Technopreneurship Case Centre (NTCC), p.2

company managed to make its name in China and to become more popular avoiding the competition of foreign multinational enterprises in the cities.

As the Chinese market for mobile technology grew quickly, Huawei decided to establish in 1995 its research centres in Shanghai and Beijing to focus on such technologies. The strategy it used was that of the reverse engineering approach, though which it managed to study foreign technologies and develop parts from disassembled foreign products without needing to sign any JV agreement. In that period, moreover, the Chinese government started to support domestic telecommunications firms by removing the import policies that favoured foreign companies and it started to notice the success that Huawei was having, deploying it as a national champion.[202]

As a result, the governmental support translated into a great amount of publicity and allowed Huawei to win important contracts with the national railway system for the development of domestic telecommunications infrastructures. As financial support started to be more available to national private companies as well, Huawei enjoyed a substantial increase of its capital for further expansion.

As a matter of fact, in 1998, the firm began to expand into the metropolitan Chinese market and was able, thanks to the loans and to the revenues obtained in the rural areas in the previous years, to implement a strong undercutting of prices which made it very competitive. The firm managed to overtake its major competitors and to become the market leader in a few years. The vast majority of Huawei's profits were still invested in R&D, that allowed the firm's product to be characterized by cutting-edge technologies and low price at the same time.[203]

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[202] Ivi, p.3

[203] AHRENS, Nathaniel, "China's competitiveness, case study: Huawei", Centre for Strategic and International Studies (CSIS), 2013, pp. 6-7

3.1.4 International expansion: business strategy

When, in late 1990s, international telecommunications enterprises started to enter the Chinese market through mergers and strategic partnerships and competition grew fiercer, Huawei started to look abroad for an opportunity to keep growing.[204]

Huawei had already developed strong capabilities in technology but had to face the challenges presented by the poor reputation of Chinese products, thought to be of bad quality. For this reason, the firm decided to firstly enter countries that needed affordable technologies, offering prices that were significantly lower than those of its competitors. However, the focus for Ren Zhengfei was still the quality of Huawei's technology, that he thought as the only element that could have kept the firm competitive in foreign markets. He stated, indeed, "we must realize that we have no competitive advantage, and that we can only gain the market through advanced technology, reliable quality, and superb service".[205] The combination of low prices and continuous innovation, known as the "cost-innovation strategy", is what made Huawei successful all over the world.

Huawei's entry into foreign markets can be divided into two big "internationalization pushes", reflecting the firm's choice of entering first developing markets and then developed ones. As a matter of fact, the first big internationalization push refers to the above-mentioned choice of entering markets with low technological requirements, with inadequate telecommunications infrastructure and a lack of ability to pay. This choice can be explained by the firms need to be able to sell products at low prices, at least in the beginning of its internationalization process. Such push was so successful that by 2004 Huawei's international revenues were higher than their domestic ones.[206]

In 1997, Huawei entered the Russian market through the formation of a joint venture with the Beto Corporation to assemble Huawei switches in Russia. In the Russian market, the firm was already able to undercut international prices by 12% but still offer impressive after-sales services. After that, Huawei turned its sales to other developing markets like Thailand, Brazil, and South Africa, where it was able to implement an even more

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[204] GUANG Chong, "Chinese telecommunication giant Huawei: strategies to success", Nanyang Technopreneurship Case Centre (NTCC), p.3
[205] AHRENS, Nathaniel, "China's competitiveness, case study: Huawei", Centre for Strategic and International Studies (CSIS), 2013, p. 7
[206] Ibidem

aggressive pricing strategy, undercutting the prices of competitors by up to 30%. The good results that the firms obtained in such markets led it to be defined as a "national champion" by the Chinese government, that increased the support of Huawei's business.

