

“Made in China”: Building Chinese Smart Manufacturing Image

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Abstract

This paper sets out to analyze how China makes best of its late development advantage (LDA) to change global image of “Made in China” to “Chinese Smart Manufacturing” by demonstrating recent technologies and advances in China. In literature review, the author compares Recommendations for Implementing the Strategic Initiative Industrie 4.0 [1] (hereinafter referred as Industry 4.0) with Made in China 2025 [2] in priority development domains and paths of actualization. To examine how the term “Made in China” has changed in both its connotation and value worldwide, the author analyzes China’s Late Development Advantage (LDA) by seeking evidences in contemporary economic and technological advances in Section three. Chinese government makes the best of LDA to develop its economy and implement policies such as Supply-side Reform and Belt and Road Initiative, which eventually changes the connotation and image of “Made in China”. China is guiding the world to value more for “Made in China” products, services and technologies.

Keywords

Made in China, Industry 4.0, Chinese Smart Manufacturing, Late Development Advantage

1. Introduction

“Made in China” is a label attached to the products manufactured in China. Owing to the advantages of rich labor resources and raw material resources in China, products made in China are well-received in the world on account of their competitive price and quality nowadays, although quality may be a controversial word for many “Made in China” products in early manufacturing development. Lack of innovation and technologies in the design and production

process also resulted in a negative image of the label “Made in China”. Historically, “Made in China” even represented an image of “being cheap but not good”. Although a great number of labor-intensive products, *i.e.*, electronic goods and shoes are made in China, their designs are completed in west countries. However, a growing number of Chinese enterprises nowadays are devoting themselves to establishing their own brands, hoping to be transformed from “Made in China” into “Designed and Made in China”. Chinese government is also striking great efforts to change the traditional image of “Made in China” to “Chinese Smart Manufacturing”, which is rich in technological advances and innovation indication, although “Made in China” ^{zhōng guó zhì zào} “中国制造” and “Chinese Smart Manufacturing” ^{zhōng guó zhì zào} “中国智造” have the same pronunciation in Chinese language, the connotation changes remarkably.

Chinese government put forward the ten-year strategic planning *Made in China 2025* in 2015 with an aim to promote its manufacturing development in accordance with the current fourth Industrial revolution circumstances. Under the guidance of *Made in China 2025*, Chinese economy is experiencing a profound and swift reform and innovation and has achieved preliminary yet remarkable accomplishments to surf in the fourth global industrial revolution tide [3].

The author emphasizes the significance of “Made in China” connotation change and illustrates technological innovations applied in Chinese manufacturing accomplishments in recent 3 years so as to demonstrate the empirical contributions to archival research method. There are two research questions:

Research question 1. How does China make best of its Late Development Advantage to change world image of “Made in China” to “Chinese Smart Manufacturing”?

Research question 2. How does China apply emerging technologies and advances under China’s strategic policies to embrace a thriving and sustainable all-in-one Development?

2. Literature Review

2.1. *Made in China 2025: Is It the Chinese Version of Germany Industry 4.0?*

Industry 4.0 was proposed by the German government as a brainchild of safeguarding the future of its leading manufacturing power in global industry in April 2013. In human history, the use of steam power led to mechanical production marked the first industrial revolution. Mankind has experienced two more industrial revolutions ever after. The use of electricity since the beginning of the 20th Century which enabled mass production in industries was the second industrial revolution wave. The third industrial revolution refers to the pervasive use of Information technologies (IT) since the 1980s. IT has empowered human beings to have remarkably increased automation of manufacturing process. The fourth era of industrial revolution is ongoing and disruptive: along with the

deepening process of globalization, stimulated by the trends on connectivity and being profoundly service-oriented, advanced materials together with processing technology can be controlled by computers with collaborative advanced manufacturing networks devices. The perfect marriage of advanced materials, technologies and computing network has contributed to the infinite smartness within physical-digital environment, which is the viral concept of Internet of Things (IoTs) nowadays.

Although *Industry 4.0* aimed to give full play to the traditional advantages of German manufacturing originally, it provoked revolutionary breakthroughs in a new round of technologies which lead to rapid and significant advances in all walks of life and imposed great impact to the entire world, including affecting our lifestyles, changing the way of recognizing the world by broadening and deepening our visions etc. The entire world now is at the threshold of technological innovations to build up a smart digital-physical network among internet, machines and human beings in order to create a more user-oriented and connected Internet of Things (IoTs) and Services. Industry 4.0 has attracted the attention of the manufacturing sector in all countries in the world, especially in some major economies. For instance, the United States put forward the concept of Industrial Internet at Summer Davos Economic Forum in 2014. The United States concept of Industrial Internet is pushing the boundaries of minds and machines indicates a new area of innovation and change.

In China, Li Keqiang (Premier of Chinese State Council) brought about *Made in China 2025* at the 12th National People's Congress in March, 2015. China has been in a fast advancing tempo ever after and the world has witnessed a tremendous change in China. *Made in China 2025* has become the hot word in government work reports [4]. It is a decade strategic manufacturing plan targeting "China smart manufacturing power". Due to the continuity of time and the homogeneity of the large background, it is regarded by some as the Chinese version of Germany *Industry 4.0*. But is it really a simple mimicking literature of Germany *Industry 4.0*? In comparison, differences in framework is shown in **Table 1**.

