CONTENTS

Chongqing: Trade in Services, Made-in-China 2025 and Internet Plus

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Summary and recommendations

- Chongqing's impressive development has made it a dynamic international and domestic growth pole in inland China. Its strategic importance was highlighted during the visit to Chongqing by President Xi Jinping at the beginning of 2016.
- But the global economic context is characterized by uncertainty, rapid change, and challenges to globalization. This presents a difficult context for the upgrading and transformation of China's economy, including in Chongqing.
- The Chinese government's 'Made-in-China 2025' and 'Internet Plus' strategies provide an excellent platform for the next phase of the country's development. Chongqing's government has grasped these opportunities in proactive and innovative ways.
- Further market-based economic reforms will help take these plans forward and, when carried out in Chongqing, make the city more attractive to foreign businesses.
- Continued investment in Chongqing's connectivity and logistics platforms will contribute to the development of trade in services.
- Improvements in the speed, stability and access to internet would support the further use of information technology in manufacturing and trade in services.
- Chongqing's desire to build an open economy will contribute to its industrial upgrading. Promoting and encouraging more international cooperation in innovation would take this process further.
- Through upgrading its economy and integrating its development with the 'belt and road' strategy, Chongqing has strong potential to develop further as a major growth pole in inland China.

1 Introduction

This paper looks from an international perspective at the implications for Chongqing of China's development of trade in services, in the context of the 'Made-in-China 2025' and 'Internet Plus' strategies. It is submitted by the Jardine Matheson Group (JM) as a contribution to discussion at the 11th meeting of the Chongqing Mayor's International Advisory Council (CMIA) to be held on 25 September 2016.

We have followed with interest developments in Chongqing since the 10th CMIA a year ago. The GDP growth rate of 10.2% in 2015 was the highest for any provincial-level unit, taking GDP to RMB1.57 trillion.[1] The strategic importance of the city was highlighted when President Xi Jinping made Chongqing the first city of his 2016 schedule of visits. This followed the announcement in November 2015 of the China-Singapore (Chongqing) Demonstration Initiative on Strategic Connectivity, a welcome innovation which should develop connectivity across finance, telecommunications, aviation and logistics. And as the *People's Daily* pointed out in June,[2] Chongqing has been making progress in developing traditional pillar industries, the new internet economy, new industries, and an open economy. Industrial profitability remains strong (up 16.5% in 2015).

The development in Chongqing over the last two decades has taken it from a less developed industrial city in inland China to become a dynamic international and domestic growth pole in inland China. According to the *People's* Daily, the Yu-Xin-Ou train route had carried 554 trains by end March 2016, accounting for over 80% by value of goods transported across land from China to Europe. And as was discussed at the 10th CMIA in 2015, its strategic location at the intersection of the major 'belt and road' initiative and the development of China's Yangzi river economic belt positions the city to develop further its status as a growth pole. To do so, it will need to continue to engage in the upgrading and transformation of its economy, in line with China's national strategies outlined below.

The rest of this introduction looks briefly at the global context, followed by a section on issues in upgrading China's economy. The paper then discusses the implications for Chongqing, before drawing conclusions and making recommendations.

Global context: uncertainty and rapid change

The immediate global economic context is one characterized by uncertainty and rapid change. The IMF has warned of the risks of widespread economic stagnation. The outlook for many emerging markets has weakened while developed economies in Europe and Japan have not yet taken up the slack. At the same time, rapid and disruptive change is happening in many business sectors. Forces of technological change include the ongoing digitization of commercial activity across manufacturing and services.

Trade has slowed, partly for cyclical reasons in a period of slower GDP growth, but also for structural reasons.[3] This reflects the changing nature of relationships between trade and GDP, between trade and investment, and between trade in goods and services. Rather than value being created through simple trade in goods, value is increasingly created through technology transfer, and services are increasingly embedded in manufactured and traded goods.

Some of these changes are reflected in the changing nature of global value chains (GVCs). Data suggests that GVC participation fell in the aftermath of the global economic crisis of 2008, and has not regained earlier levels. This would also be

consistent with the trends witnessed in the Chinese economy, which has moved away from reliance on export-led growth, and which has seen its trade surplus decline from around 7% to under 3% of GDP between 2007 and 2015.[4]

It was integration into GVCs which drove a large part of China's economic and business development in the early reform era, and Chongqing has played a striking role in subsequent sectoral shifts in GVCs, leading to the assembly in the city of around 40% of the world's laptops. The Chongqing experience also helps to explain some of the changes in international trade, as manufacturing and assembly inputs have come increasingly from within China's borders and so do not contribute as much to international trade as in the past.

In other words, the period of globalization where production was increasingly dispersed or fragmented across borders, with parts and components for assembly being produced in multiple countries, may be being replaced by a trend of supply chains being brought inside national borders, particularly in large economies such as China's.

2 Upgrading China's economy

It is in this context that China is facing the challenge of restructuring and upgrading its economy. This reflects long-standing policy goals by the Chinese leadership which have been gradually implemented through the recent 12th five-year programme period (2011-2015) and are projected to continue during the 13th five-year programme (2016-2020). They were at the heart of the reform programme set out in November 2013 at the Third Plenum of the 18th Central Committee of the Communist Party of China.

From an international perspective, there are many noteworthy aspects of these reform plans. The rest of this section of the paper comments on three areas which are the focus of the 11th CMIA: trade in services, Made-in-China 2025 and Internet Plus, followed by some general comments on China's economic transformations from the perspectives of international businesses.

China and trade in services

As is well known, China's trade has grown rapidly since reform and opening up was initiated, and in particular following accession to the WTO in 2001. China's total trade grew from USD20 billion in 1978 to USD500 billion in 2001 and USD3.64 trillion in 2011, growing five times as fast as overall global trade in the decade after WTO accession. Since then, in a period of slower and inconsistent trade growth, China's trade has still risen to reach USD3.96 trillion in 2015. This makes the PRC the world's largest exporter of goods and the second largest importer, accounting for over 10% of global totals. The structure of this trade has also changed, with the trade surplus – which peaked around 2007 at 12% of China's total trade volume – falling in relative terms since then.

A major driver of the growth in China's trade and its subsequent changing shape has been the nature of China's integration into the global economy. From the 1980s this was driven primarily by the extension of international production networks to incorporate cities along China's coast. The results can been seen in the geographical concentration of China's trade, with coastal provinces consistently accounting for over 90% of China's total trade. Since the mid-2000s important inland economic hubs such as Chongqing have begun to challenge this coastal dominance of trade, including through connectivity across land towards China's west and the promotion of the 'belt and road initiative'.

China's status as the major global trader in goods is not matched when it comes to trade in services.[5] China's services

trade was USD72 billion when it joined the WTO, and grew to USD362 billion in 2010, around 5% of the global total, with a target of USD1 trillion in 2020. In contrast to the surplus in goods, China has consistently run a trade deficit in services, up to USD137 billion in 2015 (its deficit in trade in services with the US in 2015 was USD29.5 billion, with total trade in services between the two recorded at USD61.3 billion). In 2014, global trade in services grew faster at 5% yoy than trade in goods (0.3% yoy), to account for 21% of total global exports at just over US$5 trillion, compared to US$19 trillion for merchandise exports.[6]

China has indicated a desire to participate in the negotiations under the WTO for a Trade in Services Agreement, but the US has not yet responded positively.

Made-in-China 2025

Chinese policy makers have for some time been conscious of the impact of digitization and technology on economic activity. In an interview with Chinese media outlet *Caixin* in 2014 the Minister of Industry and Information Technology said that, 'We are now in a key era of transformation of comparative advantages, one in which technological innovation will determine industry's future development and replace cost advantages to determine China's status in international competition.' Other drivers for China to upgrade the economy include the declining working age population (though urbanization means that the urban workforce will continue to grow to 2030), which pushes Chinese policy makers to move away from a low-cost labour-intensive approach to manufacturing.

For the moment, China remains dominant in much global manufacturing. Total output in 2013 was over RMB20 trillion, approaching one third of the global total. And China is the largest producer of 220 categories of the 500 major types of industrial product. But currently a relatively small proportion of China's manufacturing is digitized. The Mercator Institute for China Studies reports that Germany has 282 industrial robots to 10,000 factory workers, whereas the figure in China is just 14, reflecting labour cost disparities and the difference in manufacturing level between the two countries.[7]

In May 2015, the State Council set out a new plan called 'Made-in-China 2025'. This set out a strategy to upgrade manufacturing industries in China to build China into a strong manufacturing country, rather than simply the large manufacturing country it is today. The strategy – the first to set out ten-year targets in this area – is to be implemented in three stages:

(i) By 2020, the plan targets further progress towards China being a major industrialised manufacturing country, and a significant increase in the application of information technology ('informationization') to manufacturing. It aims to develop key technologies, strengthen competitiveness in key sectors, and improve product quality, as well as show clear improvement in the extent to which manufacturing is digitized, networked and smart. There should be reductions in energy usage, waste and pollution. By 2025, there should be a major increase in the overall quality of manufacturing, and in innovation capacity, a clear increase in labour productivity, and a new level in the integration of industrialization and informatization. Improvements in energy usage and reductions in waste and pollution should place China at the front of global standards. There will be (Chinese) multinational companies and industrial clusters which have strong international competitiveness, and China's position in the global division of labour and global value chains should be raised noticeably.

(ii) By 2035, the plan sees China as being in the middle level of globally-strong manufacturing countries, with big advances in innovation capacity, key sectors, overall competitiveness, and the ability of strong sectors to drive global innovation.

(iii) By 2049 (the 100th anniversary of the establishment of the PRC), the aim is that there will be further consolidation of China's status as a great manufacturing power, and it will be at the frontline of global manufacturing countries.

This plan represents a shift in emphasis from earlier strategies, including that to promote 'indigenous innovation' set out in 2006 in a Medium-Long Term Plan covering the period to 2020, and the identification of seven strategic industries in the 12th five-year programme (2011-2015) and subsequent policy documents. The Made-in-China 2025 plan is broader and has less focus on the idea of indigenous innovation. This reflects other policy statements by the current Chinese leadership about building an open economy. Back in 2012, Xi Jinping said that 'the development of science and technology requires extensive international cooperation. Science and technology have no nationality!'[8] This approach to developing global networks of innovation will be welcome to many international businesses.

The Made-in-China 2025 plan envisages a more innovation-driven and ecologically-friendly manufacturing. It is intended to target all manufacturing industries (including modern services) and use a range of policy tools. There is a particular emphasis on the use of technology and the internet to upgrade manufacturing. There is a goal to increase domestic content of core components and materials to 40% by 2020 and 70% by 2025. Both the state and markets will be involved, with planning to lead to the development of a number of manufacturing innovation centres (15 by 2020, 40 by 2025).

The plan is also in line with the general reform direction of the Chinese government, to strengthen the role of market forces. It recognizes the importance of intellectual property rights protection, including for small and medium-sized enterprises. There is much talk of encouraging companies to attain international standards.

There are ten key sectors to be prioritized under Made-in-China 2025:

(i) New information technology
(ii) High-end data-controlled machine tools and robots
(iii) Aerospace equipment
(iv) Ocean engineering equipment and high-end vessels
(v) High-end rail transportation equipment
(vi) Energy-saving cars and new energy cars
(vii) Electrical equipment
(viii) Agricultural machinery
(ix) New materials, such as polymers
(x) Bio-medicine/biopharma and high-end medical equipment

This strategy is also one of the drivers for the growth in China's outward direct investment (ODI). Growth in Chinese demand for robotics was seen in the recent bid by Midea to buy Kuka, a German robotics company which plays a leading role in the automation of automobile manufacturing.[9]

Internet Plus

The launch of Made-in-China 2025 was followed a couple of months later by the State Council's promulgation of an 'Internet Plus' action plan. This develops some of the Made-in-China 2025 themes by focusing particularly on ways of integrating the development of the internet with traditional industries, and combining the internet with traditional industries (hence 'Internet Plus'). In particular, the aim is to integrate internet-based trends such as mobile internet, cloud computing, big data and the internet of things (networks of physical devices and objects which enables the exchange and collection of data)

with the upgrading of manufacturing and the development of services, for example in banking and personal finance.

The government also advocates the role of the internet in wider reforms to the Chinese economy, challenging existing business models and facilitating disruption. This can be seen, for example, in the development of internet banking platforms by companies such as Tencent or the AliPay service, both of which have stimulated innovation in related sectors. Internet-related businesses are some of the more dynamic parts of the Chinese economy, for example having an impact on the provision of medical services or helping smaller businesses to serve a wider range of customers. International attention is increasingly being paid to companies such as ride-hailing service Didi Chuxing – which received USD1 billion in investment from by Apple in May 2016 – which are facilitating urban transportation and thereby increasing productivity.

Reflecting this, online consumption in China has grown more rapidly than in most global markets. Online shopping segments grew 37.2% yoy in 2015, with total retail sales of goods and services online reaching RMB3.8 trillion, an increase of more than RMB1 trillion on the previous year.[10] The 2015 'Singles Day' in China (11 November) saw online sales by Alibaba of RMB91.2 billion, almost 60% more than the figure for 2014. Projections for further growth suggest that online sales will double in the next three years.[11]

Another consequence of the development of the internet is for the development of smart cities, with positive knock-on effects in addressing many of the 'urban diseases' which afflict Chinese cities, from traffic congestion to air pollution, by making more efficient use of space and other scarce resources.

Developing the internet can also contribute to building the connectivity which is being encouraged by the Chinese government's three strategic regional development initiatives, the belt and road initiative, the Yangtze river economic belt, and the Beijing-Tianjin-Hebei plan for coordinated development. In western China, the growing integration and connectivity of the economies of Chongqing and Chengdu will also be facilitated by the development of internet-related economic activities.

To promote the Internet Plus in manufacturing, Chinese researchers see a need for the development of information technology enterprises in big data and cloud computing. This requires capability in semi-conductors, components and parts, and software. There is a direct link from the internet back to the development of trade in services. Good internet connectivity should facilitate the provision from a distance of business and financial services, as well as the growth of e-commerce.

3 Implications for Chongqing

As noted at the start of this paper, Chongqing has continued to deliver an impressive economic performance during a period when China has been entering the 'new normal' of slower growth. President Xi Jinping has highlighted the strategic importance of Chongqing, and this has been reflected in growing international trade and investment. Progress to date in developing traditional pillar industries, the new internet economy, new industries, and an open economy provides a good foundation for the city to develop further its status as a growth pole in inland China, taking advantage of its strategic location at the intersection of the major 'belt and road' initiative and the development of China's Yangzi river economic belt. This section of the paper looks in more detail at the issues around upgrading and transforming its economy, in line with the national strategies discussed above.

Jardines businesses in Chongqing

Businesses under the Jardine Matheson Group (JM) have been investing in Chongqing for over a decade. Chongqing remains a strategic area for JM in developing its China business:

- Chongqing is the Chinese city in which Hong Kong Land has its largest presence, some 6.6 mn sq. m of developable land in GFA.
- Zung Fu operates two dealerships. Zhongsheng Group has a Lexus dealership and is constructing a second (Audi) dealership.
- Mannings has 18 stores in Chongqing and its private label products sell more in Chongqing than any other city in China. Maxim's opened two dining outlets in 2014.
- Yonghui Chongqing operates 98 stores, and generated revenue of US$1.8 billion in 2015, ranking the top retail business in Chongqing.
- The Mandarin Oriental Chongqing will open in 2019, occupying the top 20 floors of a 25-metre office tower in the Jiangbeizui district.