After the success it had in developing markets, Huawei was able to begin its second big internationalization push and move to more developed ones. In 2001, it made its first major sale in Europe, selling to Dutch and German clients. The Dutch can be taken as a good example of the "cost-innovation" strategy, or "value-for-money innovation". Huawei, indeed, sold a wireless station that enabled multiple communications standards to be run. The firm decided to focus on upgrades on software rather than on hardware for such product, being able to provide advanced features and customization at minimal price premiums, saving the money on hardware. On the same year, Huawei also set up an office in Plano, Texas, officially entering the US market. New sales were made in the following years to a French operator, to which the firm offered to build part of the product free of charge and provided three months of free testing before purchase, and to clients in the United Arab Emirates, which made the country the first Arab state with 3G. It then moved to the Danish and British markets, focusing mainly on 3G networks. The firm managed to become one of British Telecom's preferred partners for next-generation networks in 2005 and a global supplier of Vodafone.[207]

We can safely affirm that year 2004 represents a very important milestone for Huawei's internationalization. In that year, the firms received impressive credit backing from the China Development Bank (CDB) and the Export-Import Bank of China, that allowed the firm to afford even lower prices, but to keep investing in R&D in order to keep providing advanced and innovated technologies. Huawei was able to undercut its competitors' prices by almost 70% in the following years and even started to provide vendor-financed loans to customers. As a result, the company's sales increased impressively together with its partnership opportunities. In 2010, it was listed in the Fortune500 list and in 2012 became the world's largest telecommunications vendor in the world for all three sub-sectors (carrier network, enterprise, and consumer).[208]

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[207] Ivi, pp. 8-9

[208] GUANG Chong, "Chinese telecommunication giant Huawei: strategies to success", Nanyang Technopreneurship Case Centre (NTCC), p.4

When Huawei decided to enter a new foreign market, it chose specific entry modes that appeared as more adequate for the market conditions of different countries. For instance, it chose to enter the Russian market through joint ventures, being the Russian market one with weak telecommunications infrastructure but a great potential for development. On the contrary, the entry mode chosen for markets like South America, Asia and Africa was that of the export, due to factors like the great geographical distance and local market conditions. The Colombian case can serve as a great example, as the firm was able to sell products perceived as a luxury at low prices, managing to gain a great amount of market share in a short period of time. One other entry mode was chosen for markets like North America and West Europe, where the firm decided to set up alliances like franchising, co-research, co-production (OEM), and co-sales. This can be explained by the fact that such markets were much more developed, saturated, and also educated to products like the telecommunications ones. [209]

Huawei's business strategy for the internationalization can be summarized by the following features. First of all, the company chose the so-called "easy first and then difficult" penetrating strategy.[210] Just as in the domestic market it chose to begin with the rural areas and then move to the cities, it decided to enter developing markets first and then move to more developed and mature ones. This enabled the company to pursue the "cost-innovation" strategy. What is evident is, as a matter of fact, that Huawei's products are characterized by a combination of low prices and high technology. The choice of the markets enabled the company to maintain low prices and to build a name in the international arena, while the strong investments in R&D enabled it to keep high standards in the quality of technology. Huawei has always focus strongly on research and development, making it the focus of its business and the destination of the majority of its funds.

One other important feature is the focus on the development of an efficient customer service. The firm has always put the customer at the centre of its operations, and even provided after-sales customer services free of charge on some occasions. The focus on clients has also enabled the brand to provide high levels of customization for its products,

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[209] DEL MAR, Maria, RAJAWAT, Abhishek, "A Case Study on Huawei Technologies", *Journal of The Community Development in Asia (JCDA)*, 2019, p. 31
[210] DMITRIJEVS Romans, "Research on Marketing Strategy of Huawei Mobile Phone in European Market", *Open Journal of Business and Management*, 8, 2020, p.1143

as well as systems that are easy to use and upgrade. This way, Huawei managed to build a good customer basis and to encourage customers' trust in the brand.

Finally, the alignment of Huawei's business with the Chinese national goals of developing the telecommunications industry for the shift towards being an innovated high-tech power has provided the company with multiple forms of support over the years. Such support came both directly, through financing and loans received by the major Chinese banks, but also indirectly, through publicity and support in the country's foreign policy activities.[211]

3.1.5 What being a Chinese company means: marketing strategy to create brand awareness

Certainly, being Huawei a Chinese company with a Chinese-sounding name, the products' country of origin has many times worked against the success of firm's business, especially in markets like the European and US ones. The firm's country of origin has, indeed, generated concerns in foreign customers on different levels: many international consumers perceive Chinese companies as not transparent and controversial and, most of all, associate Chinese products with low quality. The low-pricing strategy adopted by Huawei certainly did not play to its favour for the dispelling of such a myth, especially because the amount of investment made by the firm on R&D was not widely known by consumers and the effects of an advanced technology on the perception of the products usually come later through word-of-mouth recommendations and, obviously, require the consumers to buy the product first. For this reason, when Huawei decided to sell its products to competitive markets like the European smartphone one, had to put its efforts into building a strong and distinctive brand and to create brand awareness among the consumers.[212]