It can be obviously seen above that *Industry 4.0* pursues a new production mode in industrial revolution with industrial network and smartness as the main characteristic. As the traditional world leading power in manufacturing, *Industry 4.0* in Germany is no longer specific in developing technologies, it aimed to establish a new production system, to optimize production management and to guarantee production safety and higher level of manufacturing automation by professional employee training. Whereas *Made in China 2025* focuses mainly on manufacturing industries, most of which were announced in 2010 as strategic emerging industries. German manufacturing is already a symbol of leading automation and *Industry 4.0* does not only target at achieving revolutionary breakthrough in manufacturing technologies, but also lead to profound changes in the way of production organization and social economy. Therefore, it is a macro-level guideline.

Table 1. Priority areas for action (priority development domains).

Germany <i>Industry 4.0</i>	<i>Made in China 2025</i>
Standardization and open standards for a reference architecture	High-grade CNC (Computer Numerical Control) machine tools and robots
Managing complex systems	New generation Information technologies
Delivering a comprehensive broadband infrastructure	Marine engineering equipment and high-tech ships
Safety and security as critical factors or the success of Industry 4.0	Electronic equipment, agricultural machinery and new materials
Work organization and work design in the digital industrial age	Bio-medicine and high performance medical devices
Training and continuing professional development for Industry 4.0	Energy-efficient and new energy vehicle
Regulatory framework	Aerospace equipment
Resource efficiency	Advanced rail transit equipment

In comparison, *Made in China 2025* is more concrete in priority industries which emerging technologies and industrial internet big data can be applied into top ten priority industries including new generation of information technologies (IT), robotics, large aircraft, new generation of rockets and heavy carrier vehicles, deep-sea exploration technologies, marine engineering equipment and high-tech vessels, advanced rail transport equipment, energy saving and new energy vehicles such as electric vehicles and fuel cell vehicles, large capacity hydro-power units, nuclear power units and heavy gas turbines, high-end agricultural equipment, etc. Path of actualization of the two government reports is listed in **Table 2**.

As can be seen from **Table 2**, the goal of *Industry 4.0* is to lead the fourth industrial revolution and to ensure the future of German manufacturing industry as always in the leading position. *Made in China 2025* is the plan to strike three decades efforts to bring China to the forefront of world manufacturing power.

In strategies, *Industry 4.0* emphasizes intelligence, network and system in manufacture. It aims to build the Central Physical System (CPS) with Internet of things (IoTs) and services widely used in the manufacturing sector, to complete process module integration and digitization in products manufacturing process, to build a highly flexible and characteristic production mode ensuring standardization, organization work and availability of the products in the implementation of *Industry 4.0*. However, *Made in China 2025* is more focused on market access system, transformation of government economic functions, reform of administrative examination and approval system, construction of market environment, policy support, technology research and development, transformation of scientific and technological achievements, innovation. Chinese government has an evident role in the process to achieve strategic objectives.

Table 2. Objectives & strategies.

Germany <i>Industry 4.0</i>	<i>Made in China 2025</i>
Objectives(goals)	
Enhancing Germany's global competitiveness;	To be among world leading Manufacturing powers by 2025;
To ensure the leading level of German manufacturing in the future.	to be at medium level among world leading manufacturing powers by 2035;
	to be at the top among world leading manufacturing powers by 2049.
Strategies (path of action)	
Enterprises to establish a global information Central Physical System (CPS);	Institutional reform; Building a fair competitive market environment;
Horizontal integration by value network; Building end-to-end work that runs through the entire value chain;	Financial support; Fiscal and taxation policy support; Building a more open-up manufacturing industry;
Process digital integration; Building vertical integration and networked manufacturing systems.	Supporting small and medium-sized enterprises; Optimizing organizational mechanism.

2.2. Late Development Advantage

2.2.1. International Research on Late Development Advantage

Alexander Gushenkron, the 20th century economic historian studied the industrialization process of Germany, Italy and other European countries and put forward "Late Development Advantage (LDA)". He pointed out that compared with relatively developed countries, the backward countries has an inner urge to speed up the pace of the industrialization resulting in system reform and technological introduction and innovation, while at the same time taking advantage of local resources rationally and making up for the inadequacy of prerequisites [5]. After that, Philip Levy, an American economist, went from perspectives of resources, capital, labor, technology, system and demonstrated the existence of the late development advantage [6]. He proposed a "leapfrog" model based on the technology development of late development advantage [7].

Late development advantage is now a term in Development Economics referring to a country or region's backward developing economic status that may receive faster economic growth rate if given certain stimulating factors.

2.2.2. China's Research on Late Development Advantage

In addition to the main points mentioned above, many scholars in China have studied and summarized late development advantages, but most of them are mainly related to the following major factors, *i.e.*, resource advantage, cost advantage and the advantage of creating conversion cost. Huang of Sichuan University analyzed the reasons of the late development advantage which has become increasingly apparent due to the increased R & D investment, less intensified innovation risk, decreased market development cost and acceleration in the replacement of old technologies with new ones [8]; Shi summed up late devel-

opment advantages and demonstrated their important role in the course of modernization in China [9]. Zhang J. discussed late development advantage as an important performance advantage when the country was in the backwardness of technology innovation and pointed out from the perspective of resource accumulation and technology imitation and innovation which made the inner mechanism of the late development as an advantage [10]. Liu *et al.*, starting from the basic theory of development economics, further studied the theory of late development advantage in relation to the Catch-up Effect (Chase Effect) in Macroeconomics and summarized under the condition of globalization and informatization, China will be bolstered with a faster development with many potential benefits and changes [11].