Trade in services

As is the case at the national level, Chongqing's trade in services lags trade in goods, but has been growing rapidly over recent years. In 2014, Chongqing's trade in services totalled USD13.1 billion, a 25% increase on the figure for 2013, and compared to USD3.5 billion back in 2010. Traditional trade in services accounted for 43% of the total, while modern services trade accounted for the remaining 57%. Of the total, exports of services accounted for USD5.8 billion, with imports taking up USD7.3 billion – like China as whole, Chongqing runs a deficit in trade in services. In the same year, total delivered offshore service outsourcing reached USD1.4 billion, a 27% increase on 2013 (97% of this by value took place in Chongqing's 18 demonstration international service outsourcing zones, with Jiangbei District, Yubei District, Yuzhong District each accounting for over USD100 million).[12]

Since then, the volumes have grown rapidly. In the first three months of 2016, Chongqing's trade in services reached USD2.85 billion, up 18.8% on the same period in 2015. Of this, imports were USD1.78 billion and exports USD1.07 billion. Chongqing's main partners for trade in services are Hong Kong, Republic of Korea, the USA, Australia and Canada. The most significant sectors are tradition tourism, transportation, trade in services '5+1' items and insurance services. Outsourcing services were worth USD350 million, up 16.7% yoy, with the main partners being the USA (accounting for 21%), Hong Kong (14%), Vietnam (13%) and the UK (8%). The main types of service outsourcing were information technology outsourcing which accounted for 14.3%, business process outsourcing at 13.3%, and knowledge process outsourcing at 72.4%.[13]

In August 2015, the Chongqing government announced a plan to accelerate the growth in trade in services and service outsourcing industries.[14] By 2017, Chongqing's total trade in services is projected to reach USD30 billion, representing annual growth of 30%. The contracted value of offshore services outsourcing should reach USD3 billion, at a similar rate of annual growth. By 2020, the total figure for trade in services is projected to reach USD50 billion and outsourcing contracted value some USD6 billion, annual average growth of 25%.

In the first quarter of 2016, Chongqing obtained the status of national cross-border e-commerce comprehensive pilot area, and the Two Rivers New Zone (trade in services industrial park) became a national pilot area for developing innovation in trade in services. Chongqing is creating three main platforms for the development of trade in services: Chongqing foreign

commerce financing and leasing building, Chongqing cross-border e-commerce building, Chongqing headquarters trade building. A number of companies have already based themselves there.[15]

There are a number of key sectors for development. First is cross-border e-commerce. Strengthening this requires the promotion and facilitation of customs clearance, inspection and quarantine work, transaction settlement, and tax rebates. It will require the further development of the logistics industry and third party payment services.

Internet-based cloud computing and big data industries are a second priority. The focus is on speeding up the construction of a cluster in the Two Rivers Zone international cloud computing data centre, promoting the development of big data technology research and utilization services by key industry zones, bringing some international companies which can provide storage, handling, development and use of big data, and expanding the supply chain for value-added services in big data.

Third is facilitation of cross-border settlement and investment: focusing on offshore settlement in processing trade and cross-border e-commerce, encouraging multinationals to set up accounting functions in Chongqing, developing trade in insurance, financial leasing, financial outsourcing services, and so on, to expand the scale of trade in financial services. The goal is to build Chongqing into an offshore financial settlement centre in inland China.

A fourth important sector is international logistics. Chongqing should make full use of the advantages of its air transport, cargo and railway ports, build a logistics public information platform, develop bonded logistics and modern logistics services for international transshipment, allocation (*fenbo*), and distribution and delivery; build a logistics cluster centred around third and fourth party logistics and supply chain services; accelerate the construction of a designated Chongqing-Europe railway ('Yu-Xin-Ou') port for car imports (*zhengche jinkou*), build an inland railway postal services hub and contribute to Chongqing's position on a major corridor for China-Europe goods trade.

Other areas for development include bonded trade, international cultural trade, and offshore service outsourcing (as discussed above).

Chongqing already has a good basis for development of trade in services and some strengths, but it is still in the growth phase. There are a number of challenges facing Chongqing's development of trade in services, including a lack of enterprise scale, dispersed operation, and limited ability to capture the international market share. The city also needs to attract more talented personnel and develop leadership and management skills. Otherwise the development of trade in services will be constrained.[16]

Upgrading Chongqing's manufacturing[17]

Chongqing's manufacturing industries continue to grow at a rapid rate, faster than the national averages. Key sectors are automotive, electronics and computer manufacturing, liquid crystal displays, integrated circuits (集成电路). Chongqing is the largest automotive and vehicle manufacturing base in China (2.6 million units in 2014, 70% produced by Chang'an; total number of passenger cars reached one million in 2015), and the city produces around 40% of the total global production of laptops (55.75 million units in 2015). The automotive industry has been established for some decades, growing out of an earlier phase of Chongqing's industrialization. But the computer assembly industry has been developed from scratch in less than a decade.

Nonetheless, the challenges in upgrading Chongqing's manufacturing are substantial given the transformation in China's economy and the shift to slower growth under the 'new normal'. There are pressures from resource constraints and

environmental factors, and new competition from elsewhere in China and overseas. It is difficult to bring together the development of industry with the application of information technology ('informatization').

Chongqing government officials have made clear that the Made-in-China 2025 plan provides an excellent platform for the city to build on the foundation of Chongqing's manufacturing strengths and 6+1 pillar industries, and to develop the ten new strategic industries in Chongqing. By 2014, the ten strategic industries in Chongqing accounted for over RMB60 billion in industrial value added, with a target of RMB150 billion for 2015 and RMB1 trillion by 2020. Software and information technology services had operating revenue over RMB165 billion in 2015, with a similar figure for new emerging industries (RMB166.4 billion), which contributed 30% to the annual increase in industrial value added.[18]

Chongqing has already developed some leading enterprises in these areas. The Chongqing government has focused on nurturing electronics core components, logistics networks, new materials, new energy vehicles, and smart vehicles, with the goal of developing clusters in these strategic industries. The goal is by 2020 to have around 20 clusters of modern industry with core competitiveness with turnover above RMB100 billion.

Chongqing officials have described the key elements of Made-in-China 2025's focus on 'smart manufacturing' as the application of informatization and automation to manufacturing processes (echoing Industry 4.0 in Germany). The city's plan for the development of clusters in robotic and high-end smart manufacturing equipment industries sets a target of revenue at RMB100 billion or more, with the aim that the industrial supply chain will integrate research and development, testing and experimentation, manufacturing and services.

The Chongqing government has responded to this opportunity through the establishment in 2013 of an industrial base for robotics and high-end smart equipment manufacturing in the district of **Yongchuan**.[19] By the end of 2015, 106 enterprises were registered there, up from 45 at the end of 2014. In 2015, Chongqing's cluster in robotics and high-end smart equipment manufacturing had turnover of RMB10.2 billion, with a target of RMB15 billion set for 2016.[20] In September 2015 and April 2016, the first two China (Chongqing) International Robotics and Smart Manufacturing Industry Equipment Exhibitions were held in Yongchuan.

Yongchuan's advantages include its strategic location at the heart of the Chongqing-Chengdu economic belt. It sits at the intersection of the Chongqing 'half hour economic circle' (i.e. within half an hour of the city centre), the Chengdu 'one hour economic circle', and the Kunming 'one and a half hours economic circle'. It is at the hub of six expressways, five railways, one port and one airport. After the opening of a new high-speed rail line at the end of 2015, the travel time by high speed rail to Chongqing centre is only 15 minutes, and to Chengdu 45 minutes.

Its location between Chongqing and Chengdu supports a substantial potential for the development of industrial robotics given Chongqing and Chengdu's prominence as China's major manufacturing centres for automotive, motorbikes and netbook computers. Yongchuan also enjoys a good industrial environment, based on the status given to it in Chongqing's 2016-2020 plan; good human resources, based on the district's 17 vocational schools, 130,000 students, and a good overall environment, including parks and leisure facilities. The government offers good policy support, including tax incentives related to western China, and local preferential policies. Yongchuan is also a key location for the development of urbanization and industrialization in Chongqing.

4 Conclusion and recommendations

For multinationals and international businesses, Made-in-China 2025 offers both opportunities and challenges. The

opportunities come from the potential for cooperation with Chinese companies as they move into new sectors and develop their capacity further. At the same time, it will raise the competitive challenge from Chinese companies further, and could make operations in the China market more complex. It will require a shift in strategy from international manufacturers, focusing on their areas of comparative advantage vis-à-vis Chinese companies, and engaging in more flexible cooperation to develop these.

International businesses also face a challenge in developing the flexibility and nimbleness to respond to the rapid changes to the business environment from the impact of internet technologies. In these areas, local businesses in China are showing that they can respond more quickly and flexibly, given their better understanding of the local market.

The growth of China's trade in services should open up new opportunities for many international businesses in service sectors. As noted above, China runs a trade deficit in services, partly reflecting the stronger development of international businesses in these areas. For example, 65% of the members of the European Chamber of Commerce in Southwest China are in services, compared to 33% in manufacturing.

The European Chamber of Commerce's recent Business Confidence survey (published June 2016) on the business environment in China gives some insights into the general views of international businesses in China (the negative and critical aspects of their most recent findings have been emphasized most in the media). Main concerns are around China's economic slowdown, rising labour costs, the impact of the global economic slowdown, market access barriers and investment restrictions in China, and RMB volatility. In southwest China, European Chamber members report that administrative and other regulatory issues are top of their list of obstacles to doing business. The European Chamber's Business Confidence survey also shows that southwest China (Chongqing and Chengdu) is a favoured location for future business expansion within China.

There are several major areas where policy measures could further enhance the attractiveness of Chongqing to international businesses looking to engage with the upgrading of the city's economy in manufacturing and services.

(i) Broad market-based economic reforms

In general, international businesses support strongly further structural reform in the Chinese economy, along the lines of the programme set out at the Third Plenum in November 2013. Chongqing is in a good position to take a lead in the implementation of many of these reforms. This will make the city more attractive to foreign businesses.

(ii) Human resource issues

The upgrading of manufacturing and the development of service industries rely primarily on the availability of skilled and experienced human resources. Chongqing should review how to enhance the attractiveness of the city as a home for domestic and international talents, from easing local transport through to improving the choice and quality of international education and healthcare provision (including greater English-language support for the international community). Trade in services also relies on making the movement of people as smooth as possible, and Chongqing should examine how to facilitate this further.

(iii) Logistics and connectivity

From an international perspective, Chongqing's location in inland China means that it is always going to have to work harder to be accessible internationally. The increase in international flight connections over recent years is welcome, and we encourage the government to continue to work to improve this, particularly connections to Europe. This is linked to the development of logistics infrastructure, which again has been strong over recent years. The expansion of the Chongqing Jiangbei international airport (to take passenger capacity from 30 million to 45 million per year) is a welcome step, and further investment in these areas would help develop the city's connectivity further.

This can be supported by further promotion of tourism, which will contribute to the development of service industries and trade in services. Chongqing's proximity to Chengdu and Sichuan and ease of travel on the new high-speed rail lines could help increase the number of foreign visitors to the city (2.6 million in 2014).

(iv) Internet management and cyber risks

A fast, secure and stable internet is key to the development of any technology-based industries, as well as trade in services. Over recent years, international businesses across China (not just in Chongqing) have become increasingly concerned about stability, speed and access restrictions in the internet in China, and perceive this as having a negative impact on their productivity in China, and on the ease of doing business in the country. This is exacerbated by trends in international business to use the internet for a growing number of internal and external functions and communication. If Chongqing could invest more in this area than other cities, or pilot different ways of managing internet connectivity, this could have a positive multiplier effect on the upgrading of the city's economy and international trade in services.

One emerging risk which needs managing is information security. Cyber security threats are constantly shifting, with attack targets moving from their original targets on the commercial internet to manufacturing control systems. The impact of these risks could be particularly severe in areas such as energy, water resource management, chemicals, etc. Security systems and standards are particularly important in developing the use of information technology in manufacturing.

(v) Innovation models

Industrial and commercial innovation is increasingly being carried out through global networks, and the expansion of research and development in China by international companies is part of this trend. Promoting and encouraging an open approach to international cooperation in innovation will help Chongqing to upgrade its manufacturing industries and directly contribute to growing trade in services.

Overall, we believe that these measures can enhance Chongqing's global connectivity as an 'inland high point of opening up', transform the economic structure, and strengthen competitiveness in international supply chains. They will reinforce Chongqing's position as a major growth pole in inland China by supporting the spillover of economic development within China. All of this will build on the success in integrating Chongqing's development with the 'belt and road' strategy and connectivity through river, land and air transport.

Notes

[1] *General data from European Chamber of Commerce Southwest China Position Paper 2016.*

[2] *重庆：集聚新动能提升含金量, 17 June 2016.*

[3] *https://www.imf.org/external/pubs/ft/wp/2015/wp1506.pdf (all urls last accessed 11 July 2016 unless otherwise stated).*

[4] *GVC participation for a country is calculated from the import side as the total amount of foreign value-added from all source countries that is embodied in that country's exports, and from the export side as the total amount of value-added which that country's exports add to exports of all other countries, including value that gets passed to a third country. Adding these two amounts and dividing by the country's total exports gives the GVC participation for a country.*
See https://www.federalreserve.gov/econresdata/notes/ifdp-notes/2015/slowdown-in-global-trade-20151230.html

[5] *Services range from construction, computer and related services; energy; express delivery; e-commerce; financial, legal and accounting services, retail and wholesaling; transportation; telecommunications; and travel. They include end-use products, such as legal services and financial products. Not all services are tradeable but may be embedded in goods which are tradeable.*

[6] *http://www.hellenicshippingnews.com/international-trade-in-services-was-main-driver-of-growth-in-global-trade-in-2014/*

[7] *http://knowledge.ckgsb.edu.cn/2015/09/02/technology/made-in-china-2025-a-new-era-for-chinese-manufacturing/*

[8] *http://www.iau.org/static/scientific_meetings/iau_ga_2012/speeches/xi_jinping.pdf*

[9] *http://www.ft.com/cms/s/0/99e46166-3db2-11e6-9f2c-36b487ebd80a.html#axzz4DhV1WIGR*

[10] *http://www.iresearchchina.com/content/details8_19531.html*

[11] *KPMG, 'China Outlook 2016', p. 7.*

[12] *http://www.ft.cq.cn/zxfw/ljcqfwmy/; see http://www.stcn.com/2015/0812/12406602.shtml for 2010 figure.*

[13] *http://www.fdi.gov.cn/1800000121_33_5883_0_7.html (ITO 信息技术外包, BPO 业务流程外包， KPO 知识流程外包)*

[14] *http://www.stcn.com/2015/0812/12406602.shtml*

[15] *http://www.cqgaoke.com/index.php?c=6&cid=24&id=1096 (egs of cos).*

[16] *http://www.stcn.com/2015/0812/12406602.shtml*

[17] *Data drawn from http://www.zgsxzs.com/view-692147.html; http://cq.cqnews.net/sz/2015-08/02/content_34911235.htm; http://www.sf-expo.cn/cq/News/294.html (some examples)*

[18] *Both from People's Daily, 17 June 2016.*

[19] *http://www.cq.xinhuanet.com/2016-04/13/c_1118608756.htm; http://www.cinn.cn/quy/xb/355751.shtml*

[20] *http://webmis.cqnews.net/zhibo/zhibopage.aspx?id=2049*

Trade in Services in Chongqing against the Background of "Made-in-China 2025" Plan

Masami Iijima

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1 Made-in-China 2025 overview:

The following various economy-related policies, which China has announced since 2014, are all closely related and precisely lay out the path China will follow in the future.

① Beijing-Tianjin-Hebei Integration Concept: July 2014

② One Belt One Road: November 2014

③ Yangtze River Economic Belt Concept: September 2014

④ Internet Plus: March 2015

⑤ Made-in-China 2025: May 2015

⑥ Launch of AIIB: December 2015

⑦ 13th Five-Year Plan: March 2016

Among these, the "Made-in-China 2025" initiative states in its preface that China, through its manufacturing industries, has become the biggest manufacturing power, but not a strong manufacturing power, and specifically and openly recognizes the following present problems.

① Weak independent innovation capabilities, highly dependent on overseas suppliers for core technologies and high-end equipment (Ex: Reliance on imports for 80% of IC chips).

② Underdeveloped innovation systems in manufacturing, low product ranking, and lack of globally recognized brands.

③ Low efficiency of resource and energy utilization, and serious environmental pollution problems (Ex: China's energy consumption per unit of GDP is 1.9 times higher than the global average level, 2.4 times higher than the United States, and 3.7 times that of Japan, and is worse than that of Brazil and Mexico).

④ Irrational industry structure, and lagging development of high-end manufacturing and service industries

⑤ Low level information technology usage, and insufficient linkage with industrialization (Ex: Reliance on imports of high-end core software for industrial applications, and lagging human resources training)

⑥ Slow internationalization of industry, lack of corporate global management capabilities (Ex: China's overseas net assets are roughly half the level of Japan's.)