A great example of Huawei's marketing strategy in Europe can be found in the firm's 2016 campaign called #BePresent. The campaign's objective was, specifically, to change the

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[211] AHRENS, Nathaniel, "China's competitiveness, case study: Huawei", Centre for Strategic and International Studies (CSIS), 2013, p. 31
[212] GUANG Chong, "Chinese telecommunication giant Huawei: strategies to success", Nanyang Technopreneurship Case Centre (NTCC), p.7

stereotypical perception of a Chinese brand as aggressive but of lower quality rather than well-established brands, and to achieve a competitive category focused on technology. The achievement of such objective and the increase of the "Brand Desire" parameter, according to the brand, required an emotional connection with the consumers, to be obtained only focusing on them first.

The mission, in particular, was to convince the consumers that Huawei provided the best technology at a reasonable price, to build credibility as an innovative and breakthrough brand, and to build a desirable brand perception. Moreover, since the main obstacle was represented by the stereotypical perception of the brand, the firm chose as target group people who were interested in new devices and appreciate premium design and technological advancement at a decent price. Such a target group was represented by urban young adults (25-45 years old). The campaign was launched during the Christmas period and developed the message of "being present" putting the smartphone aside, focusing thus on the importance of feeling and emotional connection.[213]

The campaign was a success as brand consideration increased significantly in all markets, while rejection rate decreased. The Huawei brand also shifted from awareness to preference and even primary usage, effectively moving away from the negative perception of Chinese names.

3.1.6 Conclusion

The case of Huawei can be considered as a great example of how a Chinese company managed to effectively enter foreign markets and gain a great amount of market share. The business and marketing strategies it chose certainly were peculiar and pivotal for the company's success and for the overcoming of negative stereotypes linked to its country of origin.

We can safely affirm that the combination of a fast-penetrating low pricing strategy, strong promotional efforts, investments in R&D, and the focus on the customers' needs, let the company gain a great amount of market share in a limited period of time and let

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[213] "Huawei #BePresent case study", euro Effie awards, 2016

foreign customers, even the more sceptical like the European and American ones, accept the firm's products despite their Chinese origin. Besides, the choice of powerful, customer-oriented promotional campaigns also contributed to the building of brand awareness across foreign consumers, necessary for the sustainability of the firm's business overseas.

The brand is, today, amongst the most successful producers of smartphones and telecommunications equipment in the world, together with the most powerful and famous brands like Samsung and Apple, and it is expected to grow even further over the next years contributing even more to the transformation of the common negative perception of the "Made in China".

3.2 Xiaomi: the importance of a loyal fanbase

3.2.1 Company profile: history, mission and values

Xiaomi Corporation (小米集团) is a privately-owned Chinese multinational electronics company founded in April 2010 in Beijing, where its headquarters are currently located. Lei Jun, former CEO of Kingsoft, another Chinese software developing company, is among the eight co-founder of the firm and is, today, its chief executive officer (CEO). At the time of its establishment, Xiaomi, in fact, engaged exclusively in the development of software and was founded specifically for the creation of a new custom Android-based firmware (ROM). Their mission was, at that time, to provide additional functionality to those that Android already offered, as well as an easy to use user interface.

The ROM they created, called MIUI, was as successful that, as of 2014, it could be downloaded and installed to over 200 devices in both English and Chinese with over 30 million users worldwide as of the end of 2013. The success of the ROM is to be linked to it providing very sophisticated services while still being easy to use and, therefore, accessible to everyone. Such services include cloud backup, a music player, and a Xiaomi branded app store.

As stated by the company itself, its vision is that of becoming a global company with a focus on creating user experiences from all aspects, constantly refining and enhancing the products developed. Accordingly, the mission is to make quality technology available to everyone. It focuses on designing, developing, and selling top-quality smartphones, cellular and electronics applications at slanted prices. [214] The declared values are dedication and belief in innovation. Dedication refers to the importance that the company attributes to its customers, to which provides constant high-quality support and service. The belief in innovation reflects the pivotal role that the quality of products has in the business strategy of the company. According to Xiaomi's founder Lei Jun, as a matter of fact, the most important feature of the company's products is their quality, which, in combination with low prices, will represent the main competitive advantage for the firm.