2.2.3. What Is the China's Late Development Advantage?

As analyzed above by economics home and abroad, a country or region's late development advantage lies in the absorption and introduction of advanced technologies, system, labor, etc., to skip certain traditional economic developing stage to gradually catch up with or even overtake advanced economic bodies [12].

Chinese economist Lin, Zhang established an endogenous growth model to illustrate that the less developed countries with lower technical level and wages determined by comparative advantages, can enjoy a faster growth rate than developed countries as long as the less developed countries are able to gain introduce advanced technology from developed countries and to adapt into technology changes faster than developed countries [13]. They analyzed that less developed countries would not fall into the trap of low technology products and creativity forever, but also realize a convergence of economic development to the developed economies by faster application and update of emerging technologies.

Although China's economy has maintained an average annual growth rate of 9.9% from 1980 to 2012, some American economists analyzed that it is unlikely for China to keep as fast a growth in the contemporary economy based on the Convergence Theory when Chinese annual GDP per capita reached 58% of the US annual GDP per capita. They predicted a 75% probability of slow-down in China's economic development in the year 2023 according to the data from Penn World Tables. Lin Yifu also believed that China is unlikely to maintain 8% growth rate with the consequences of low labor productivity and high energy consumption rate in the course of modernization and industrialization in China [14]. However, the global fourth industrial revolution featured with Big Data, Smart Manufacturing and Wireless Revolution in Chinese industries with super technical change is brewing a new mode of production mode and increasing productivity. It is widely believed that the new industrial revolution could revolutionize global technology and market elements, and thus re-carve the world labour and wealth division. As the United States still holds a big lead in the future race of international division of labor in the major, China has also passed

the era of competitive advantage of cost-based manufacturing. China is now engaging in an more active role in cultivating research and development of forward-looking technologies, improving its global financial service level and accumulating the industrialization experience with new technologies. Only in this way can China consolidate its late development advantage and build more competitive advantages in industry 4.0 tide.

The long-term growth of China's economy depends on the growth of technological progress and human capital growth caused by knowledge, information, research and development (R & D) or innovation. Among them, technological progress is the most important driving force.

It is gratifying that China's R & D spending has been growing at 10 per cent for many years now. Chinese companies and researchers are building up technological know-how in a number of areas, including smart manufacturing, that could lead to "disruptive" changes in products and services in the future. China therefore is also seen as a potential breakthrough in global innovation, especially in key technologies.

Previous 7 years of R & D spending (Percent Change in GDP) are demonstrated in the **Graph 1** below.

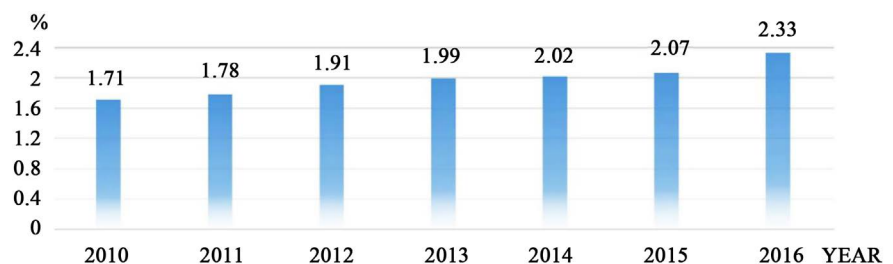
According to China Science and Technology statistics website (<http://www.sts.org.cn/>), R & D expenditure totaled RMB 1544 billion, covering 2.33% of total China GDP in 2016, which was 0.1% lower than what the National 12th Five-year Plan regulated. Although it is second to America, this is both clear and sufficient to indicate that China is attaching great significance in R & D of technologies and is investing more than ever in boosting long-term sustainable development.

3. Methods

Research Questions

1) How does China make best of its Late Development Advantage to change world image of Made in China to Chinese Smart Manufacturing in Industry 4.0 era?

2) How does China apply emerging technologies and advances under China's strategic policies to embrace a thriving and sustainable all-in-one Development?



Graph 1. China's R & D expenditure in GDP from 2010-2016. Data source: Ministry of Science and Technology of China (MOST), <http://www.most.gov.cn/>.

This paper applies mainly archival research method by analyzing key information and extract data from social media, news reports, journal articles and government documents. The purpose is to answer the above two Research questions by sufficient evidence and to support the research findings with data of reliable sources and illustrated with tables and graphs. Throughout the paper, The author first compared the Germany *Industry 4.0* with *Made in China 2025* using inductive and descriptive methods in literature review. To answer the first research question, the author collected and analyzed the major epoch-making events in China from 2015 to 2017 including key disruptive technologies. The events are presented in **Table 3**. When answering the second research question, a descriptive and deductive method is applied to analyze Chinese government policies in regard to change “Made in China” connotation and value and build Chinese Smart Manufacturing image. In Discussion and Conclusion, the author tried to support the findings with data from either a inductive or comparative manner.