Up to now, China has achieved high growth mainly by using its advantage in manpower (cheap and plentiful labor) as a means to undertake mass production as the "factory of the world". On the other hand, as a result, China now faces problems like those described above. A large proportion of these overlap with the problems Japan faced during its own high-growth

period (from 1955 to 1973). Japan spent many years acquiring technologies introduced by Europe and the United States, which helped it evolve to the point it obtained its present position as a "technology-oriented nation".

In the "Made-in-China 2025" plan, China's government has set three milestones, one for 2025, one for 2035, and finally, one for 2049, the 100th anniversary of the founding the People's Republic of China, and has laid out the route for China to become a global manufacturing power. As the first step, China hopes to take its place among the ranks of strong manufacturing countries by 2025. Then, gradually, it endeavors to become the strongest manufacturing country. This is a long plan that will take more than 30 years (with Made-in-China 2025 merely the first step), and, as described later, advanced countries are seeking to move further ahead during this interval; so, I believe it is extremely reasonable to think that this amount of time will be required to ultimately catch up with them.

While the problems China will need to resolve in order to join the "strong manufacturing countries" are numerous, as I have already described, China already understands those problems, and the following measures are clearly described in "Made-in-China 2025" as "Five Policies".

① Driven by innovation: Position innovation at the center of manufacturing development, and prepare the requisite systems and environment. Promote cross-sector/cross-industry-type collaborative innovation. Digitalization, networking, and smartification of the manufacturing industry.

② Priority on quality: Strengthen proactive firm-led responsibility on quality. Seek developments to compete on quality.

③ Green development (development that takes the environment into account): Sustainable development → Energy-saving/Green engineering/Recycling economy/More efficient recovery and utilization of resources

④ Structural optimization: Transition from production-type manufacturing (manufacturing only) to service-type manufacturing with high-quality and high efficiency.

⑤ Human resources: Create mechanisms for healthy and rational selection, use, and training of human resources

Needless to say, for China to join the ranks of the manufacturing powers, the so-called "IoT", which takes advantage of the Internet to achieve the digitalization, networking, and smartification described in ① above, will be indispensable.

2 Movements in Global manufacturing:

"Manufacturing" in the world today is said to be in the era of the "Fourth Industrial Revolution. That is,

1st Industrial Revolution: Automation by steam engines (latter half of 18th c.) = 1.0

2nd Industrial Revolution: Automation by electric power (beginning of 20th c.) = 2.0

3rd Industrial Revolution: Automation by computer (1980s) = 3.0

4th Industrial Revolution: "Autonomy" through IoT = "Industry 4.0"

To realize Industry 4.0, every country in the world is seeking to accelerate innovation that takes advantage of its respective national characteristics. Examples include "Industrie 4.0" in Germany, the "Industrial Internet" centered on GE in the U.S., and "Made in India" in India. Japan, as well, is seeking the realization of a new economic society dubbed "Society 5.0", a super-smart society that can achieve industrial restructuring based on productivity enhancements that use the IoT and AI, and furthermore use these to solve societal problems.

The key points here are:

✓ Early use of the IoT will be indispensable for achieving high-quality manufacturing

✓ Furthermore, merely manufacturing high-quality products will not be enough; producers will have to skillfully utilize tools such as the Internet to add various "services" to their products. Put conversely, in the future, products that lack such added services probably will not be considered "high-quality".

In other words, the "goal" being pursued by China, as a manufacturing power, will not remain static (stay at the current point). Even as China is chasing this goal, technical innovations will be introduced one after another, and the goal of "being an equal among advanced countries" will move even higher. On the other hand, this will put China under more and more pressure in the future from newly developing countries those are catching up. To transform these pressures into opportunities, China will need to increasingly meld manufacturing that takes maximum advantage of the Internet with service industries (including logistics).

3 The role Chongqing should play in the future:

At last year's CMIA Council, with regard to the theme of "Connectivity" I stated that Chongqing, which sits at the "intersection of transportation and logistics" for initiatives such as "One Belt One Road" and the "Yangtze Economic Belt", is maintaining its high economic growth and is leading, without exaggeration, the Chinese economy, and as the core city in the western (inland) region of China, should contribute to China's stable growth ("New Normal") while considering development through an even wider "bundling".

Following this year's theme, I will say "the role Chongqing should play will become more and more important in the future." It is the role of "the heart of connectivity between manufacturing and services in China".

As the result of having aggressively invited a diverse range of excellent, leading-edge foreign firms in the past, and furthermore, as the result of also having made efforts to create an international logistics network, including the Yu'Xin'Ou Railway and a new airport, to accommodate these invitations, the foundation for accomplishing all of the five policies expressed in the "Made-in-China 2025" plan is already in place in Chongqing.

Chongqing has sound manufacturing and information industries, which are considered to be the foundations of economic development. Therefore, Chongqing already has a base that can serve as a major hub in China for so-called "Trade in Service" that combines the above foundations with the Internet, and domestic and foreign services. The critical point now is, how will "services" that use the IoT for competitive advantage be added to these foundations that have already been prepared.

Each of the firms in all manner of business in various countries that participates in the Chongqing Mayor's International Economic Advisory Council, including my own company, Mitsui & Co. Ltd., supports the challenge of further increasing the value of Chongqing. Our mission is to accomplish a win-win at a higher level, together with Chongqing, and I believe we can satisfactorily achieve that mission.

Internet Plus and Trade in Services as an Engine for Industrial Upgrading in Chongqing

Michael Smith

Advisor to the Board of Australia and New Zealand Banking Group Limited

1 Introduction

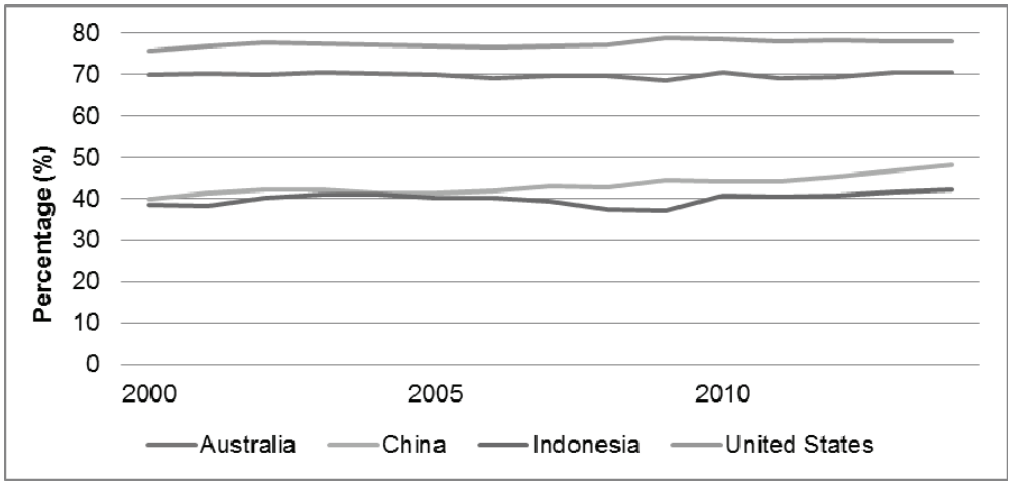
This research paper, prepared for the 11th Annual Meeting of the Chongqing Mayor's International Advisory Council, considers the role of the internet in the provision of trade in services and how this can facilitate industrial upgrading in Chongqing. It does so by reflecting on three areasof services provision: small and medium enterprise (SME) service providers,financial services providers andlogistics service providers.

The Internet Plus is an initiative of the Chinese Prime Minister Li Keqiang.[1] It recognises the importance of internet-based industries and encourages the integration of the internet into traditional sectors of the economy.

1.1 Services

The service industry in China is large andrapidly growing.. Most recently, the services sector was estimated to contribute just over 50 per cent of gross domestic product (GDP) in China in 2015, compared to just under 40 per cent in 2000.

Figure 1.1: Percentage Contribution of the services sector to GDP by country



Source: International Monetary Fund, World Economic Outlook Database, April 2016

[1] *South China Morning Post (2015)*

In mature economies services account for an even greater proportion of GDP. In Australia services account for around 70 per cent of GDP, and this has changed little over the last fifteen years. Services' contribution to the US economy is even larger.

This is consistent with historical experience, where as a country's income rises its demand for food and other necessitiesas a proportion of all GDP decreases, giving way to a rise in an industrial sector, which in turn eventually leads to an increase in the service sector.[1]

On this basis China should expect a continuing growth in its service sector over the coming years. If the growth in China's service sector continued as it has over the last ten years, in ten years' time from now it could be expected to account for 56 per cent of Chinese GDP.

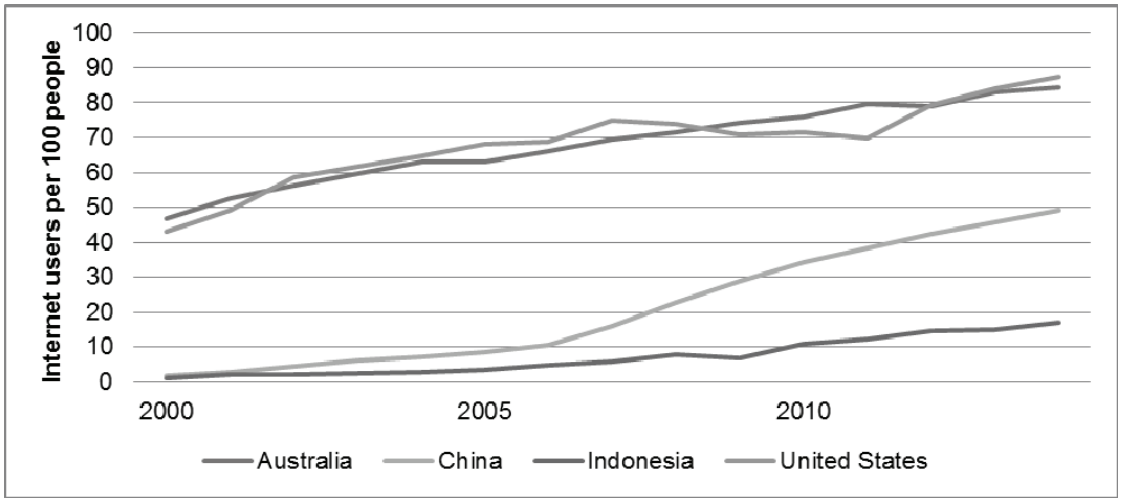
1.2 Internet Use

The internet has been around for many decades now, but the nature of what exactly the internet is and what it can offer is constantly evolving. Ten years ago the concept of cloud computing was only emerging, now it is a well-known and understood concept. It is quite likely that the trends that we are talking about today will rapidly change tomorrow.

The internet's prevalence and importance in day to day life has increased across the globe as internettechnologies, and hence the information and services it can offer, have continued to improve. In the year 2000 it was estimated that there were 17 million websites globally, that estimate now stands at over one billion.[2]

Internet use has been rising globally, but in China this trend has been even more pronounced. Looking at the chart belowthe growth in China's internet users since 2006 is striking. There are now more than five times as many people with access to the internet in China as there were in 2006. If this growth rate were to continue, China would have the same number of internet users per head of population as Australia or the United States do today by 2020.

Figure 1.2 Internet users per 100 people, selected countries



Source: World Bank World Development Indicators 2016

[1] *Soubbotina andSheram(2000)*

[2] *Internet live stats (2016)*

In Australia, Deloitte Access Economics has produced a "Digital Disruption Map" which provides a basis for thinking about how different industries are likely to be affected by the rise of the internet and digital.

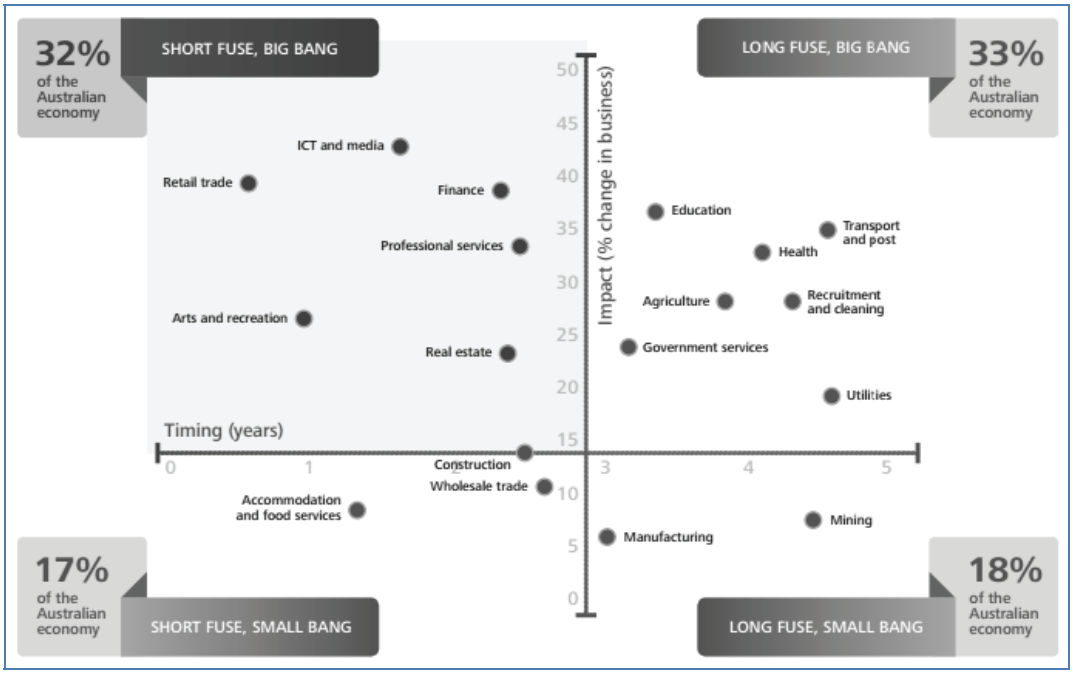
The map compares eighteen industries and their vulnerabilityto disruption from two perspectives: the size of theimpact and the imminence of change.[1]

It found that a large number of sectors are likely to be highly disrupted (a "big bang") and in a short space of time (a "short fuse"), this included finance, professional services and retail trade. It also found that a large number of sectors are likely to be highly disrupted (a "big bang") over a longer period of time (a "long fuse"), this included transport and post.

The Deloitte analysis provides an analytical justification for this research paper's focus on logistics service providers ("transport and post"), small and medium enterprise service providers (many of whom operate in the "big bang" category), and financial service providers ("finance").

The map considers factors such as the extent to which products and services are delivered physically, the propensity of customers to use digital channels, the importance of broadband and computing infrastructure in business operations, how mobile a company's customers and workforce are, the significance of social media and innovations like cloud computing and how digital innovation might be inhibited by government regulations or other factors.

Figure 1.3 Digital Disruption Map



Source: DAE 2013

While the composition of the Chinese economy is clearly different when compared to Australia's, the characteristics of the industries considered in the above analysis are likely to be similar.

[1] *Deloitte Access Economics (2013)*

1.3 Industrial upgrading

Industrial upgrading has been defined as a process of improving the ability of a firm or an economy to move to more profitable and/or technologically sophisticated capital and skill-intensive economic niches.[1]

It seems a reasonable aspiration that the Internet Plus initiative could help foster a new wave of industrial upgrading – and therefore growth and development – in China. The likelihood of substantial economic gains should not be underestimated. For example, it has been estimated that the internet accounted for 21 per cent of economic growth in mature economies over a five year period to 2011.[2]

This research paper provides some insights into how Chongqing can make the most effective use of the internet and digital.The integration of digital technologies into economies (and in particular their services industries)is well under way around the world and this research paper draws on those experiences in three selected areas, itthen provides recommendations about how these insights might be applied to facilitate Chongqing's industrial upgrading.

2 Small and Medium Sized Enterprise service providers

Different countries have different definitions as to what constitutes an SME. In China official definitions depend on firm size, and when compared to other countries include relatively large firms. With firms employing betweenup to 3,000 employees, and up to ¥300 million (~US$42 million) in revenue a year counted as an SME.[3]In China, SMEsare responsible for around 80 per cent of China's jobs,employingalmost 760 million people.[4]

In Australia, SMEs are of similar importance, although the overall scale is of course much smaller. By a count of the number of firms actively trading, more than99per cent of Australian businesses are SMEs with 200 or fewer employees. The majority of those having four or fewer employees. SMEs employ 70 per cent of the Australian workforce.[5]It is not surprising that SMEs generate the largest number of new jobs in Australia every year.