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[214] SAFIYA H.M., SHYLESH S., "Analysis of Business Strategies of Xiaomi", *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, 3(1), 1-8, 2019, p.2

Just one year after its foundation, Xiaomi expanded to the hardware market as well, with the development of its first smartphone, the Mi One phone, in 2011. Consequently, the company quickly gained market share in China, becoming the country's largest smartphone producer in 2014, even surpassing Huawei. Currently, Xiaomi engages in the production of several different products, like smartphones, mobile apps, laptops, bags, earphones, shoes, fitness bands, and many other, but the main focus still remains the consumer electronics industry. The company, with more than 16,700 employees worldwide, is now the world's fourth largest smartphone manufacturer, after Samsung, Apple, and Xiaomi, as well as the youngest Fortune Global 500 listed company in 2019.

Xiaomi has moved quickly outside China, firstly to South-Eastern countries and India, where they managed to create a vast market base in a limited period of time, to the move to more developed and competitive markets like the European one. Its business and marketing strategy, both in the domestic and in international arenas, has certainly been successful, as much that the company has frequently been depicted as "The Apple of China".

3.2.2 Main product categories

As already mentioned before, Xiaomi started as a software developing firm, producing the MIUI firmware based on Google's Android operating system, similar to Android's TouchWiz and Apple's iOS. As the company's goal of providing user experiences from all aspects was shaping, Xiaomi decided to develop accordingly, entering the hardware market as well. As a matter of fact, in 2011, the first Xiaomi smartphone, the Mi One, was released. The reason behind this choice is that the firm sees hardware sales as an intermediary tool for users to be able to feel the software and services.

From that time on, Xiaomi continued to develop several lines of smartphones, as well as software and apps, and even household equipment, smartphone accessories, online videos, etc. Currently, the company's product catalogue is amongst the most various in the market.[215]

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[215] Ivi, pp.2-3

The firm's smartphones include several different lines: Mi Series, Mi Note Series, Mi Max Series, Mi Mix Series, Pocophone, Blackshark, and the Redmi Series. Xiaomi launched a new model of Mi phones, that include the company's first ever smartphone, each year starting in 2011 up to the Mi 10, presented in 2020. This line mainly targets the premium segments of the market.

On the other hand, the Redmi (红米) line, the firm's more budget smartphone line was launched in 2013 and later became a separate sub-brand of Xiaomi in 2019 with entry-level and multi-range devices. The Redmi line is divided into Redmi, that markets entry-level products, Redmi Note and Pro, as well as RedmiX, that focus on the mid-range production, Redmi A, the low-end version, and, finally, RedmiK, the targets higher end markets. The main difference with other Xiaomi devices is that Redmi utilizes less-expensive component for the manufacturing of smartphones, that, thus, have a lower price but still retain high specifications.

As well as mobile phones, Xiaomi soon started to manufacture wearables, mobile accessories, and home electronics equipment, like televisions and speakers, as well. In 2018, the production expanded to consumer electronics goods like tablets, laptops, and smart-home devices, that allowed the user to connect its home equipment to the smartphone and create an even seamless, easier experience. In the same year, the company even started to produce simple goods, like sunglasses, umbrellas, caps, pillows, lunchboxes, backpacks, luggage, etc. Today, Xiaomi's product lines range from smart TV, smart set-top box for TV, tablet, network router, external battery charger, and smart wristband to Personal Transport product series, such as electric bikes and electric scooters, and Smart Home product series even including blood pressure monitor, air purifier, smart webcam, action camera, smart scale, water purifier, smart rice cooker, and robotic vacuum.[216]

Together with hardware and consumer goods, Xiaomi has always kept developing software, that, as the company officially stated, is the main focus of its production and business. Despite smartphones always being the leading product for Xiaomi, the firm calls itself a "internet services" company and aspires to become a broader e-commerce company for a large number of products. The firm has, as a matter of fact, developed

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[216] Deep Dive into Xiaomi's Strategy to Dominate the Connected Home https://medium.com/@yuany44/deep-dive-into-xiaomis-strategy-to-dominate-the-connected-home-fe21476b0b54

numerous smartphone applications, a Xiaomi branded app store, as well as advanced technologies that allow all Xiaomi devices to connect and work complementarily.