4. Results

4.1. China's LDA under Implementation of Made in China 2025 and Its Preliminary Achievements: Emerging Technologies and Advances Since 2015

Under the guideline of *Made in China 2025*, Chinese government increased significantly investment of R & D in many key sectors, the world is witnessing a great deal of magnificent changes in China along with the emerging technologies.

Table 3 lists the 27 epoch-making events in China from 2015-2017.

4.2. Big Data in Transportation: Internet of Autos

4.2.1. China's High Speed Rail (HSR) Development

China's high-speed rail system, which has surpassed Japan's Shinkansen and many other fast train systems in both speed and stability, has been building high-speed rail diplomacy network abroad. In 2004, Chinese Railway Ministry bought 40 models from Bombardier Ltd, Canada and initiated a long journey of technology introduction and renovation. Along with the large payment of technology transfer fees, China launched its CRH trains in a cooperative manufacturing effort with Canada, Japan, Germany and France to improve China's high-speed emu design, software development, manufacturing and technical level [15]. Since 2012, drawn from China's national conditions, Chinese Railway Ministry initiated the overall road design and manufacture of high-speed motor units platform, gradually realized China's HSR trains independent and standardized R & D, shifting the HSR image from “made in China” to “created in China”. The process of research and development of Chinese own trains saw tremendous progress with CRH-6 and CR 400 trains running among cities and remote high altitude and cold areas all over China and HSR trains and rails export to many countries in the world [16].

Table 4 shows China HSR development.

Table 3. The 27 epoch-making events in China from 2015-2017.

2015
1) First Chinese scientist Tu Youyou won Nobel Medical Prize with her invention of Malaria cure—Artemisinin; 2) China's self-developed large plane C919 in manufacture, making Chinese "big plane dream" into reality. 3) Beidou Navigation Satellite carrier rocket "Long March 3/Expedition one" carrying 2 new-generation satellite. 4) China-world's first quantum satellite key component developer and manufacturer status founded 5) The 2nd World Internet Conference gathered 2000 guests from 120 countries covering the latest IoT achievements including driver-less cars, virtual reality cameras and mobile operating systems etc. 6) China's 4th generation nuclear power core technology leading the world: electromagnetic helium fan with advanced high temperature gas cooled reactor nuclear power technology. 7) China is building the world's longest quantum communication artery from Beijing to Shanghai, being pioneer of future quantum communication network. 8) China Turbofan 15-the 4th Generation Thrust Engine applied in war-crafts. 9) May 8th, the state council issued "Made in China 2025" as a decade strategic plan to comprehensively promote quality of Chinese manufacturing industry under the new international and domestic environment.
2016
1) May 25th, Global Innovation Index Report listed China as the only middle-income country to enter world top 25. 2) July 15, "Renaissance" HSR(High Speed Rail) created another world record in speed as China's complete and independent intellectual property rights HSR product. 3) August 16, China launched the world's first quantum scientific experimental satellite. 4) September 25, the world's largest aperture spherical radio telescope with a diameter of 500 meters, or FAST, AKA the "heavenly eye", was officially opened in Guizhou province. 5) October 19, Shenzhou-11 spacecraft successfully docked with Tiangong-2 and conducted a series of space experiments. Tiangong-2, China's first truly space laboratory, will be key construction of Chinese space station. 6) November 3, China Wenchang space launch site, Long March 5massive, rocketed into the space as China's largest capacity carrier rocket. 7) Tianzhou-1 cargo spacecraft and Tiangong-2 space lab successfully completed the first propellant in-orbit completion test, Making China the 3rd country in the world to independently master this key technology.
2017
1) March 9, independent R & D of "Sea Wing", the deep sea glider, finished in the Marianas trench deep dive observation mission and safe recycling with the maximum depth of world record-6329 meters. 2) April 26, the launching ceremony of the second aircraft carrier in China was held at Dalian shipyard-China's first self developed aircraft carrier 001A. 3) May 3, World's first quantum computer dwarfing classical computers was made in China. 4) On May 10, 2017, China's successful test of "combustible ice" in the south China sea reflected core technology of exploration and demonstrated independent design and manufacture of "blue whale I" offshore drilling platform. 5) May 14, President Xi delivered keynote speech titled "working together to promote Belt And Road Initiative"attending One Belt And One Road International Cooperation Summit. 6) June 28, launching ceremony of the new Navy Destroyer (warship), held in Jiangnan Shipbuilding Group. 7) August 10, Chinese scientists completed a special experiment on quantum teleportation from ground to space in the first quantum scientific experimental satellite, Mozi. 8) China's first X-ray space astronomical satellite (Hard X-ray Modulation Telescope, HXMT, Huiyan, was launched and carried three small satellites which completed 248 flights of the Long March Carrier Rockets. 9) First 25-Mev continuous wave standard test in superconducting proton accelerator laid solid foundation to undertake subsequent national major scientific infrastructure-accelerator driven evolution research unit (CiADS). 10) World Rice Father, Prof. Yuan Longping's "sea rice" test was successful: the maximum yield per mu was 620.95 kilograms, which exceeded world expectations. 11) By November 13, 2017, China overtaking the US in the total number of 202 to 143 fastest supercomputers. In the fiftieth world TOP500 list.