2.1 SMEs and industrial upgrading

SMEs play an important part in the process of industrial upgrading in any country.By virtue of their size, SMEs have been found to have many advantages over larger enterprises, they have been found to be essential in "improving the competitive environment, creating opportunities for development and adaptation of new technologies, occupying niche markets that are not profitable for large companies, [and] anchoring in local economies by capitalizing local resources (financial, material, of labour and informational)".[6]

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[1] *Gereffi(1999)*

[2] *McKinsey Global Institute(2011)*

[3] *Liu (2008)*

[4] *UN (2015) and World Bank (2015)*

[5] *SME Association of Australia (2016)*

[6] *Aceleanu, Livia, & Serban (2014)*

SMEs are more likely to innovate and are the main drivers of growth in many countries around the world.[1]The OECD considers that "[t]echnological progress is not translated into economic benefits and jobs by governments, countries, or sectors, but by innovative firms."[2]

Its report on SMEs estimates that between 30 to 60 per cent of SMEs can be characterised as innovative and approximately 10 per cent are technology based. With a risk to reward ratio that would be unfavourable to large firms, SMEs are uniquely poised to be pioneers and developers of new markets and a vital source of innovation and R&D in fragmented or emerging markets.

2.2 SMEs and the internet

The internet already has a widespread role in the Chinese economy. SMEs are integrating the internet into their everyday operations. But there is always more that can be done.

There is a substantive body of evidence that the use of the internet and digital tools makes SMEs more efficient, innovative and agile. One study found that SMEs that are actively engaged with customers on the internet experience sales growth that is 22 per cent higher than those firms that have low or no presence on the internet.[3]

With digital technologies, SMEs have access to a wider range of opportunities than through more conventional offline strategies, and few sectors can expect to not be impacted by the introduction of these technologies.

The benefits to SMEs of the smart use of information and communication technology include the streamlining of business processes, facilitation of entry into markets, reduction of administrative overheads and the strengthening of relationships with big companies. This results in an economy that is on the whole more dynamic, competitive and better able to encourage new entrants on reasonable terms.[4]

A study found that two-thirds of Indian SMEs are missing out on the benefits of key digital tools such as the cloud, data analytics, mobile technologies, websites and e-commerce.[5]

While it does not appear that comparable research has been conducted for the city of Chongqing, or China more generally, if Chinese SMEs are not actively using digital tools in a similar – or even much lower – proportion, this represents a significant economic opportunity for the Chinese economy.

An econometric analysis in the study found that moving from offline to advanced digital engagement could mean individual SME revenue growth that is up to 35 percentage points higher.[6]

This Research Paper now considers two important options: cloud computing and mobile technologies.

2.3 SMEs and the cloud

Cloud computinghas proved that the internet can be transformational for the way service orientated SMEs operate,

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[1] *Boston Consulting Group (2015)*

[2] *OECD (1996)*

[3] *PwC (2015)*

[4] *European Commission (2012)*

[5] *Deloitte Access Economics (2015)*

[6] *Ibid.*

establish themselves and grow.

Cloud computing, often referred to as 'the cloud' is the delivery of computing resources – such as application and data centres – on a pay-per-use basis over the internet. Instead of data and applications being stored and run from a local hard drive, either in a personal computer or on a local network drive, data is stored off-site and must be accessed over the internet.

Through the internet, cloud computing provides connectivity to businesses and individuals across the globe. It allows businesses to organise their operations differently, allowing them to concentrate on what they're best at and source out the other things. Cloud services can aid in collaboration and allow different users access from different sites.[1]

If business owners can start or expand a business at lower cost then there will be greater business expansion and the process of industrial upgrading will be accelerated. Cloud computing assists this by lowering the upfront computing costs of SMEs, generally without the need to employ in-house information technology (IT) expertise to look after hardware and servers.

Lower entry barriers mean a faster moving and more competitive economy. A significant advantage of the cloud is the ability to quickly scale up and downwards as the demands of a business change, without being restricted to contracts or paying for bundled services that aren't needed. Another advantage of the cloud is that it allows smaller firms to access sophisticated software that might have otherwise been out of reach.[2]

Cloud based accounting software Xero represents an excellent example of both a service orientated SME that was able to use internet technologies to establish itself and expand rapidly, as well as itself providing a service to other SMEs that are looking to establish and expand their businesses. It is discussed in the Case Study below.

Case Study Xero accounting software

Xero is a software company that offers a range of cloud-based financial platforms tobusinesses. Founded in 2006, Xero is now one of the top 20 companies on the New ZealandStock Exchange. It is also widely recognised as one of the most innovative businesses inthe world for its contribution to cloud technologies.

Xero is a business that is growing fastbecause of the internet and the benefits of cloud technology over desktop software.Technology toolsincluding cloud platforms have shifted from being 'nice to have' to a 'must' for survival.

Cloud platforms like Xero offer business owners the ability to monitor their cash flow inreal-time, helping them make informed business decisions with up-to-date information,and reducing time spent on accounting.

Xero customer and food retailer Sixth Coursehas experienced benefits including automated cash flow and an 80 per cent reduction in timespent on accounting tasks – time better spent running the business.

Mr Ridd from Xerobelieves the shift in how businesses are using digital technologies is transforming some ofthe traditional business functions. For example, Xero's accounting practice is moving awayfrom an account reconciliation tool to a real time financial status monitoring service.

Source:Deloitte Access Economics, The Connected Continent II (2015)

It has been estimated that just 5 per cent of Chinese SMEs currently use cloud based services.[3]Although this number has

[1] *Minifie (2014)*

[2] *Ibid.*

[3] *South China Morning Post (2013)*

been predicted to grow with both the growth of cloud computing and the growth of the internet in China.

Driven by increasing demand from SME users for communication, collaboration, and business applications delivered via the cloud computing market, the mainland SME cloud services market will reach ¥16.7 billion this year (~US$2.5 billion). This is a huge 54 per cent increase from ¥10.8 billion (~US$1.6 billion) in 2012.[1]

Over the next five years it has been suggested that clouds will not only provide 'point solution' services such as human resources or accounting, but will be integrated into core business activity. This is because of continued decreases in storage costs and improvements in software offerings.[2]

2.4 Barriers to adoption of cloud based technologies

Often concerns over securityand transition costs present themselves as a barrier to adoption of cloud technologies.

Cloud based technologies do have their limitations.For example, while many different applications are available, the fact that they are stored remotely can inhibit theability of users to customise their applications as required.

Cloud computing alsorequires reliable high speed internet access. The use of cloud based technologies may not yet be an option for SMEs in remote areas. Another limitation is that backing up and copying data when changing services can also be difficult, as using different cloud services for different aspects of a business means data is not stored in a single location.[3]

Despite these limitations cloud computing represents an exciting opportunity for SME service providers. SME service providers tend to have limited budgets. Cloud services represent an attractive option for SMEs who want access to a range of software to help their businesses work more effectively and grow, but who may not be able to justify the high upfront costs of traditional non-cloud based software.

2.5 Mobile handset based internet technologies

In China there are594 million users that access the web through smartphones, accountingfor 89 per cent of China's total internet users.[4]

It is therefore important for service SMEs to consider mobile technologies when they consider how to use the internet to engage with their customers.

Recent developments in technology have led to improvements in user experience, and lowered costs when using mobile technology. In China, the mobile – including manufacturing, service providers and mobile app developers – are responsible for 3.7 per cent of China's GDP. China has been the world's largest smart phone market since 2012. China has more than one million appdevelopers–which is more than double the number of app developers in the US.[5]

Chinese SME service providers are already well placed to take further advantage of mobile technologies. There is widespread adoption of mobile technologies in China, with around 1.1billion mobiles – or 82 per 100 people - in circulation.

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[1] *Ibid.*

[2] *PwC (2016b)*

[3] *CPA Australia (2015)*

[4] *Xinhuanet (2015)*

[5] *Kogekar (2015)*

This level of adoption dwarfs mature economies in absolute terms but is comparable in relative terms to countries such as Australia (110 per 100 people) or Singapore (150 per 100 people), and ahead of some othermajor economies such as India (73 per 100 people) or Pakistan (65 per 100 people).[1]

A study by the Boston Consulting Group looked at a range of major economies such as the US, Germany, Brazil and India, and found that mobile technologies contributed between 2 to 4 per centof GDP in each country, with a combined contribution to global GDP of US$1.2 trillion (~¥8 trillion).[2]

2.6 Mobile technologies help service SMEs get noticed

In order to be successful a service SME has to be able to market itself, engage with its current and potential customers, and build a reputation for providing a quality service. With over 8 in 10 people carrying a mobile phone in their pocket in China, internet based marketing channels represent a huge opportunity for service SMEs to grow and expand.

Crowdsourced review sites that are easily accessible on today's smartphones help level the playing field, giving smaller service SMEs the chance to stand out and gain trust among customers. Surveys suggest that around 30 per cent of US businesses get their new customers through internet based referrals. It is likely that a large proportion of these customers come from mobile referral "apps".[3]

Apps offer another innovative way in which service SMEs can look to either establish themselves or expand their business model. Some SMEs even create apps for internal purposes, such as an app used by field workers to access information about a job and report its completion, including through the use of inbuilt cameras found in mobile phones.[4]

The attractiveness of social media platforms to business is one of the reasons that social media platforms such as Facebook and Weibo are now amongst the most valuable companies in the world.In 2015 it is estimated that around US$23 billion (~¥152 billion) was spent on advertising to reach consumers through social media platforms.

The ability for a service SME to engage in and monitor social media is also made easier with mobile technologies. Firms are more easily able to communicate with current and potential customers and increase their brand awareness.

Whether or not a service SME should develop an app requires careful consideration. Developing an app will not be economical for all service SMEs, as there may be significant costs to developing, maintaining and updating an app.[5]

Clever use of mobile technology can also be used to significantly improve efficiency within an organisation. In a dense urban environment such as Chongqing travel times can act as a barrier to increased productivity. Internet enabled mobile phones make it easier for workers in service SMEs to work from home or other locations that might be more enjoyable or convenient than the office.

A study of one service SME in the US found that people working from home completed 13.5 per cent more calls than staff that were working in an office environment. In addition there were savings in terms of office furniture and space as well as travel times.[6]

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[1] *CIA World Fact Book (2016)*

[2] *Boston Ccnsulting Group (2015)*

[3] *Ibid.*

[4] *Yamine et.al. (2014)*

[5] *Yamine et. al. (2014)*

[6] *Harvard Business Review (2014)*

In some areas with limited fixed-line connectivity, it is the more basic improvements in connectivity and information sharing provided by mobile technologies that are likely to have the most significant economic impact. For example farmers in rural India use mobile devicesto access information on pests, market conditions, pricing andweather alerts.[1]Because of this farmers are able to farm to higher standards and have a far better ability to find the highest possible price for their crops. These changes brought about by mobile technologies can have a significant positive economic impact on these farmers' lives.

2.7 Conclusion

SME service providers play acentral role in the industrial upgrading of any economy. By better utilising internet based technologies, such as cloud computing and mobile technologies, SME service providers in Chongqing are likely to grow faster, contributing to the overall industrial upgrading of the city. There are a range of straightforward approaches that SME service providers can take to ensure that they are able to utilise the internet to its full potential.

Recommendation One

Chongqing should consider promoting the benefits of cloud computing. Cloud computing can be instrumental in assisting SME service providers to establish and expand. In doing so Chongqing should consider whether internet speeds are suitable for the widespread use of cloud technologies in both urban and rural areas of Chongqing.

Recommendation Two

SME service providers in Chongqing could further consider how mobile technology can be used to improve their organisational efficiency. In particular the use of social media and mobile technology as well as how mobile technology might be used by employees within a firm to improve communication and reduce the need for costly and time consuming travel in a dense urban environment.

3 Financial Services

A vibrant financial services sector is fundamental to the industrial upgrading of any economy. Financial service providers include credit unions, banks, credit-card companies, insurance companies, accountancy companies, consumer-finance companies, stock brokerages, investment funds and some government-sponsored enterprises.[2]

China's thirteenth five year plan (2016-2020) for financial services has placed focused on a further opening up of China's financial markets to foreign capital. It also focuses on improving market access for financial services and encourages more private sector investment.[3] This presents both a threat and an opportunity to domestic Chinese financial services firms.

3.1 Fintech

The use of the internet and other digital technologies has become so important in the financial services sector that the

[1] *Boston Ccnsulting Group (2015)*

[2] *International Monetary Fund (2012)*

[3] *King Wood Mallesons (2016)*

term ‘fintech’ has been coined.

Fintechs are businesses in the financial services industry that leverage the internet and digitaltechnologies to provide attractive, innovative and efficient financial services. These fintech companies are changing the financial services industry and how it operates. They are doing thisthrough the offering of innovative products, reductions in costs, and improvements in the quality of financial services.

Fintech has already arrived in China, with an estimated US$1.9 billion (¥12.6 billion) of investment in the area in 2015.[1] In the early part of 2016, funding to venture capital-backed fintech companies in Asia stood at US$2.6 billion (¥17.3 billion), and corporate participation in these Asian fintech companies was (through venture capital and other means) at 31 per cent, which is a higher proportion than in Europe and North America.[2]

An example of an innovative technology that is giving financial services providers an edge is so called ‘data-driven lending’. This refers to a practice where financial service companies use a range of data collected through the internet to try andbetter assess risk when compared to decisions based on credit scores or meetings between banker and client.[3]

Data-driven lending can be beneficial when compared to using credit scores, especially when for example, 30-35 million US consumers cannot be scored due to insufficient information about their credit history.[4] However, about 10 million people out of that population have would have much higher scored when assessed on the basis of a wider range of data.[5]

Another example of an innovative fintech is Alibaba’sAlipay, an online payment platform (Alibaba is China’s largest e-commerce sales portal).Alipay has been able to displace more traditional payment platforms by providing a way for consumers to verify that they are happy with their goods before releasing payment to a supplier. This is made possible through the use of internet technologies.

Alipay has been able to leverage Alibaba’s tremendous online sales presence to gain a market share of nearly 80 per cent of all e-commerce payments in China.[6] Currently, more than 30 per cent of the Chinese population use internet payment systems.[7]

Fintech companies are also establishing themselves on a smaller scale and then growing rapidly. The Case Study below looks at the success of Prospa, an Australian fintech start-up that focuses on promoting short term loans to small and medium sized businesses.

Case Study Prospa

Prospalaunched in 2011 and has grown quickly to becomeAustralia’s largest online only business lender. It utilises an online platform and application to provide loans to businesses based on the creditworthiness of the business itself, rather than the personal credit score of the business owner.

This can make it easier for small businesses to apply for loans for up to A$250,000 (~¥1.2 million) and receive the funding within a short timeframe, in many cases less than 24 hours. Prospais also innovative in that it can provide businesses

[1] *Accenture (2016)*

[2] *KPMG (2016)*

[3] *The Economist (2015)*

[4] *VantageScore (2013)*

[5] *Centre for Financial Services Innovation (2015)*

[6] *Business Insider (2015)*

[7] *McKinsey (2016)*

with short term loans of 3 to 12 months with flexible daily or weekly repayments.

Customers appear to be happy to pay a premium for these conveniences, as the effective interest rates on these loans can exceed those found on an over the counter credit card.

Since its inception in 2011, Prospa has lent more than A$70 million (~¥352 million) to thousands of businesses across Australia. According to Deloitte's 2015 Technology Fast 50 report, Prospa's revenue growth from 2013 to 2015 was the highest rate of growth amongst any public or private technology company in Australia.

Source: Deloitte (2015)

The internet and other digital tools have transformed everything from mobile payments, to foreign exchange and insurance. The Alipay system in China started as an online payment and escrow service and has now become a mobile app that can transfer money to other Alipay members and share or split bills among them using QR codes. It can be also used in other daily applications such as paying utility bills, and topping up mobile phone credits. It has become a fully integrated solution for people to make a variety of payments.

3.2 Crowd sourced funding

Crowd sourced funding, or crowdfunding has been a much publicisedpart of the fintech story that has implications for the way businesses are funded.

Crowdfunding is the practice of funding a project or venture by raising contributions from a large number of people "the crowd", rather than a traditional intermediary such as a bank. It allows individual businesses that may have been denied funding through a traditional bank to seek funding from the crowd directly.