The secret to Xiaomi's quick expansion to new product categories is its "Mi Ecosystem Companies" diversification strategy, according to which, the firm has aggressively invested in several companies to expand into new hardware fields. Of all the products Xiaomi released under its brand, only smartphones, smart TV, smart TV set-top box and network router are designed and developed by Xiaomi. The rest are produced by Xiaomi's Ecosystem Companies, which are typically invested by Beijing Xiaomi Technology Co., Ltd (Xiaomi's largest business entity that focuses on manufacturing and selling mobile phones), Xiaomi's investment funds (Shunwei and Jinxing), CEO Lei Jun himself, or a combination of those.[217]

In Lei Jun's vision, there are three layers of product offerings in Xiaomi's ecosystem: at its core, are its well-established products of smartphones, smart TV, TV set-top boxes, and routers. The next level up is the Internet services based on Xiaomi's MIUI system that supports the hardware products. According to Lei Jun, smartphones only serve as a distribution channel for the firm's software services, like smartphone games, cloud storage and mobile finance, and not a source of profits. Finally, the third layer coincides with Lei Jun's ultimate vision for the future of Xiaomi, that of becoming an important player in the "internet of things" and the "smart home", developing a line of smart home devices to be seamlessly connected under the Xiaomi ecosystem.[218]

The Xiaomi brand has officially become an umbrella brand that comprises numerous different product categories. Such strategy can be possibly linked to the firm's necessity to create a strong brand and loyal customer base in order to ensure a constant success of the business and to afford selling products at such low prices. Xiaomi has, indeed, been able to create a very faithful and passionate fanbase that supports the firm's business and represent the majority of its sales and success.

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[217] Ibidem
[218] Ibidem

3.2.3 Business model

The incredible success that a young start-up like Xiaomi managed to obtain in only ten years, certainly has to be linked to its peculiar business and marketing strategy, that, despite being different from that of any other electronics company, has guided the firm on a fast and effective development path.

The initial strategy, as stated by the company's official mission and goals, was a cost performance strategy, focused on selling innovative technological products, with the same specificities of the world's most famous brands, at very low and competitive prices. The strategy was, as a matter of fact, that of selling products almost at production cost, making the firm's profit margin as low as 5% in most cases. At the same time, the company still wanted to invest in high technological standards, as well as in the development of advanced software to be used on Xiaomi devices, conceived initially only as delivery means for Internet and software services.[219] The software available on the Mi Store, moreover, are developed by the company itself, differently from the case of App Store for Apple. This allows Xiaomi to monetize such smartphone applications, that enable the user to fully customize their device, and let them build a long-term commitment with the company and its devices. The sale of Xiaomi developed themes, games and apps which only work on MIUI operating systems and on Xiaomi devices has contributed with an average of more than 6 million US dollars on the company's monthly sales revenue.[220] This way, the company often does not make a profit when the customer buys the product, but it does when he uses the product and all the affiliate features.

In order to be able to afford such a low profit margin, Xiaomi had to adapt the rest of its marketing choices, ranging from distribution to promotion strategies. First of all, costs are reduced to the vertical integration of the product value-chain implemented by the company. Xiaomi, as a matter of fact, controls all the stages of production of its devices, from the supply of raw materials, to assembly, to the final distribution. Accordingly, the company chose not to distribute its products through the traditional distribution channels and, therefore, to avoid offline distribution. In the first four years, indeed, Xiaomi

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[219] Deep Dive into Xiaomi's Strategy to Dominate the Connected Home https://medium.com/@yuany44/deep-dive-into-xiaomis-strategy-to-dominate-the-connected-home-fe21476b0b54

[220] PANIGRAHI, Ashok, "A Case Study on Marketing Strategy of Xiaomi", *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 4(2), 2019, p. 49

smartphones and devices, were only sold online through the brand official e-commerce platform (Mi.com) or through partnerships with other, more established, online suppliers like Amazon or Alibaba. This way, the company was able to reduce distribution and logistics costs, as well as the cost of building and maintaining venues. Moreover, another great strategy, especially in the Chinese market, was to sell smartphones in flash sales in such e-commerce websites. This way, the company managed to increase the hype that surrounded the launch of its products and keep overstock at a minimum, avoiding inventory costs.[221]