4.2.2. "Renaissance": Technological Innovations of CR400 Trains

"Renaissance" locomotive system is manufactured completely in China with advanced science and technology. Overall design of China's standard vehicle group aims to be advanced in the design of vehicle body, bogie, traction electric system, braking system, conductor room and whole-train Wi-Fi network etc. Key

Table 4. China HSR development.

Model No.	Co-Manufacturer	Max Speed	year	Nick Name
CRH-1	Bombardier Ltd, Canada	250 km/h	2004	Harmony
CRH-2	Kawasaki Ltd., Japan	250 km/h	2005	Harmony
CRH-3	SIEMENS, Germany	350 km/h	2006	Harmony
CRH-5 high altitude series	ALSTOM, France	250 km/h	2007	Hairtail fish
CRH-6 Trans-city series	China South Railway (CSR)	200 km/h	2012	Trans-city Express
CR 400 Renaissance	Self developed by China Railway Ministry	400 km/h	2017	Blue Dolphin, Golden Phoenix

Data Source: <https://baike.baidu.com/>.

technologies are independently researched and developed in China and have full independent intellectual property rights due to the fact of 84% sole Chinese standards among total 254 technologies. Its technological innovation and achievements are mainly reflected in:

First, the security technology is more advanced. “Renaissance” is equipped with intelligent sensing system, and has a strong security monitoring system. The whole train is deployed with more than 2500 monitoring stations and able to operate in various altitudes and remote mountainous regions, bearing extreme temperatures. It provides all-round real-time monitoring the temperature of cooling system, brake system status, carriage environment etc. The China standard emu has also added a collision absorbent device to improve the passive protection of the motor vehicle group. In order to adapt to China’s vast territory and complex environment (−40 Celsius degree to +40 Celsius degree), long distance, high strength operation needs, “Renaissance” Chinese standard mu trains were designed according to the highest standards with designed life of 30 years, 15 million kilometers, able to operate for a distance of 600,000 kilometers which is higher than European average standard of 400,000 km).

Secondly, the ride experience is more user friendly than previous CRH trains. Passengers can not only charge their electronic devices with 220 V power sockets in the train but also have Wi-Fi access. The “Renaissance” China standard emu car has fully covered Wi-Fi network. The train conditioning system fully considers the influence of the external pressure wave and reduces the discomfort of the ear when passing through the tunnel or the intersection. The train has a variety of lighting control modes, which can provide different lighting conditions according to the passenger demand. The China standard “Renaissance” locomotive system has also adopted a variety of anti-vibration and noise reduction measures, improved the facilities for washing and gargle, and are equipped with barrier-free facilities to provide passengers with a better ride experience.

Thirdly, the sensing system is more intelligent. When encountered with abnormal speed the train is designed to automatically stop. Chinese standard “Re-

naissance” gathers as many as more than 1500 items of all kinds of vehicle state information to comprehensively monitor real-time train running status including safety check, environmental information (e.g., temperature) records of all parts use condition, to provide all-round, multidimensional fault diagnosis and maintenance support. When the train is abnormal, it can automatically alarm, and automatically control the speed within limit or initiate stop measures according to the security policy. In addition, the China standard “Renaissance” also uses remote data transmission, which can obtain vehicle status information on the ground in real time to improve the ground synchronization monitoring and remote maintenance capability.

Fourthly, the train body is smoothly designed with low resistance streamline which can not only reduce energy consumption, but also significantly decrease noise in the train. It is therefore has a beautiful nick name Blue Dolphin. The resistance level of “Renaissance” trains has decreased by 12.3% compared with the existing CRH380 series, and the per capita energy consumption per capita of 350 km/h speed scale has decreased by 17 percent, effectively reducing the continuous operating energy consumption.

With increased space and WI-FI, user friendly facilities and intelligent operating design, good energy conservation and environmental protection performance, “Renaissance” trains are truly new train standard that are smart-manufactured in China. They are good to enough to be utilized by Chinese leaders to establish friendly diplomatic relations with 17 neighboring countries. It is also a magnificent part of Chinese One Belt and One Road Initiative to gradually enhance China’s image to be global, dynamic and smart manufacturing.

4.2.3. Evidence in New Energy Vehicles

Chinese government has been pioneering in the R & D of new energy vehicles and advocating environmental protection. There will be a decreasing use of traditional gasoline and diesel engine automobiles in China. Chinese Police Bureau has announced that by the end of 2017, new automobile licenses for clean energy use will be applied with green color instead of the traditional blue color, serving as a kind reminder of environment care for citizens’ well-being.

4.2.4. Internet of Autos

World Autonomous Vehicle Ecosystem Conference was held on Nov. 6th, 2017 in Shanghai. The conference was sponsored by Chinese Ministry of Industry and Information Technology and Shanghai Municipal Government, aiming to build a connected world and intelligent future for internet of Autos.