Crowdfunding tends to only fund smaller scale business and projects as such it is better thought of as a complement for the traditional private banking sector rather than as a replacement. Notwithstanding this, given the support it can provide to small innovative businesses it has an important role to play in the industrial upgrading of Chongqing.

Modern day crowdfunding gained traction when ArtistShare was launched in 2001 as a crowdfunding platform for the music industry.[1]Today there are over 1,200 crowdfunding platforms around the world.[2]Out of this number, there were 600 platforms in Europe, 375 in North America and 169 in Asia.[3]In 2015, it was estimated that the total fundraising volume globally was around US$34 billion (~¥225 billion).[4]Crowdfunding volume in 2015 in North America was US$17.2 billion (~¥115 billion), whilst Asia raised US$10.54 billion (~¥70 billion) and Europe raised US$6.48 billion (~¥43 billion).

Some of the most well-known English language crowdfunding platforms include Kickstarter, Indiegogo, Pozible and Fundable.Some of the most well-known Chinese language crowdfunding platforms include Demohour.com, Kaistart.com, Baidu and Taobao.

Crowdfunding provides an alternative source of finance that is accessible to individuals, entrepreneurs and businesses. Anything from starting up a takeaway food store to taking an upcoming holiday can be crowdfunded.

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[1] *Freedman and Nutting (2015)*

[2] *National Crowdfunding Association of Canada (2015)*

[3] *Statista (2016)*

[4] *Massolution (2015)*

Access to an alternative source of funding for SMEs are likely to enable greater investment and innovation going forward.However, the importance of crowdfunding must be kept in perspective. The amount of funding raised throughcrowdfunding is still very small when compared to the traditional banking sector.

Crowdfunding operates as a complement to the traditional banking sector, and it is difficult to see that changing anytime in the near future. Crowdfunding platforms are not viewed as realistic alternatives to banks.[1]

Where crowd funding has a particular strength is in smaller niche campaigns. There are many forms of crowdfunding including rewards-based campaigns, donation-based campaigns, equity-based campaigns and debt based campaigns (peer-to-peer lending). The rewards-based campaigns essentially involve people pledging money to a project in return for a reward, where the reward might be the first run of a company's new product or service.

One of the most recognisable crowdfunding platforms in the world is Kickstarter, which launched in 2009. To date it has raised a total of US$2.53 billion (~¥16.8 billion) and successfully funded over 110,000 projects.[2]

It has raised this money from a "crowd" of over 11 million people. You can back projects from anywhere in the world on Kickstarter however project creation is only available for individuals in select countries including China, the US, UK, Australia and Germany.

3.3 Crowdfunded businesses

The most successful Kickstarter campaign has been the Pebble Time smart watch, which is a digital and customisable wristwatch that runs downloadable sports and fitness apps and connects wirelessly to smartphones.[3]A key selling point of the watch is that it provides up to seven days battery life, in comparison to its rivals offering only one to two days.[4]

In this specific example of a rewards-based campaign, if people contributed more than US$99 (~¥657) to the campaign, they were promised a watch (once the campaign was funded and it was made). The campaign raised US$20.3 million (~¥135 million) in pre-orders for the watch, and is currently one of the top ranked crowdfunding projects globally in terms of the amount of money raised.

From an economic perspective the relevant question is whether the pebble watch would have been funded in the absence of crowdfunding platforms.

If the pebble watch would have otherwise been funded through other channels then crowdfunding simply represents a shift in the way businesses are funded, rather than a new source of funding that drives additional investment and economic growth. The novel funding campaign for the Pebble Time watch suggests it may not have been funded in the absence of crowd funding.[5]

Another innovation that reached production phase withcrowdfunding is Flow Hive.Flow Hive is a device created by an Australian beekeeper that simplifies the extraction process of honey from bee hives. The invention was launched on Indiegogo

[1] *Michaels (2015)*

[2] *Kickstarter (2016)*

[3] *Freedmanand Nutting (2015)*

[4] *Drege (2015)*

[5] *Business News Daily (2014)*

where funds raised were in excess of US $12 million (~¥79 million).[1]

The importance of this device is the potential it has to save time for small-scale beekeepers. It is an example of a simple innovation that has the potential to revolutionise the practicesof an industry, with positive economic effects.

3.4 Traditional banks respond to disruption

Crowdfunding and fintech more generally is driving a competitive response from traditional banks.

ANZ is based in Australia and operates out of thirty-four countries and has over nine million customers.[2]In March 2016 ANZ Maile Carnegie was hired as the first Group Executive for Digital Banking. Ms Carnegie has said that “if you aren't a tech company or you're not on the way to becoming one you're in big trouble". Ms Carnegie noted thatcompanies like ANZ were already tech companies.

ANZ is looking to use digital to further improve its customers’ user experience, with a particular focus on the SME sector.[3] ANZ has also embraced the economic potential of SMEs, supporting SMEs with two ‘lending pledges’ providing at least A$2 billion (~¥10 billion) in financing to the sector in each pledge.[4]

Competitors to ANZ in Australia are also exploring fintech platforms. NAB, a traditional bank in Australia, has entered the SME online lending market with the launch of NAB QuickBiz Loan, which has enabled customers in the SME lending market to borrow up to AU$50,000 (~¥256,000) in unsecured funding through an online platform utilising a range of financial technology.[5]

3.5 Financial Regulation

Effective financial regulation is fundamentally important to the integrity of a country’s financial system. With effective financial regulation economic growth is likely to be both strong and sustainable.

The integration of internet and digital technologies into the financial sector haspresented a challenge to financial regulators globally. Technology is moving faster than the regulators.For this reason, a major part of the evolution of the internet integrating itself into financial services – such as through crowdfunding – has been the regulatory backdrop.

Around the world there have been concerns about how to effectively regulatenew online platforms. Different jurisdictions are at different stages of their regulatory journeys and have come up with different solutions to the challenges presented by fintech.

In the US, the Obama administration enacted the Jump Start Our Business Start-ups (JOBS) Act, which is designed to increase job creation and economic growth by improving access to public capital markets for emerging growth companies. In the case of crowdfunding it enables private businesses to raise money from retail investors via equity-based platforms.

Despite the positive political narrative that was associated with the JOBS Act it also introduced limitations on the amount

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[1] *Deloitte (2016)*

[2] *ANZ (2016)*

[3] *Sydney Morning Herald (2016)*

[4] *The Hearld Sun (2015)*

[5] *Smart Company (2016)*

of funding that could be raised through crowdfunding platforms. This was done in order to limit the exposure of people to poor performing investments. Mechanically, it placed limits in terms of how much they invested in each project, and the amount that companies could raise via crowdfunding.[1] Title III of the JOBS Act brought in regulations that enable individuals to invest in companies in return for equity.[2]Although, the regulations contain particular protections for lower income investors.

Regulations associated with the JOBS Act have imposed a limit of US$1,000,000 (¥6.6 million)of fundraising by companies via crowdfunding for a rolling 12-month period. In addition, there have been limits placed on the amount that investors can contribute, for example, those with an annual income of less thanUS$100,000 (~¥663,000) can only invest US$2,000(~¥13,000) or 5 per cent of their annual income, whichever is greater.

In Australia, a wide ranging independent inquiry into its financial system was undertaken in 2014. The Financial System Inquiry (FSI) report with 44 recommendations was provided to government for action. Amongst others, theFSI explicitly considered regulatory issues that relate to fintec, includingcrowdfunding.

At the time of the review a number of regulatory settings acted to impede the development of crowdfunding. Proprietary companies were generally prohibited from making public offers of securities and there were licensing requirements that applied to direct lender-borrower models. The FSI recommended that Government should implement regulation to facilitate, rather than impede, crowdfunding for both debt and equity. [3]The FSI wanted the regulatory environment to facilitate innovations in fundraising from new technologies as well as providing small and medium-sized enterprises with additional funding options.

At the same time the FSIexplicitly recognised the need for consumer protections by capping individual investments. A Bill was introduced into the Australian Parliament to implement the crowd-sourced equity funding scheme, however, it ultimately was not passed to become active legislation owing to concerns from industry and the Oppositionthat some requirements were ‘onerous and heavy-handed’,[4]such as requirements that would force start-ups to convert to unlisted public companies in order to take part in equity crowdfunding.

A key Australian financial regulator, the Australian Securities and Investments Commission (ASIC) has separately sought to apply existing regulations to crowdfunding. For example, they have issued guidance stating that a crowdfunding scheme could be classed under what is currently called a ‘managed investment scheme’.[5]

In general terms, the regulatory environment in China is beginning to become more accommodating of crowdfunding as the government sees it as an important tool for boosting the economy. However, currently there are regulations that do not allow the direct solicitation of funds from people, which is the basis of traditional crowdfunding.[6]

The current regulatory regime in China has seen unique crowdfunding models develop. For example, Alibaba’s Yu Le Bao scheme avoids soliciting funds directly from individuals by making their offerings similar to insurance and wealth

[1] *Javers (2013)*

[2] *Barnett (2016)*

[3] *Financial Systems Inquiry (2014)*

[4] *The Hon Ed HusicM.P. (2015)*

[5] *Australian Securities and Investments Commission (2012)*

[6] *Santos (2015)*

management products.

3.6 Conclusion

Crowdfunding is an exciting development. It is driving a range of competitive responses across the banking sector. It is driving traditional banks, such as ANZ, to be even more customer focused and agile in what they do. However the importance of crowdfunding must be kept in perspective, while it is funding a range of exciting projects globally, the sector still operates as a complement to traditional banking.

Recommendation Three

Chongqing's traditional banks should consider embracing fintech technologies. A practical way to achieve this is to appoint a senior executive whose only responsibility is to analyse digital trends and integrate them throughout the bank.

Recommendation Four

The legal and regulatory environment should be carefully calibrated to the use of the internet and digital in financial services. Laws and regulations in the financial services industryshould strike a balance between promoting fintech innovation and insuring that financial stability is maintained.

4 Logistics Service Providers

Logistics service providers arebusiness that provide transport services to other businesses and individuals. This includes trucking logistics, shipping logistics and air logistics. It has been estimated that the value of the global logistics market has exceeded US$4 trillion (~¥26 trillion).[1] By ensuring the timely and reliable delivery of goods in a way that minimises costs, a well-functioning logistics industry is fundamental in facilitating trade and is essential to the industrial upgrading of an economy.

As China's economy has grown so too has its logistics industry. In 2015 China's logistics market was estimated to be worth around US$450 billion (~¥2,900 billion).[2] A study by PwC found that the satisfaction of customers with logistics service providers in China was high.[3]

4.1 The internet of things

The expanding reach of the internet combined with the evolution of other technologies has led to coining the term 'the internet of things' (IoT). Simply defined as "the networked connection of physical objects", objects gain an additional purpose or improved functionality through a connection to the internet.[4]

For example, a streetlight connected to the internet allows it to serve another purpose, such as detecting the presence of

[1] *Cerasis (2015)*

[2] *ATKearney (2015)*

[3] *PwC (2012)*

[4] *Kückelhaus et al (2015)*

cars in parking spots below it. This information can then be fed to an app and used by consumers to inform them of an available parking spot, helping to minimise unnecessary traffic on city streets and reduce travel times. This information could also be used to inform dynamic pricing based on availability, or to help inform local government on transportation usage to inform their city development strategy.

More common examples in use today include smart watches or other wearables like activity trackers. Respondents of a Pew Research Centre survey of technology experts and stakeholders expect IoT to play a role in many areas:

- bodies, through monitoring health and fitness, employees and children;
- homes, largely through controlling appliances or other consumer electronics;
- communities, by monitoring pollution levels and enable better transportation networks;
- goods and services, through better monitored and interconnected logistics networks; and
- theenvironment, by taking readings on resource extractions, fields and oceans.[1]

This transformation is only in its infancy. Of all the objects that could potentially be connected to the internet, currently less than one per cent are currently connected. It has been estimated that by 2020, there will be four internet devices for every person on the planet, nearly three times as many as in use in 2014.[2]

The principles and technology behind IoT will have a broad impact in organisations, particularly in risk management, business strategy and network design.[3]

4.2 Logistics service providers and the internet of things

For logistics service providers, the IoT is bringing about changes that will benefit their customers across the value chain. Logistics service providers were some of the earliest adopters of IoT technologies. For example, handheld scanners and sensors on cargo are now familiar sights, yet there is great scope to further exploit the technology.

Machine to machine connections enable loading containers, equipment, and other devices and assets to communicate with each other.

Assets or containers connected to geolocation devices can help keep track of cargo.[4]Devices attached to vehicles can send alerts to identify maintenance needs, or alert if a vehicle diverts from a route or makes stops for an unexpectedly long period of time. This information can be used to optimise how the components of the chain coordinate and work together through the use of data analytics.

But the IoTs can take this use of data even further, with connected devices measuring performance, and communication allowing the capacity to change future tasks, processes can become automated and dramatically reduce the need for manual interventions.[5]

New levels of visibility on goods movements ensure goods are much more likely to arrive at the right location, when expected and in good condition.[6] The next generation of ‘track and trace’ technology will deliver more accurate and

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[1] *Pew Reseach Center (2014)*

[2] *Mercer (2014)*

[3] *Blanchard (2016)*

[4] *Key (2015)*

[5] *Kückelhaus et al (2015)*

[6] *Ibid.*

predictive information faster and more securely. Items like low-cost almost paper-thin electronic sensors are allowing logistics service providers to better keep track of goods, reducing the likelihood of theft, and making it much more likely that when goods are stolen they can be recovered.

Case Study Nestle

Nestle is a Swiss multinational food and drink company. When measured by revenue, it is the largest food company in the world

Nestle has employed a vehicle management system on over 2,000 trucks across more than 60 distribution and manufacturing facilities. Through vehicle data that is uploaded automatically, problems are reported and then based on actual usage, maintenance is scheduled. This system helps to ensure safety practices are adhered to, provides energy saving mechanisms, and ensures that only authorised personnel have access to the Nestle fleet.

Source: Blanchard (2016)

The IoT can also be used to help prevent equipment failure. Planes, trucks and ships that carry goods, as well as the goods themselves, can become connected in new ways through the IoT. Devices on vessels can send signals to the network if they sense mechanical difficulty. A sensor can send a signal from the engine room to not only the captain and others responsible for maintenance, but to customers themselves to notify them of changes in expected arrival times. Downtime could be reduced through the arrival of the necessary parts at a future destination. Through theIoT, communication is accelerated, which can minimise or avoid delays, as well as give further advanced notice of expected delays to minimise any impact they may have on customers transporting goods.[1]

The IoT can be used to improve the maintenance process for logistics service providers. Predictive asset lifecycle management is one such concept that utilises the IoT. For example, a manufacturer of heavy equipment can install sensors in tyres to predict failure, helping to minimise the risk that machines unexpectedly needs repair during use. The devices can constantly monitoran entire fleets'tyre pressures, allowing repairs to be made to tyres on a preventive basis. This is a far safer and more economical situation than waiting for tyres in a fleet to fail.For example, an EU backed research project between Volvo, DHL and others developed a truck that was able to decide when and how it needed maintenance. vehicle uptime increased by up to 30 per cent.

A system of sensors in different systems of the truck identified material breakdown and monitored performance, fed the information to a central unit for analysis. Maintenance crews would then be notified if necessary.

The benefits of these tyre sensors can extend beyond maintenance activities. The sensors can also be used to the manufacturer's benefit, which in turn allows them to better understand customer use patterns, which in turn allows them to offer additional with other participants in the supply chain.[2]

The IoT is changing the way fleet management is undertaken. Fleet management is moving away from a system of discrete systems that operate independently to a more integrated system. In addition to minimising vehicle downtime, fleet management can ensure the vehicles are fully utilised and operating efficiently. Sensors can monitor capacity of the load, feed this information to a central dashboard, which provides specific opportunities to consolidate loads with other assets in the fleet

[1] *GT Nexus (2015)*

[2] *Openshaw et. al. (2014)*

and to optimise route operation. [1]

Case Study TheDow Chemical Company

The Dow Chemical Company, known as Dow, is a multinational chemical corporation headquartered in the US. It provides chemical, plastic and agricultural products and operates in approximately 180 countries.