For what concerns the promotional channels chosen by the company, it decided to avoid the traditional, expensive advertising means like television and magazines, but mainly focus on online advertisement and on the powerful word-of-mouth marketing. Xiaomi, as a matter of fact, works on several social media for the promotion of its products, both through official brand accounts and through influencer marketing. This is especially useful for Xiaomi, as it mainly sells its products online, and because it allows the company to always keep contact with its customers and potential buyers. Furthermore, word-of-mouth promotions represent a very strong and powerful tool of advertising for Xiaomi that, in a very short period of time, managed to build a strong and loyal customer base.

Xiaomi, as a matter of fact, has built a very large fan base (Mifen 米粉) through online channels like Weibo, the Chinese version of Twitter, where the company registered an average engagement rate of over 60%.[222] The company has often relied on such fan base for the promotion of its products, through reviews and feedback on new devices and services. The words of "Mifens" have been very powerful, as they have been translated into more than 20 languages and have provided a strong base for Xiaomi's globalization. It is also important to highlight that Xiaomi has never kept its low profit margin as a secret to its customers, in order to let them know that the affordable prices are not synonym of bad quality, but that, on the contrary, the company was ready to reduce its profit for their satisfaction.

Xiaomi has always declared the importance of "customer centricity" for its business. The company tries, on many occasions, to involve its customers in the development of new

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[221] Ivi, p. 50
[222] These 10 ingredients are the recipe to Xiaomi's secret sauce https://www.techinasia.com/10-strategies-xiaomi-secret-sauce

products and in the adaptation of existing ones to their needs. Customization and "open innovation" are, as a matter of fact, two important features of Xiaomi's strategy. the company engineers have direct contacts with the users and help them gather information or modify the software to adapt to their requirements,[223]and customers are welcomed to use online branded forums to exchange opinions and to give feedback. The company's CEO Lei Jun itself considers customer feedback as essential for product development and credits its customers for a third of the features added to the MIUI operating system over the years and for the exponential growth that the company's community of users has experienced. Moreover, Xiaomi claims itself as the best provider of customer service, as it has three dedicated factories for device repairs and two call centres with more than 600 employees only for the Indian market.[224]

3.2.4 Internationalization strategy

Xiaomi's internationalization path started at the regional level. After establishing strongly in the domestic market, as a matter of fact, the company decided to move its sales to the South Eastern Asian region and to countries like India and Indonesia in 2014, before moving to more developed and advanced markets likes the European one.[225]

Since logistics did not represent a core competency for a start-up like Xiaomi, it needed to establish partnerships with local firms. The ideal partner for the distribution in the region was represented by Singapore Post Limited, the Singapore public post company.[226] This way, Xiaomi could manage to keep its online distribution strategy, that happened to be successful in the markets like the Indian one just like it had been in China. The company's business and marketing strategy, based on low prices, online retail, and social media advertising, was, indeed, replicated in the new markets, even if very diverse and competitive like the Indian one.

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[223] PANIGRAHI, Ashok, "A Case Study on Marketing Strategy of Xiaomi", *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 4(2), 2019, p. 49
[224] SAFIYA H.M., SHYLESH S., "Analysis of Business Strategies of Xiaomi", *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, 3(1), 1-8, 2019, p. 4
[225] TIGE' Q., "The Effect of Liability of Foreignness on Firm's Internationalization Process: A Study of Chinese Firms", HEC Montreal, 2019, p.59
[226] Ibidem

Xiaomi's strategy in the Indian market can potentially serve as an important example, as the company was able to replicate the segmentation of its product lines to the segmentation of the market itself. It decided to promote the different product lines to different market segments based on the specific needs and characteristics of the customers. Such segmentation was realized on the basis of four main factors, namely the customers' purchase power, the functionalities they required, their technological familiarity, and the intended use of the products.[227]