China is committed to building a smart, efficient, comfortable and convenient Internet access system with zero emissions, zero casualties and zero obstacles by increasing innovation of auto intelligent network and common key technologies, establishing a public platform for the R & D, testing, evaluation and demonstration of intelligent network vehicles. All related departments in China will work together to strengthen the construction of smart online vehicle regulations, and

to actively promote the expansion of the pilot demonstration of intelligent network vehicles. A joint-effort of exploring, collecting, analyzing and sharing of big data is encouraged to promote the application of big data in automobiles and to develop smart transportation for an energy-saving and environmental friendly urban development.

4.3. Big Data in China's Shared Economy

4.3.1. Evidence in Shared Economy

The concept of “shared economy” originated in the United States by Marcos and Joan has been enriched and developed in more than 30 years of business practice [17]. Based on scattered social idle resources, shared economy is applied to improve the efficiency of resource utilization. In recent years, the shared economy has developed in a global scale, promoting the matching of scattered supply and demand to unleash economic vitality.

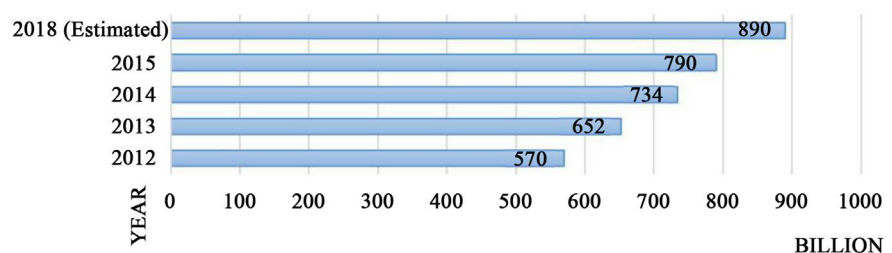
China has now formed a \$62.5 billion shared economy volume, and kept a 54% of high-speed growth in 2016. By the year 2018, the total volume is expected to reach \$230 billion, covering 44% of the global share [18]. China's development of shared economy has certain foundation and conditions:

- China's resource per capita is low and resources are unevenly distributed. Huge gap between supply and demand can be seen in the society and shared economy can improve resource utilization rate
- Mobile internet technologies and applications rapidly infiltrates into residents' lives. The penetration rate of mobile Internet is increasing continuously. China's rapid development of mobile Internet user scale increased from 570 million in 2012 to 790 million in 2015, is expected to reach 890 million in 2018, the continuous expansion of coverage and permeability provides rich soil for development of Shared economy.

Internet population in China is shown in **Graph 2** below.

- There is a growing diversity of social networks in China.
- Along with the rapid advance of urbanization in China, emerging middle class becomes more powerful in consumption and more educated to adapt into social and technological revolutions.

Chinese residents' consumption habits require a service-oriented economic development. Therefore, China sees a great opportunity for sharing in economy. Under Shared economy, practically everything can be shared. Traffic modes,



Graph 2. Chinese internet population. Data source: <http://www.stats.gov.cn>.

dinners, gym membership, taxis, parking lots etc. Some highlights of shared economy in China are listed below:

- Mobike

Year 2016 and 2017 have witnessed the development of shared bike services in Chinese cities for short distances travelling, commuting for work and recreational exercise purposes. Mobike, for instance, is an Internet short-distance travel solution developed by Beijing Mobai Technology Co. The orange bikes have a fashionably sporty design and are equipped with a smart hardware that applies GPS technologies which requires only a smart phone to scan QR codes on the bikes to unlock and they don't need special piles for storing. Therefore, every possible public idle space, *i.e.*, parks, sidewalks and schools, etc., can be used for borrowing and returning. People can quickly rent and return a mobike with affordable 1-yuan price to complete a few kilometers of city cycling.

- DiDi Chuxing

DIDI Chuxing, (Chinese: 滴滴出行; pinyin: Dīdī Chūxíng) is a major ride-sharing service company, providing transportation services for more than 450 million users across over 400 cities in China. It provides services including taxi hailing, private car hailing, Hitch (social ride-sharing), DiDi Chauffeur, DiDi Bus, DiDi Test Drive, DiDi Car Rental, DiDi Enterprise Solutions, DiDi Minibus, DiDi Luxe and bike-sharing to users in China via a smart phone application. DiDi has over 7000 employees, 40% of which are women. Didi Chuxing is the largest and most powerful ride-sharing company in the world, with a monopolistic investment and M&A portfolio in the ride and bike sharing industry across the globe. The company completed 1.4 billion rides milestone in just 2015 alone, clocking over 200 million rides in 2016. This far surpassed any other ride-sharing companies, including Uber which completed only 1 billion rides in 6 years' time since its founding in 2009. In May 2017, Didi Chuxing started to develop an English version of its app and services, with plans to expand its platform globally. Recently, it has also been involved in autonomous driving and artificial intelligence (AI), hiring researchers and investing in these areas.

- Car-sharing travel

Car-sharing travel in China has broad prospects for development. Direct demand increased from 8.16 million times/day in 2015 to 37 million times/day in 2018. In corresponding to the demand, market capacity is expected to increase from RMB 66 billion/year to 380 billion yuan/year. The potential demand potential market capacity is expected to reach 1.8 trillion yuan or more. Car sharing will be a vibrant area in China. Within only three years, travel car sharing has expanded rapidly to 1.77 billion orders, creating 1.77 billion jobs and attracting investment of \$23.4 billion, about 250 million Chinese users to use at least once a week travel sharing software. Car sharing is still accelerating and showing strong vitality. [19]

4.3.2. Alibaba Double 11 Shopping Festival Dewarfs US Black Friday

A total amount of internet transaction 168.2 billion yuan on the famous Double

11 Alibaba Shopping Festival was closed on Nov.11, 2017 with 1.48 billion orders from 222 countries and regions, 256,000 online payment per second which hit world historical high.