Dow uses the IoT to monitorthe transportation and distribution of high-risk and hazmat shipments, whether by truck, train or ocean carrier. Risk management systemsutilise different identification systems (such as radio-frequency identification (RFID), global positioning systems (GPS) and bar codes) and while in transit, sensors are used to monitor environmental conditions and the security of the route being taken.

Source: Blanchard (2016)

4.3 Challenges

While the IoT represents an exciting opportunity for logistics service providers, there are a range of challenges that logistics service providers looking to embrace the IoT should consider.

The complexity of managing a large amount of data is proving to be a challenge. Sophisticated analytics are required in order to harness and make sense of these large amounts of data in a timely way. The amount of data that IoT technologies are able to generate is at risk of outpacing businesses' ability to analyse it in an effective manner. Businesses must be aware of this challenge and budget to outsource data analysis to expert firms as appropriate.

Implementation of an IoT strategy can also suffer when a number of devices remain stand-alone and are not connected to each other. While the components of theIoT are not new, the way they are combined and applied to find solutions is changing logistics management and will continue to do so.[2] For example, real time tracking solution provider Agheer has developed an open platform for connecting different telematics devices (telematics refers to the long-distance transmission of computerised information), accessed through one portal.

While some are sceptical as to whether the IoT transformation will fully take off in other sectors,[3] its role in logistics is already established, and as the technology becomes more widely used, the cost of not using the IoT is likely to become too great to ignore.

4.4 Conclusion

High quality logistics service providers are fundamental to the industrial upgrading of any country. China is already well placed, with a large and sophisticated logistical services network.

The Internet of Things is proving to be transformational for logistic service provision in the way it assists in tracking cargo, improves maintenance processes, analysis ofconsumer patterns and optimisation of fleet management.

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[1] *Kückelhaus et. al. (2015) andBlanchard (2016)*

[2] *Blanchard (2016)*

[3] *Pew Reseach Center (2014)*

Recommendation Five

Chongqing should encourage logistics service providers to embrace the Internet of Things in their operations. For guidance, logistics service providers in China should look to other providers, both in China and globally, that have effectively utilised the Internet of Things in their logistics businesses.

Recommendation Six

Chongqing should insure that as the Internet of Things is integrated into logistics service provision there is an adequate understanding of how to use the large amounts of data that is created by IoT devices. Private sector developers could be encouraged to focus on the development of software that can be used by logistics service providers.

5 Conclusion

The role of the internet in our economy is constantly evolving. The Internet Plus initiative of the Chinese Government represents an opportunity to assess how the internet might best be used by business to facilitate industrial upgrading in Chongqing.

This research paper has considered three areas where the internet is having, and is likely to continue to have, a significant impact on the way business is done in Chongqing.

SME service providers play an important role in the industrial upgrading of any economy. By better utilising internet based technologies, such as cloud computing and mobile technologies, SME service providers in Chongqing are likely to grow faster, contributing to the overall industrial upgrading of the city.

In the financial services sector, crowdfunding is an exciting development. It is driving a range of competitive responses across the banking sector, with traditional banks, such as ANZ also embracing the technologies that come with fintech.

In logistics services, the Internet of Things is proving to be transformational for logistic service provision in the way it assists in tracking cargo, improving maintenance processes, analysing consumer behaviour and optimising fleet management.

Chongqing's economic growth has been impressive. In 2015 alone the economy is reported to have grown by 11 per cent.[1] By embracing the use of internet technologies in a range of key industries Chongqing is helping to ensure that its economic future remains bright.

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[1] *Reuters (2016)*

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Cities of Tomorrow Will be Digital

Gérard Mestrallet

Chairman of ENGIE

Cities of tomorrow will be:

- more efficient, with a lower consumption of resources (financial, energy, water…);
- safer: security is essential for both citizens and city administrators;
- more attractive: infrastructures and services ought to attract developers;
- more sustainable as far as consumption of resources, pollution are concerned;
- more human: greener, more sociable, more friendly for the well-being of citizens.

In a nutshell, cities of tomorrow will be smart cities that enable their citizens to live a happy, healthy and economically independent life by optimizing the relationship between the individual and the resources of the city.

Cities are at the heart of the energy transition. Even if they only represent 2% space, they account for 50% of the population today (75% in 2050), 75% of the energy consumption and 80% of greenhouse gas emissions. Cities must therefore also be part of the solution, and reducing urban emissions will be pivotal to reach global CO_2 emissions reduction targets.

Cities are furthermore evolving. Silos between public universal services are being challenged. Cities are more and more experimenting to set up innovative ecosystems. Energy transition is a tangible reality in most of them.

Cities are moreover getting digital and are beginning to organize data collection and management.

The internal organization of cities evolves, and so does ENGIE. The Group is evolving from its traditional businesses (power producer, supplier of gas and electricity) towards services, new energy businesses, cities of tomorrow. Services have been at the center of our activities since a long time, as prove the leader position of ENGIE COFELY or the fact that 100,000 out of 150,000 ENGIE's employees are working in services. ENGIE takes on the issues of ongoing evolutions, marked by the decentralization of energy generation, the decarbonization of energy sources as the major challenge of climate change, and the digitalization of the economy.

The ambition of the Group is to be closer to territories to refine understanding of the issues met by cities, better integrate into its offers the most recent technological advances (digitalization,miniaturization, etc.), make them more efficient and unique: designed with customers to meet their specific needs and the context of individual cities and regions.

ENGIE's strategy is to be everywhere a local player, listening to citizens and local governments. It leverages on its strong local presence, its long track-record at the service of local governments and its capacity to mobilize the whole expertise of an international leader in the utilities sector, to play a role of facilitator to the benefit of all sizes of cities.

1 Cities are going digital

ENGIE's approach is based on the services we offer and the infrastructures we build for the cities. We are acting to improve the specific and measurable performances of the cities: how to massively introduce renewable energies in the city? How to reduce pollution and noise? How to decrease road congestion and make traffic more fluid? How to reduce the consumptions of buildings?

The Group has been already working on improving the operation of cities, even before the emergence of new digital technologies. One example is the regeneration partnership signed between the North East Lincolnshire Council (NELC) and ENGIE in 2010, with the long-term presence of ENGIE at the heart of the city over a broad set of services: lighting, maintenance of roads, rationalization and rehabilitation of the city's buildings stock, parking management, initiatives of economic development…

This systems approach allows us to commit on tangible objectives: 10-year programs of investment in the city, number of jobs to be created, energy consumptions, reduction of traffic accidents, etc.

But a real acceleration springs up, in terms of quantity or value creation, thanks to Digital. According to the law of Moore, data treatment capability doubles every 18 months at constant costs. Cloud computing and the ubiquitous connectivity offered by wireless networks provide unmatched flexibility and scalability compared to current cable solutions.

First input of digital: improve the efficiency of existing services (lighting, security / people protection, energy management, energy efficiency…), through better monitoring and thus better understanding for improved control:

- VERTUOZ is a digital platform for the monitoring of the energy performance of a building stock: cross-checking and massively handling data collected in more than 60,000 buildings.

- The business unit France networks relies on a dynamic tool to control district heating and cooling systems (for instance the monitoring & control system of the Climespace district cooling network close to Paris railway station "Gare de Lyon").

- The digital city services – Cit'Eazen is an application that lets citizens directly report incidents and get responses from the city services; it is used in Edinburgh among other places.

Second input of digital: offer new services

- Street Light Data uses telecommunication and GPS data made anonymous to identify, quantify and qualify traffic flows in a given area.

- « Troubled families »: the abovementioned North East Lincolnshire Council contract includes one initiative which cross-checks public service databases (police, schools, social care) to detect families at social, energy, school risk … so that the North East Lincolshire Council is able to help them as soon as possible and at the best social and financial costs.

- « Silver economy »: digital tools make it possible to imagine a full set of offers, especially to help patient and seniors stay home longer and in better conditions, thus relieving care services for instance.

- E-health – ENGIE Ineo currently provides support to over 350 health facilities, including an offering that allows patients, doctors and hospitals to share information via a digital terminal and online telemedicine platforms.

Third input of digital: a holistic vision of the city and its actions

- The digital tool Cit'Ease, designed for cities, helps them control the performance of a set of urban services (urban cockpit).

- ENGIE collaborates with cities to help them handle and cross-check their databases against all possible dimensions.

- A new step is the 3D SIMULATOR: it allows the city to visualize all impacts of decisions, thus being an essential decision-making aid.

For that, ENGIE works with the whole local ecosystem: SMEs, start-ups, universities (example: the « Troubled Families » project with Newcastle in UK, has been developed with a spin-off of the University of Newcastle).

2 Visualization and urban planning

Cities hold significant data which needs to be unlocked to realize its value.

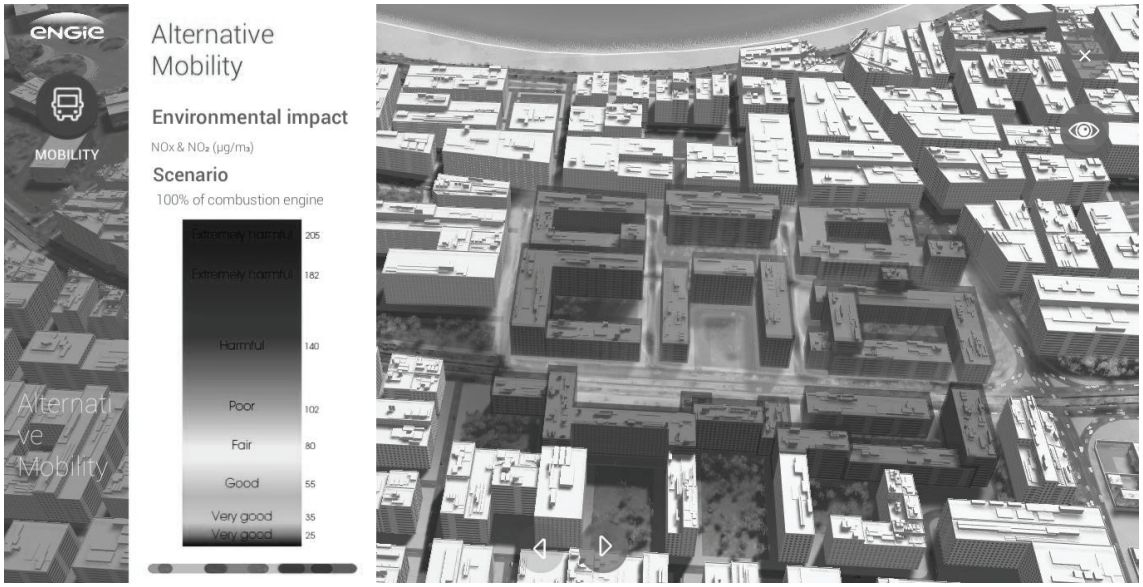
Modeling and experimenting serve the objective to understand the value of data in a city, develop and prove business cases and models, or else enable informed decision-making including through simulation.

It develops value for city stakeholders from the data in a city, create collaboration across all of them, deliver value to citizens, businesses and government.

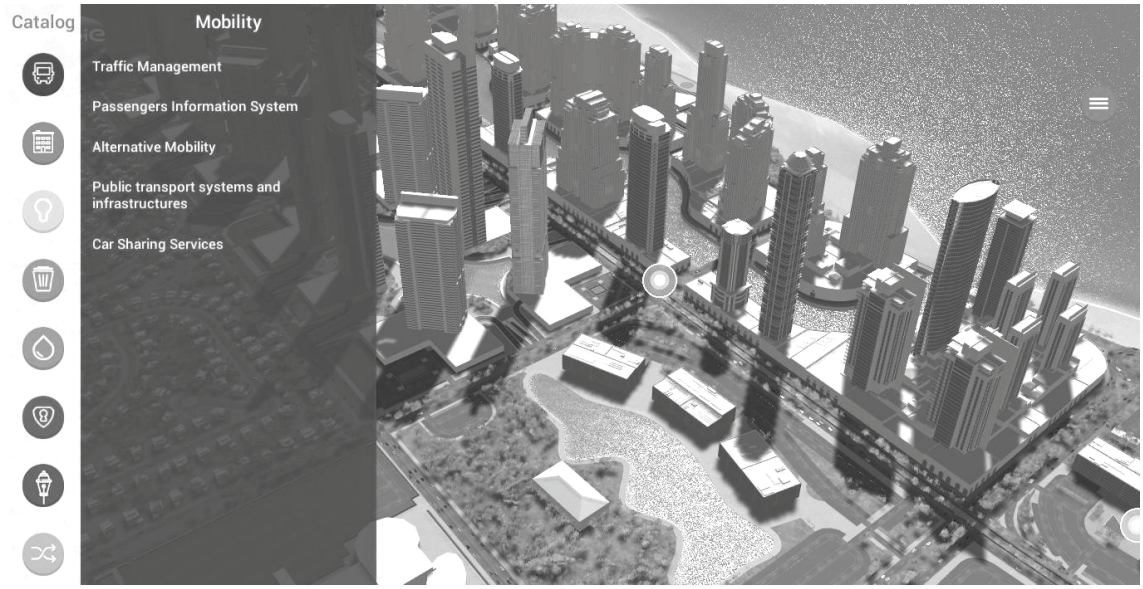
Virtual reality

ENGIE provides a 3D tool to get both broad and deep knowledge of the needs of a given city or region in order to put its solutions in context. The tool includes a basic layer of simulations (specifically for public lighting, electric vehicles and air quality, and IoT[1] networks).

In addition, the Group has developed another, more powerful tool just for simulation (3D Simulation Tool) that helps cities and their stakeholders make better decisions. It can be configured on request to simulate an existing real-world city. The tool can simulate air quality, mobility, noise, CCTV cameras, PV Power potential, etc.



[1] *Internet of Things*



Experimentation to prepare large scale deployment

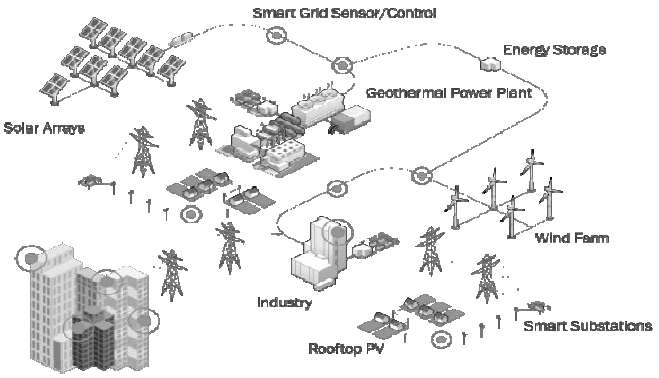
Smart Economic Activity Zone in Toulouse

A good example is the smart Economic Activity Zone (EAZ) in Toulouse (France) developed to experiment integrated microgrids for decentralized renewable and low-carbon energy.

It consists in a full-scale demonstrator of the ENGIE's know-how in multiple aspects of micro- grids (solar panels, windmills, batteries, flywheels, energy management systems, and more).

In Toulouse, a 1.5-hectare business park with a working population of 230 is successfully experimenting with a new way of sharing power networks thanks to a smart grid run by ENGIE Ineo. It pairs facilities that consume energy with those that generate and store power.

Smart EAZ project



General smart grid concept

The Smart EAZ is indeed a full-scale smart grid, including renewable energy generating systems, a 300 kWp solar panel array and a 60 kW wind power installation. The energy generated is either consumed or stored on-site in lithium-ion batteries (1.5 MWh) and flywheels (100 kWh) to optimize the economic and environmental balance of the business park site. Also, more than 100 sensors provide real-time measurement of power supply and demand at different points in the grid.

The smart energy management system developed by ENGIE Ineo gathers and centralizes all this data as the basis for matching energy generation to consumption.

Via this system, all on-site electrical systems communicate with each other continuously, enabling the generation/consumption balance to be optimized at all times. The building manager can control the facilities and balance priorities by deciding, for example, to shut down heating or air conditioning at times of peak consumption without compromising office comfort levels.

Similarly, at lunchtime or during low points in consumption, the solar energy generated can be stored for later use. Consumers therefore become active contributors to maintaining the balance of the power supply grid.

This project is being run as a partnership with the power electronics company CIRTEM, the Laplace energy conversion laboratory (INP Toulouse) and Levisys, the pioneer in flywheel energy storage.