Accordingly, Xiaomi identified three main target segments: entry level users, mid-range consumers, and high-end consumers. Entry level users represent the low socioeconomic classes, that is the consumers that usually spend a minor portion of their income on technological products, but still retain a high level of interest in purchasing them. To such segment, pricing and advertising represent the most important factors in determining their purchase decision. Accordingly, Xiaomi decided to dedicate its Redmi series, the more budget friendly product line, to such a market segment. The mid-range consumers group is mainly made up by middle class users that are moving from the lower to the higher sections of the society. Such consumers look for reasonably priced goods with a lot of value-adding features and are, therefore, the perfect target for Xiaomi's mid-range product lines. Lastly, high-end consumers are mainly people with a business background that intend to invest their high incomes on new and upcoming technologies. They usually represent the main target segment for big brands like Apple and Samsung. For this reason, they did not appeal to Xiaomi, especially at the beginning, but started to get interested to the company only after its high-quality reputation began to be established.[228]

The main strategy for Xiaomi in foreign markets was, therefore, that of promoting its low prices – high technology paradigm through online platforms and word-of-mouth publicity, in order to eventually control every segment of the market. Such a strategy appeared to be successful in the South East Asia region and in India, were the company quickly became the second largest smartphone and consumer electronics products retailer. According to official data, Xiaomi in India was able to make a profit of 1 billion US dollar in 2016, just two years after its entry in the market, beating Samsung with 27% of the market share.[229]

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[227] PANIGRAHI, Ashok, "A Case Study on Marketing Strategy of Xiaomi", *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 4(2), 2019, p. 50

[228] Ibidem

[229] The Rise And Global Expansion Of Xiaomi https://news.crunchbase.com/news/rise-global-expansion-xiaomi/

However, such strategy, that worked perfectly in Asian countries, thanks also to its adaptability to the consumers' culture and customs when it comes to online retail and marketing, needed to be slightly adapted when the country decided to move to the European market in 2017 where the creation of brand awareness is pivotal for a Chinese company.

3.2.5 Xiaomi in Europe: first customer base, then products

In 2017, Xiaomi decided to expand its sales to developed countries and, especially, chose to enter the Western European market. It deliberately chose to avoid the US market because of the political threats that, in that period, were starting to target Huawei as a Chinese company. The firm decided to replicate its overall business strategy in the European market, however, it necessarily needed to undergo some degree of adaptation in order to ensure the acceptance of the European consumer base.[230] More in detail, because of the shared negative stereotypes linked to Chinese manufactured products, brand awareness and a strong customer base represented the most important competency to be obtained by Xiaomi in Europe.

We can observe that, while the four main pillars of the business model, innovation, design, quality, and value for money, remained untouched, the company made some modifications to its marketing strategy. First of all, the creation of a loyal fanbase in Europe and the customization of the distribution and promotion channels to the customers' needs were the main concerns for the company. For this reason, Xiaomi decided to enter the European market through Spain, where a relatively wide concentration of "Mifens"[231] already existed. Such people, who already knew the company and were active of online tech forums, represented the base for the future establishment of Xiaomi's sales in the country, and were also pivotal for the development of the essential word-of-mouth publicity. We can affirm that Xiaomi firstly focused on the creation of a community to bring its products to the market only afterwards, a strategy that was in line with the mission of "providing quality products made by fans for fans". The company, indeed, relied heavily on assemblies of local community members and on the interaction

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[230] TIGE' Q., "The Effect of Liability of Foreignness on Firm's Internationalization Process: A Study of Chinese Firms", HEC Montreal, 2019
[231] Cfr. par. 3.2.3

on forums to leverage Spanish consumers' needs and accordingly adapt the products and strategy.[232] Only doing so, the company would have been able to inform European consumers of the high-quality standards of its products despite the low prices. After establishing in Spain, Xiaomi saw the potential of the European market and started to expand in many other countries as well. As a matter of fact, it entered the French and Italian market in 2018 and then moved to the UK, Ireland, Germany, and the Netherlands.