Graph 3 below demonstrates the famous Chinese Alibaba Double 11 Shopping Festival single day turnover from 2009 to 2017.

Based on the analysis of Adobe Data Analytics, U.S. retailers online sales on black Friday and Thanksgiving reached a record USD 7.9 billion (RMB 52.1 billion yuan), increased by 17.9% than the same period last year. This year, China's Double 11 Internet transactions reached 168.2 billion yuan, while the US Black Friday sales were less than one-third of China's Alibaba Double 11, which is only a single day sales. (November 11, celebrated by youngsters in China as Singles' Day.)

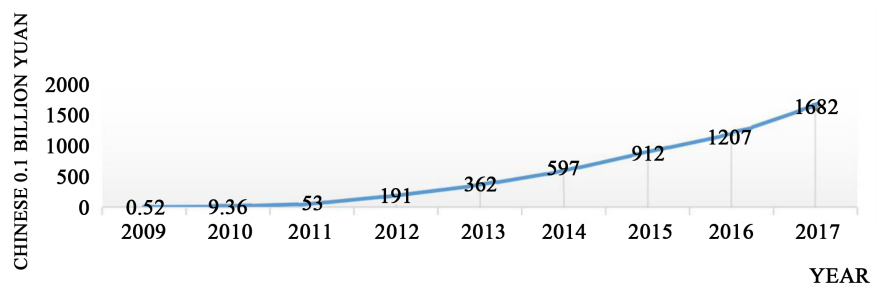
4.4. Research Question 2: How Does China Apply Emerging Technologies and Advances under China's Strategic Policies to Embrace a Thriving and Sustainable All-in-One Development?

4.4.1. All-in-One Development

In Industry 4.0 era, driven by the trend of smart manufacturing, the production process shifts from labor intensive to technology intensive. It is more penetrating and penetrating to all industries. The advances in technologies will hence lead an overall development in all industries and hence benefit all citizens in the society. Chinese government endeavors to stipulate social and economic policies to maximize the well being of all stakeholders; enterprises will make best profit out of most favorable government policies and friendly international circumstances for smart manufacturing processes. Both Chinese Citizens and overseas consumers will enjoy the ultimate accomplishments of Chinese smart manufacturing products and services in Industry 4.0.

4.4.2. Supply-Side Reform

As the 13th five year planning policy, Chinese government put forwarded 5 specific strategies to reform economic structure to adjust into global smart manufacturing trend. All five strategies were designed to improve "Made in China" brand quality. The 2008 Global Financial Crisis has made the entire world less



Graph 3. Chinese Alibaba double 11 shopping festival turnover. Data source: <https://dt.alibaba.com/>.

safe and desirable for Foreign Direct Investment (FDI). Sluggish overseas demand also resulted in a huge decrease of Chinese traditional export volume. The only way to vitalize Chinese production and demand is to increase domestic consumption. China has a large population and is rich in all kinds of resources. There is a substantial undeveloped domestic demand potential to pull China out of the Global Financial Crisis. Chinese government then spared no effort to apply technologies into manufacturing and improved the quality of Chinese products and services to the maximum extend so as to attract its own citizens consumption and at the same time, gradually changing the world's impression on "Made in China" products and services. Five strategies for Supply-side Reform are: addressing over capacity; lowering production cost; reducing inventory; DE-leveraging and bolstering areas of weakness for an all-in-one development. In specific, cutting housing inventories, tackling debt overhang, eliminating superfluous industrial capacity, cutting business costs, streamlining bureaucracy, urbanization and abandoning the one-child policy are all examples of supply-side reforms.

4.4.3. Belt and Road Initiative (66 Countries Involved)

With quality-improved products and services, China finds a way to export more. The grand Belt and Road Initiative involves 66 countries and was proposed by Xi Jinping (Chinese President) when the world started to revive from the economic crisis. The Belt and Road Initiative is a development strategy that focuses on connectivity and cooperation between Eurasian countries, primarily the People's Republic of China (PRC), the land-based Silk Road Economic Belt (SREB) and the oceangoing Maritime Silk Road (MSR). It was unveiled in September and October 2013 for SREB and MSR respectively. It was proposed by Chinese President Xi Jinping [20] and was promoted by Li Keqiang (Premier of Chinese State Council) during the state visit to Asia and Europe and is the most frequently mentioned concept in the People's Daily in 2016 and became a viral hot word. It was initially called One Belt and One Road, but in mid-2016 the official English name was changed to the Belt and Road Initiative due to misinterpretations of the term one. In the past three years, the focuses were mainly on infrastructure investment, construction materials, railway and highway, automobile, real estate, power grid, and iron and steel.