Paris Smart City Approach

With its concessionaire EVESA, Paris city is deploying around the Place de la Nation (Nation's Square) a new system for counting pedestrians at crossroads, in order to test a system for

controlling traffic lights, not only based on road traffic, but also on the needs of pedestrians. Thus, the times during which the traffic lights will be green will be adapted to pedestrians' needs in real-time. For example, when lots of pedestrians are moving in an area, large pedestrian crossings will be managed to be done in one time rather than two. The experimentation will cover around thirty crossroads around the Nation's Square.

The city takes also benefit of the renewal of the maintenance contract for elevators in the public space. This initiative puts the operational data of those facilities under real time monitoring. Thus, services offered to people with mobility problems will be able to include this new data in real-time and adapt suggestions of route, using or not these elevators. This will allow the community to better control the quality of service offered to the manager and for inhabitants to avoid detours in the public space to find an accessible path.

To conclude with examples, tall buildings' containers of Paris will be equipped until end 2016 with chips, as well as waste loading containers with chip readers and reporting tools (presentation of containers, weight of a round and movement of containers). In this way, it will be possible to evaluate for each building the periodicity of exit for green and yellow bins[2], but also to report in real-time the GPS position of collection containers, traffic incidents, etc.

3 Towards smart governments

Social networks, mobile apps and online claims are nowadays common practices and join neighborhood assemblies and associations in the expression of citizen's will. More than a simple way to distribute information, citizens want nowadays to be involved in their city's policy. These new practices combined with digital equipment offer the opportunity for local governments to better communicate on their actions.

Digital to capture ideas of citizens

In the French town of Nantes, the urban area has reinforced its digital communication by developing a mobile app. which enables citizens to get information on city infrastructures, on policies it leads, but also to hail city leaders.

Paris provides citizens with several tools too. The digital platform « Mrs. Mayor, I have an idea » encourages citizens to make propositions, which will be disputed during specifically organized meetings. One part of the budget of the city is in this regard submitted to the approbation of citizens.

Even if physical meetings are inevitable "must have", digital tools bring an essential complement. Feedback allowing the development of more appropriate equipments (mobility, networks, energy) is modifying the relationship between local authorities and citizens. A participatory approach requires some capacity to capture the needs of citizens. It creates bond between citizens and the city administration. The responsibility keeps however on local authorities' shoulders to go toward more transparency. To make it work, consultations or call for citizen report must not remain without any follow-up,

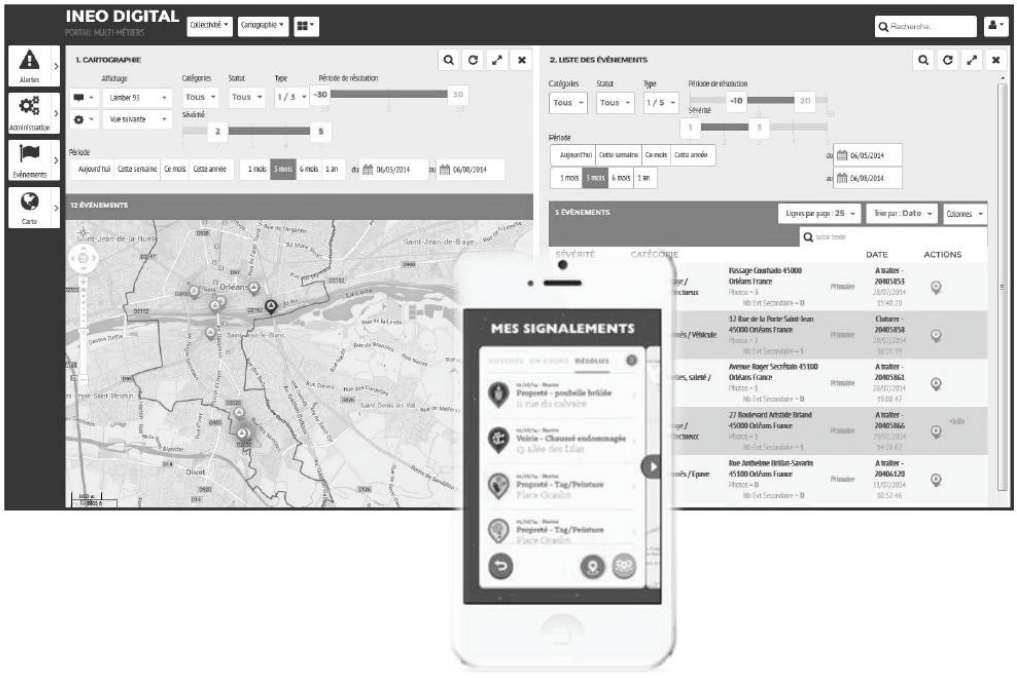
Cit'Eazen

Cit'Eazen has already been mentioned as a tool offered by ENGIE to allow cities enhance their ability to manage public services.

[2] *Colors refer to the partition of waste for further recycling.*

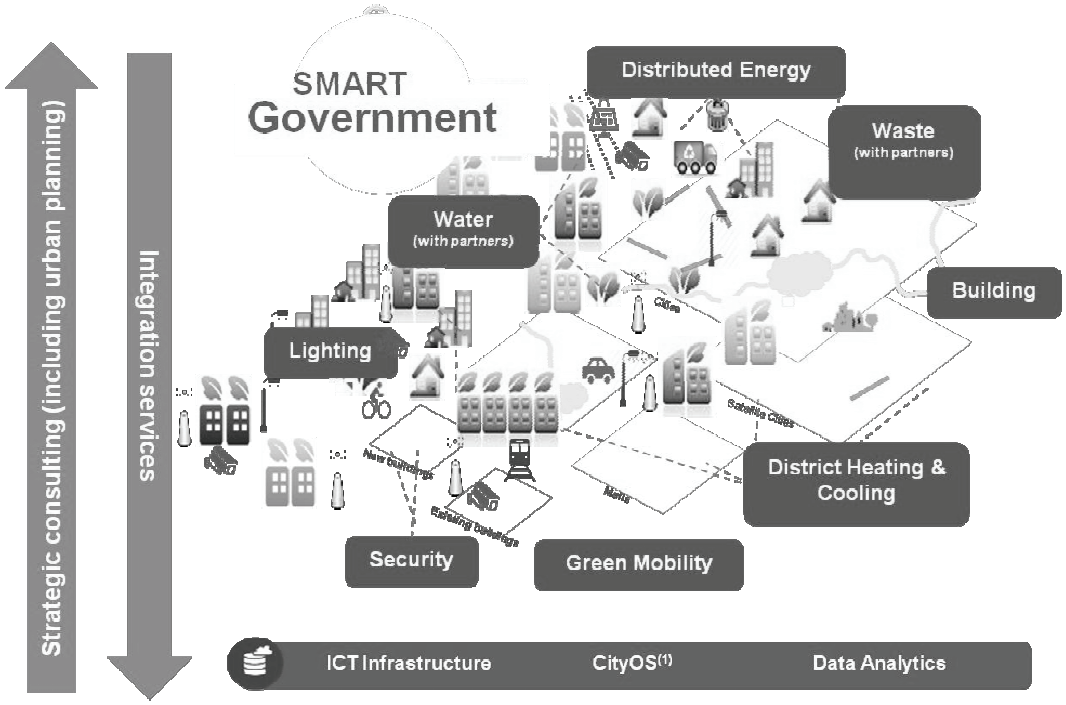
The City of Croix (France) opted for Cit'Eazen. With 20,664 citizens and potential users of the application, 83 municipal officials, and leadership by the General Services Department at City Hall, Croix lets citizens notify issues with green space, roads (excessive puddles, debris, potholes), traffic signaling, degradation of public facilities and street furniture, public transit, graffiti, and trash bins.

When citizens indicate an issue, the app. automatically locates it with GPS coordinates and provides a real time response to the user when it is solved. This brings citizens closer to their municipal services, and allows providers and officials to assess where problems are concentrated and how citizens react.



Urban management through digital city services

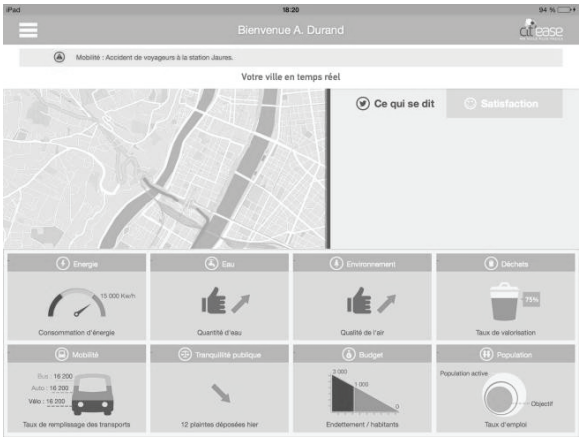
Smart government leverages the Information and Communication Technologies infrastructure, City Operating System and Data Analytics to drive greater connectivity across the value networks.

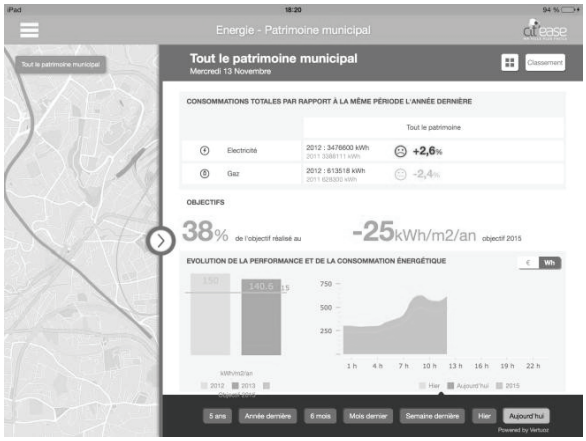


Another service offered by ENGIE and SUEZ, Cit'Ease, is a digital tool for cities that lets them manage a range of city services.

The tool centralizes and cross-references a set of territorial management data, providing a real- time display of information about a city and allowing it to coordinate and adjust parameters. The ultimate goal is to achieve a balance between available resources and citizens' needs, to reduce water and energy consumption, to improve waste management and enhance social welfare.

For example, it allows municipalities to address fuel poverty by identifying urban zones where households spend more than 10% of their income on their energy needs, thus paving the way for intervention, assistance or support policies.





4 Recommendations

Digital transformation is at the heart of Chongqing's project to be a smart city. We have identified four main attributes can truly help Chongqing to go digital:

Leadership and engagement for a digital ecosystem

For digital transformation to be successful, the initiative must come from the top ─ from municipal government who wields enough power to influence the entire city. For example, creating a forward-looking digital strategy and building a shared vision around it.

This means developing a specific roadmap focusing on organizing and exploiting data to the benefit of a sustainable city and its optimization. This strategy relies on several lines of actions, which have also been set up for example by the city of Paris:

- Experimentation, that is to say testing systems and learning from these phases, for the industrial actors for the proof of concept in real conditions, and also for the city to fine- tune the needs and its knowledge of technologies that can be mobilized.

- Dedicated human resources: a position of Chief Data Officer (general data administrator) should be considered at the top-level of the Chongqing's administration, so that digital, central for the community, will be fully and transversally managed associating all concerned divisions of the city and associated structures.

- Partnerships with structures at the forefront of data science: for example the city of Paris examines the conditions of a partnership with the French State Etalab department, which mission is to free up and facilitate the sharing of public data and which employs high- level data analysts. Such partnerships also concern companies, institutions or research laboratories.

- A data platform to collect in the same place and guarantee the maximal release of data in compliance with the

protection of personal freedoms.

It is also important to get all the key stakeholders ─ citizens, industry, community, NGOs, etc ─ engaged in the digital transformation process. Being part of the change is the best way to keep everyone positive and motivated to participate. The more points of view you have on the transformation, the better the chances of covering all angles and getting the job done right.

The use of connected objects for instance poses numerous security problems (availability, confidentiality, traceability and integrity) as well as those linked to respect for private life and data ownership. Condition of trust, digital security represents a major challenge for companies and public authorities that the emergence of Big data, of Cloud and mobility in a more and more connected environment makes even stronger.

Finally, to develop trust, the individual must be made aware and in control of his/her data. The empowerment or the management by a person of his/her data « assets » is one of the challenges for the development of connected objects and Big data. The fear to see the emergence of a « surveillance society » explains some reluctance about digital. This fear must be accounted for and be the opportunity to develop raising-awareness actions and technical answers guaranteeing trust between actors.

Digital talent pipeline to sustain the digital transformation

Digital is now booming and has not yet been consolidated. This results in a very diverse market comprising start-ups and major companies, manufacturers, publishers supplying associated applications, service providers or operators.

Industry, educational institutions and governments should tailor existing digital training opportunities (e.g., technical, management and leadership courses) to transform the local population into digital talents. Meanwhile, education, industry and government should strategically enhance their work together to build training programs that better align with industry needs and improve student employment outcomes.

A focus shall especially be given to the new jobs the digital economy needs, among others: apps designer, data scientist, search engine manager, customer experience manager, community manager...

Governments at all levels should develop a comprehensive strategy to train and attract global digital talents.

Free flow of data and data sharing to foster innovation and entrepreneurship

With Digital, the link between assets and IT is accentuated, and because of different potential technologies, network or even actors, the quantity of offers explodes. Access to data and removal of unnecessary restrictions on the free flow of data can act as a catalyst for innovation and entrepreneurship.

In the framework of the deployment of smart cities and capacities to collect data, it appears absolutely necessary to promote open data to meet favorable economic conditions.

In this context, public bodies should observe a certain number or rules associated with the opening of their own data to promote their treatment by the community of developers. This is a condition necessary for the emergence of new digital services which will improve and facilitate many aspects of urban life.

Data collected for the purpose of analysis and optimization of public equipments, buildings and housings, especially as far as energy is concerned, should be made accessible to all members of the community (local city services, start-ups, operators, partners, universities, etc.), so as to test open innovation around these data.

Collected data should as well be made available in the framework of data science competition or events (hackathons).

Key infrastructures and investments for digital launch-pads

One of the major developments which will accelerate things even further is the fact that the whole of cities or countries will be connectible.

As soon as the infrastructures will be set up for permanent, fast and easy access to the net, the applications associated to the realization of the smart city and the connectivity of objects and applications will bring true improvement opportunities of urban life: better information on the activity of the city, transports and mobility, smart parking, public services, real-time access to multiple indicators, prevention of risks, control of all kinds of consumptions, etc. The scope of uses is multifold and opens innovation perspectives to a large scale.

Physical and digital infrastructures are required to optimize the use of resources and enable a higher quality of life in the city. Innovative financial and business models are increasingly emerging to finance these indispensable local technological infrastructures.

In this regard, Chongqing municipal government could launch four digital initiatives:

- One is digitalizing public services, initiative which aims to modernize digital public services and make Chongqing a better place to live, work and invest.

- Another can be a Chongqing Cloud Initiative, which is to strengthen Chongqing's position in data-driven innovation and improve competitiveness.

- The third is Industry 4.0 Accelerator Program with the aim to accelerate the integration of cyber-physical systems and the Internet of Things, Big data and Cloud computing, robotics, artificial-intelligence based systems and additive manufacturing.

- Fourth, a Fund might be established to help start-ups and accelerate ecosystems within the field of digital technologies and help the sharing of knowledge and experiences.

5 Conclusion

The Digital transition impacts all activities and truly disrupts our life patterns, which means becoming an “all connected” world, including people and physical objects. The emergence of very high-speed broadband networks, technologic disruptions as far as communication protocols are concerned (machine to machine - M2M), generalization of access to Internet in each and every point of for example a building are radically modifying the boundaries of what is possible.

Attractiveness of cities by different economic actors relies on their capacity to develop an urban technological ecosystem able to optimize the collection, the processing and the delivery of data for a simpler and more efficient urban life. At the heart of this vision are the human being and his/her experience of the city, its new utilizations and its new economy, but also the will of citizens to take part to the building of the cities of tomorrow.

ENGIE’s goal is to be a leading architect of this transformation, and cities and regions have emerged as some of its key drivers. The Group now brings its multiple skills and specializations by placing environmental concerns at the centre of all its projects.

ENGIE would be very keen on sharing it expertise and resources with the city of Chongqing to help the city to become the smart city it aims to be and develop cutting-edge experiences and services for its citizens.