The most important adaptation of the strategy is Europe is represented by the choice of a "new retail" model. Xiaomi aimed at offline channels for the distribution, rather than limiting it to online platforms like in most of the Asian markets. The European push was, indeed, launched through the partnership with big retail companies like Carrefour and Mediamarkt, Europe's largest consumer electronics distributor. Xiaomi had realized that, because of the purchase behaviour typical of European consumers', offline retailing was to be preferred over e-commerce, and, later, started to open its own branded retail stores. By the end of 2018, there were already 50 Mi Stores around Europe. Nevertheless, online retail was still widely used, and for what concerns the European market, Xiaomi chose to delegate the distribution and logistics to AliExpress, Amazon, as well as the official brand website.[233]

The flexible strategy that combined the creation of brand awareness together with the direct selling of products revealed to be essential in determining the company's success and quick growth in Europe. For what concerns brand awareness, the company managed to create a loyal and affectionate European fanbase through the establishment of the official European website, Facebook page, and forum, where the company was able to keep deploying its advertisement strategy through the promotional work of "Mifens", influencer marketing, and the CEO Lei Jun's official account. Direct selling was important as well, as it managed to let the consumers physically see and try the products and also ensured technical assistance if needed.

Currently, Xiaomi, whose international presence has already reached 90 countries in the world, has been making business in Europe only for three years, but the results it obtained are already impressive. In the region, Xiaomi, a ten years old start-up company, ranks

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[232] Ibidem
[233] Ibidem

fourth among the main smartphone manufacturer, after Samsung, Huawei, and Apple, maintaining an average growth rate of 90%.[234]

3.2.6 Conclusion

The example of Xiaomi, a very young Chinese start-up, can be very helpful in explaining the power that a strong customer base can have in determining the success of a company. In only ten years, as a matter of fact, Xiaomi managed to establish in China but also in foreign countries as a powerful and successful smartphone and consumer electronics manufacturer through a peculiar business model and with the help its loyal fanbase. Even though the main competitive advantage of Xiaomi was the very low and competitive prices of its devices, the popularization of the brand was made possible only through the use of online platforms and through word-of-mouth publicity.

This, indeed, helped the company overcome the stereotypes that usually represent a burden for Chinese companies in foreign markets and, especially, in Europe. Even though, probably, the previous work and effort of Huawei in the market helped Xiaomi move away from such a biased perception, the company was very effective in finding its slot in the market and to put the foundations for its future development, despite its "Chinese-sounding" brand name.

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[234] Xiaomi reveals its results in Europe: a success on all fronts! https://en.gizchina.it/2020/01/xiaomi-successful-western-europe/

CONCLUSIONS

The above work has engaged in the analysis of the role that the Chinese Information Technology industry has been having in shaping the common stereotypes linked to the "Made in China" label. The results of such analysis have shown that, through the fast development of such industry and the wide popularization of Chinese IT products, especially smartphones and personal computers, consumers from all over the world have started to rethink the impression they had of Chinese-manufactured products. Many European consumers, as a matter of fact, are willing to buy Chinese products if they are technological ones, because they consider them to be of high quality and see them as great competitors to their more famous and established western counterparts.

Historically, the "Made in China" label has been always subject of negative bias, mainly linked to the country's past experience in manufacturing many of the world's products, especially low-quality ones. The Chinese government has not underestimated such a problem, that risked to undermine the country's ability to develop efficiently and to become an economic power, and, accordingly, implemented a series of economic policies aimed at changing the country's image. The most important and most recent is called specifically "Made in China 2025" and has been working toward making China an innovation powerhouse and a high-tech superpower through the achievement of indigenous innovation and smart manufacturing.

As a consequence, many Chinese Information technology firms have been developing and making their name in the most competitive international markets. Even though changing such a deep-rooted stereotype like that linked to the "Made in China" label appears as a very difficult challenge, the research presented in the paper has shown that many firms have been able to overcome such a burden. Chinese Information Technology companies, like the world-famous Huawei and Xiaomi, have strategically adapted their business and, mainly, marketing strategies to make their products more appealing to European consumers. Such consumers, even though initially sceptical when pondering the purchase of "Chinese sounding" brands, have been conquered by the functionality of the products and by the effective strategies of the two companies.

The success of the two companies, presented in the third chapter, serves as a concrete example of how Information Technology firms, developed both autonomously and thanks to the Chinese government incentives, are giving a strong contribution in changing the image of China as the "world's factory" to that of a technology superpower that manufactures high-tech but affordable products. This is also indirectly helping the country achieve the goals of the "Made in China 2025" strategic initiative, making it the world's second economy.

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