Belt and Road initiative is geographically structured along 6 corridors on the world map including the Maritime Silk Road and the New Eurasian Land Bridge, which runs from Western China to Western Russia through Kazakhstan. The six Corridors are:

- China-Mongolia-Russia Corridor, running from Northern China to Eastern Russia;
- China-Central Asia-West Asia Corridor, running from Western China to Turkey China;
- Indochina Peninsula Corridor, running from Southern China to Singapore China;

- Myanmar-Bangladesh-India Corridor, running from Southern China to Myanmar;
- China-Pakistan Corridor, running from South-Western China to Pakistan;
- Maritime Silk Road, running from the Chinese Coast through Singapore to the Mediterranean.

Belt and Road Initiative underlines China's push to take a larger role in global affairs with a China-centered trading network. Data source:

<https://www.yidaiyilu.gov.cn/>.

5. Discussion

This paper mainly applies archival research method and may be supplemented with other research methods. The author conducted an analysis of Chinese government policies to restructure manufacturing industry, to improve Chinese products and Services quality and to promote best quality Chinese products and services to the world market. The author concluded that China has successfully changed the image of “Made in China” into Chinese Smart Manufacturing by both innovation and application of technologies. The supportive Chinese government policies played a crucial role in improving “Made in China” connotation. However, the feasibility of a detailed image survey of “Made in China” among foreigners is suggested and approved in the further study, which serves a way of collecting data and supplementing research method on the topic.

6. Conclusions

The Fourth Industrial Revolution of mankind is ongoing. The entire world is going through disruptive renovations led by fast updated technologies. China made best of its Late Development Advantages in the traditional manufacturing industry and successfully became the second largest economy in the 21st Century. China is embracing actively all great opportunities for tremendous changes and advances.

This paper argues the image and connotation change of “Made in China” by demonstrating undergoing technological and political achievements in China. In the 19th CPC (Communist Party Committee) National Congress, Chinese President Xi Jinping made a modest conclusion of the past several decades of China's development. China has successfully realized overall well-off for the entire 1.4 billion Chinese population and is targeting another 30 years of peaceful and sustainable development to be among world super powers.

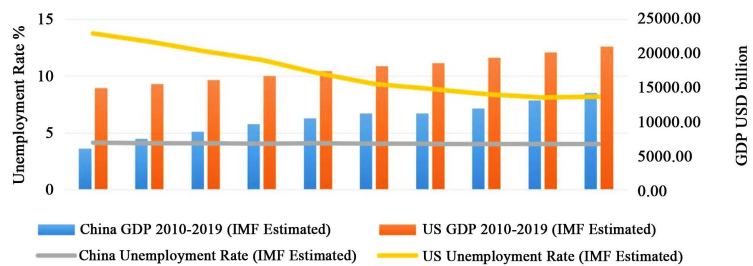
The whole research process is a detailed literature review of Chinese technological and political related news events, dataset and government policies which are in great support of modern Chinese accomplishments in global economic or political spheres, which is reckoned by the author as how exactly “Made in China” changed in its connotation and value. The author collects 10 year data (including estimated data) from International Monetary Fund (IMF) and draws a comparison between the contemporary world hegemony US and China in sever-

al principal global indicators. **Graph 4** is the illustration of data in China-US GDP & unemployment rate.

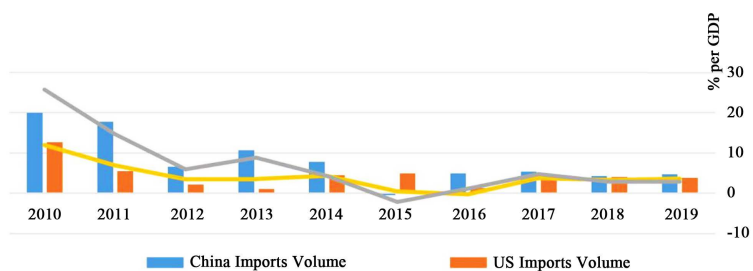
Graph 5 below shows the change in Sino-US goods and services imports and exports volume in percentage.

The above graphs illustrates that China surpasses US in both Export and Imports volume in almost all years from 2010 to 2019 (as estimated by IMF) except for year 2014 and 2015. It is a truth acknowledging by the world that China is not only the world second biggest economy, its international influence and power has been growing as well. China is committed to satisfy its comprehensive modernization dream by keeping up with the fourth Industrial revolution tide and adhering to the principles and policies for the next decades of peaceful and sustainable development. Under the guidance of *Made in China 2025*, Supply-side Reform and Belt and Road Initiative, Chinese government's endeavor to change the image of Made in China into Chinese Smart Manufacturing will be successful with the world citizens favoring Made in China products and services, if is not completely triumphant so far.

To conclude, under the circumstances of the fourth Industrial revolution which technologies innovate substantially and rapidly, Chinese government takes an active and cautious role in designing economic policies for all industries and implement reform in all sectors to keep up with the disruptive trend. It is therefore safe to predict that China will continue to take full advantage of emerging technologies in designing Internet of Things (IoTs) in all industries and will engage globally in a leading role of analyzing and applying Industrial big data to embrace a thriving and sustainable all-in-one development in the fourth industrial revolution era.



Graph 4. China-US data in GDP & unemployment rate. Data source: IMF Data. <http://www.imf.org>.



Graph 5. Volume of Sino-US imports & exports of goods and services percent change. Data source: IMF Data. <http://www.imf.org>.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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