Made in Chongqing 2.0:
Driving Trade in Services under the Made in China 2025

Hannes Androsch
Chairman of the Supervisory Board of AT&S

Introduction

Chongqing has always been vital for opening up the Western region in China. Strategically located, it has functioned as a trading hub to connect regional economies, extending to its neighbors along Russia's Volga River to reach Western European economic hubs.

As an important manufacturing base, especially for electronics and in particular semiconductors, Chongqing's role has expanded. With the Made in China 2025 (MiC 2025) proposal, Chongqing is already developing 10 strategic emerging industries including core electronic components, the Internet of Things, robots and smart equipment, new materials, high-end traffic equipment, new-energy motor vehicles and smart vehicles, MDI and new materials for chemical industry, shale gas, bio-medicine, and environmental protection.

The changes and reforms are already having a positive economic impact. In 2015, the output value of these emerging industries reached USD 25.07 billion (CNY 166.4 billion), with a contribution rate of 30 percent to the growth of the industrial output value. In Q1 of 2016, the output value of emerging industries in Chongqing grew by 42 percent; and it is expected that the annual output value of these industries will reach USD 42.18 billion (CNY 280 billion) throughout 2016.

Chongqing's economic achievements have thus been remarkable. Its economic development and economic growth rate are much higher than the average level of the state. But to sustain its growth for the long-term, Chongqing will need to overcome a number of key challenges, and in particular develop its Trade in Services potential.

Trade in Services refers to the sale and delivery of an intangible product, called a service, between a producer and consumer. Trade in services takes place between a producer and consumer that are based in the same country or different economies. It is one of the most dynamic segments in world trade and includes cross-boundary e-commerce business, exhibition and transaction of bonded goods, bonded trade, internet-based cloud computing and big data, cross-boundary settlement, and simplified procedures of foreign investment and financing for foreign investors.

There is considerable potential for Chongqing, and China as a whole, to develop Trade in Services, when compared to developed countries. This paper discusses AT&S' perspectives on the key opportunities and possible solutions for Chongqing to promote Trade in Services. With a strong focus on the electronics, and in particular semiconductor industry sector, we will look at:

- Internet-based cloud computing and big data in modernizing manufacturing
- Importance of corporation along the whole value chain
- Enabling foreign investment and financing for foreign investors by simplifying current procedures
- Why talent management is vital
- The need to adopt a technology leader's mind-set

We will conclude with a short review on how AT&S has helped to support Chongqing's electronics industry, and why it believes that Chongqing has an important role to play in global trade and innovation for the electronics industry, especially the semiconductor industry sector.

Understanding the Chongqing impact

To understand the opportunities and challenges that Chongqing faces, it is vital to first acknowledge its importance to a foreign investor.

The fast-growing 30-million strong municipal has already been named a key "emerging megacity" in a July 2012 report[1] by the Economist Intelligence Unit. It has registered exceptionally rapid industrial growth through constant economic transformation and upgrading, and has formed "6+1" pillar industries including automobile, electronics, equipment, materials, chemicals and pharmaceuticals, energy and consumer goods.

In 2015, Chongqing had the second highest growth rate of added value of the industrial sector in China. The overall industrial added value reached USD 83.71 billion (CNY 555.7 billion), up 10.5 percent, contributing 35.4 percent of the GDP and 36.9 percent of the GDP growth rate, driving the economic growth by 4.1 percentage points.

This growth has been spurred by an increase in trade in services. Chongqing has made key structural reforms to drive service transformation, which is helping businesses to become technology-driven and contribute more to the whole economy. The measures aim to meet China's goal of reaching USD 1 trillion (CNY 6.64 trillion) of total service import and export by 2020, as stated in the *Opinions on Accelerating the Development of Trade in Services* published by the State Council.

Coupled with policy innovations, such as subsidized housing and relaxed residency rules aimed at driving labor mobility, the growth rate in 2015 of Chongqing's industrial profit has been among the fastest in China for three consecutive years. The profit rate of the revenue of main business stands at 6.7 percent, an increase of 0.3 percentage points higher than the same period of the previous year, and 0.9 percentage points higher than the national average level, reaching a historical new high.

[1] *"EIU Report". Eiu.com. Archived from the original on 17 December 2015.*

In turn, this has lured many foreign multinationals seeking lower labor costs and closer access to the 300 million consumers who live in a 1,200-km radius from the city. In turn, State-led development has further fueled 11 percent growth in 2015 - the fastest pace in China.

Overall, AT&S sees Chongqing's developing strengths in five key areas that aim to drive sustainable development and the growth of trade in services. These will help the megacity to transform its resource-intensive, product-oriented manufacturing base into a service-oriented industry.

Chongqing's key strengths

1. Coordinated, growth-driven strategy. With the strategy of developing five major functional areas proposed by the municipal Party committee and the municipal government of Chongqing, Chongqing goes all out to promote the joint actions in the industries in each functional area. The industry in the urban function expansion area maintains a strong growth momentum, while the contribution rate of the industry in the urban development new zone has reached 80 percent of the growth of industrial investment of the whole city. Coordination is vital for a service-oriented economy as it is balanced across all industries, and promotes the development of trade in services across the municipal.

2. Tight vertical integration. Through clustered development and vertical integration of supply chains, especially among each industry, Chongqing has integrated the development of upper, middle and lower sections of the industrial clusters. The mega-city has formed an industrial pattern where the automobile industry and electronics industry develop side-by-side, with a number of industries as the support. Integration is a pre-requisite for the adoption of trade in services, as it allows key industries to work and contribute to overall growth.

3. Focus on emerging industries. In accordance with the MiC 2025 initiatives, Chongqing is developing 10 strategic emerging industries, including core electronic components, the Internet of Things, robots and smart equipment, new materials, high-end traffic equipment, new-energy motor vehicles and smart vehicles, MDI and new materials for chemical industry, shale gas, bio-medicine, and environmental protection. The drive and focus of these emerging industries has shored up industrial output. For example, in 2015, the output value of these emerging industries reached USD 25.07 billion (CNY 166.4 billion), with a contribution rate of 30 percent to the growth of the industrial output value. More importantly, it will create a huge demand for Trade in Services like Business Process Outsourcing, development and export of software, freight forwarding, etc.[1]

4. Least expensive logistics link to the world. The "Chongqing-Xinjiang-Europe" railway linking China and Europe, which opened to traffic in 2011, has had an enormous economic and diplomatic impact. The Chongqing route is the cheapest of five railway routes from China to Europe, costing USD 0.7 (CNY 4.65) per km or USD 9,300 (CNY 61,754.02) per container[2]. It is two times faster than shipping by sea and half as expensive as air freight. The Chongqing route is especially important for

[1] *http://tradeinservices.mofcom.gov.cn/en/i/index.shtml?method=fwwb*

[2] *http://www.macauhub.com.mo/en/2015/03/06/carriage-of-trade-railway-from-chongqing-opens-new-silk-road-to-europe/*

electronics and semiconductor manufacturers because the value lost on goods such as engines and computer components during the longer sea journey is relatively high. Meanwhile, Chongqing is ensuring that this strategic advantage is well maintained. The costs of railway operation have been reduced by 40 percent since it opened. Chongqing also has three communication hubs integrating airports, railway ports and inland harbors, three state-level ports open to the outside world, and three bonded and supervised zones, which form a "three-in-one" platform for opening-up efforts.

5. **Center of innovation.** Chongqing leads other regions in the western part of China in terms of R&D investment. It has already poured nearly USD 12.05 billion (CNY 80 billion) into industry during the 12th Five-year Period, with an annual growth rate of more than 20 percent, and accounting for 82.5 percent of the total R&D investment of China. It has 47 state-level enterprise technical centers, key laboratories, and engineering technology research centers, and 531 municipal-level enterprise technical centers, technical innovation demonstration enterprises, key laboratories for industry and information technology application. This has resulted in 25,500 licensed patents, with an annual growth rate of 21.6 percent, creating an attractive place for new levels of service innovation by local and foreign talent.

Sizing up the opportunities

To sustain its development and meet the MiC 2025 objectives, Chongqing will need to develop its trade in services further and help China to close the gap with developed countries. The OECD (The Organization for Economic Co-operation and Development) noted that China's services already contribute to 30 percent of the country's total export[1]. However, European members currently contribute up to 50 percent. This gap shows the immense set of opportunities for Chongqing to drive service transformation in its own industries. The development of a mature service industry will also aid China's push to promote quality over quantity. Below are five opportunities that AT&S sees are vital for this to occur.

Opportunity 1: Internet-based cloud computing and big data in modernizing manufacturing

By extending the industrial chain and forming industrial clusters, Chongqing has registered notable achievements in the processing industry and has become the largest production base for notebook computers worldwide and for automobiles in China. The city has also been reinventing itself as the "robot capital" since 2011.

As such, it is crucial for Chongqing to enhance digital connectivity with other cities in the Yangtze River Delta Economic Zone. Through better regional connectivity, it can drive industrial transfer from the middle or lower sections of the Yangtze River, and sustain regional development. It also offers the valuable opportunity to capitalize on new business potential by restructuring trade in services from a labor-intensive service industry to technology-oriented service industry.

[1] *http://english.ccpitbj.org/web/static/articles/catalog_2c94bbf02fd8b281012fd8de94480004/article_ff8080814c97d292014ea9088bad3c42/ff8080814c97d292014ea9088bad3c42.html*

To achieve this, Chongqing will need to heavily invest in and drive the adoption of mobile communications technologies, cloud computing, and "big data" analysis. It will boost plant throughput and uptime, enabling more flexible production and improving capacity utilization. It can also support new levels of innovation and automation that promote efficiency.

For example, production at AT&S Chongqing and in IC substrate technology is managed and controlled with data via MES (Manufacturing Execution System). It significantly improves the process and administration, and brings increased productivity, quality, accuracy and precision.

In addition, the Internet of Things (IoT) will continue to play a significant role, especially in Chongqing's robotic ambitions. AT&S believes that smart manufacturing technology, like industrial robots, can substantially increase productivity, raise yields, and improve product quality while reducing costs. In turn, this will help China to upgrade and transform its manufacturing industry and enter a new, more efficient and intelligent development stage.

With remote management through IoT, robots will be able to diagnose their own "health" and operational issues and alert service engineers before breakdown. These advances will not only transform supply chain management, but will help develop Chongqing into an important hub for piloting future smart manufacturing initiatives.

Opportunity 2: Importance of corporation along the whole value chain

With the development of trade in services and smart manufacturing, Chongqing's electronics and in particular semiconductor manufacturers have the opportunity to work with its upstream players (companies that extract raw materials) and downstream players (companies that manufacture the finished product) to develop solutions and products that they need through the concept of Co-creation[1].

Co-creation is becoming an innovative way for New Technology Development (NTD)[2]. Here the semiconductor manufacturer develops a key product by engaging major stakeholders (usually the customers) through collaborative design and co-investment. This concept is becoming especially important as commodity margins become thinner.

With more customers becoming price aware and the logistics of manufactured goods easier, Chinese manufacturers will have to compete with other global manufacturers on standardized offerings. This will eventually drive price down, and make it no longer sustainable—a key concern for MiC 2025. By co-creating with stakeholders, Chinese manufacturers can build value-creating relationships that are more sustainable, while improving innovation capabilities.

For Co-creation to work, you need similar high standards and efficiency, as manufacturers are directly interfacing with customers/suppliers. This will expand additional businesses, such as spot-inspection maintenance and operations management,

[1] *Prahalad, C.K.; Ramaswamy, V. (January–February 2000) "Co-Opting Customer Competence". Harvard Business Review.*

[2] *http://www.tandfonline.com/doi/abs/10.1080/09537325.2015.1060311?journalCode=ctas20*

thus driving the development of trade in services further. Big data and cloud services (as highlighted in Opportunity 1) will help these service providers and manufacturers to optimize their processes and minimize environmental impact.

To enable Co-creation, Chongqing needs to specifically implement key policies to allow the integration of systems for consumers, government, academic institutions and industrial systems, and enable data sharing. The resulting data analysis and technology sharing will propel the industry to lead the global semiconductor industry sector, not just become one of the world's best.

In addition, the Government has to develop a platform for dialogue between customers and manufacturers. Co-creation demands close communication and collaboration at all levels of the manufacturing chain, and a certain level of education is needed to prepare local manufacturers to become familiarized with the concept.

Co-creation can also create synergies between academia and the industry. This sharing of knowledge, expertise and innovation, supported by a rigorous IP regime (as noted in Opportunity 4 below), will help to create unique solutions and expertise that will differentiate Chongqing's semiconductor/electronics industry from the world.

AT&S' strategic advantage is rooted in Co-creation. By working closely with key customers and experts, the innovative technology and solutions portfolio, based on merging PCB and semiconductors technologies, is trusted by leading global players. The company well positions itself as a leading interconnect solutions provider and offers the market the combination of the technologies. It helps to upgrade the semiconductor industry sector worldwide.

Opportunity 3: Enabling foreign investment and financing for foreign investors by simplifying current procedures

Although enhanced capabilities are the most important factors separating winners from losers, patient capital is also essential. Patient capital is another name for long-term capital where the investor is willing to make a financial investment with no immediate expectations for quick profit.

This can help spur investments in the development of trade in services while reducing the fiscal burden on local industry. It can also be used to drive interest in the adoption of these services, thereby transforming key manufacturers into service-oriented ones.

Under its new policy, the Chinese government is having local private-equity firms manage its investments in the electronics industry, especially the semiconductor industry sector. As these firms make decisions about funding, they will adhere to the government's goals and objectives—but also strive to meet market rates of investment return.

The semiconductor sector's unique capital requirements can be a huge hurdle for Chongqing. The industry, which is characterized by long development cycles and high business cyclicality, often experiences returns that are lower than average. Most private-equity players have a hurdle rate (minimum expected return on investment) of 8 percent. Historically, semiconductor companies have, in aggregate, earned lower returns on equity than that. In fact, key segments like Chinese

smartphone shipments have grown very little, compared to the double or triple-digit growth seen in the five years preceding 2015[1].

In addition, the semiconductor industry's horizon for generating profits is typically longer than average, especially in process and manufacturing. Payback times of 5, 10, or 15 years are typical. Investing steadily and intelligently through the entire cycle and the long term will be a challenge for financial investors who have multiple options for their capital.

There is also a healthy market for well-performing semiconductor companies and assets. So private-equity funds will be competing with other corporate investors with lower cost of capital. As a result, investors may end up paying higher prices for the same assets.

At the same time, foreign companies can be invited to share the funding needs. China has essentially liberalized foreign direct investment, especially with the QFII (qualified foreign institutional investor) and RQFII (renminbi qualified foreign institutional investor) programs. One additional way to go is the creation of an additional free trade zone（FTZ）, similar to those already seen in Fujian, Guangdong, Tianjin and Shanghai[2]. This has already been tabled, with Chongqing and Zhoushan favorites to be named the next FTZ.

But even in the unlikely event that Chongqing does not become a FTZ, we believe that by simplifying investment procedures further and allowing foreign companies national treatment can offer many opportunities that Chongqing. One key area to explore is the processes involved in approving Foreign Direct Investors (FDI). Simplifying these rules and offering clear guidelines on how to meet them, combined with IP protection, can attract foreign investment. In the end, foreign investors are not just bringing in funds, but will also share key experiences and knowledge to local manufacturers. In addition, the application of national treatment, whereby the restrictions of FDI participation in strategic initiatives are removed, will buoy FDI sentiment.

Another key area where foreign investors can play a key role is in State Owned Enterprises (SOEs). Reforms in how foreign companies or experts can be represented on those Boards can change the way SOEs are managed, similar to roles of fund managers and large corporations. Here, the boards of directors will have greater decision-making powers and good corporate governance will be the key for both financing and stock performance, and indirectly contributes to shoring up revenues. It offers an opportunity for foreign investors to act as financial investors or strategic investors to play special roles in improving corporate governance, and helps Chongqing through its economic transition.

Opportunity 4: Why talent management is vital

To become international trend setters in trade in services, companies in Chongqing must build the capabilities needed to run far more complex businesses. As already seen in the global semiconductor/electronics industry, they must invest years in developing relationships and extending competencies beyond their home borders.

[1] *https://www.weforum.org/agenda/2016/01/which-industries-will-be-hit-hardest-by-china-s-slowdown*

[2] *http://www.china-briefing.com/news/2016/08/04/chinas-free-trade-zones-open-foreign-investment.html*

Although many emerging Chinese semiconductor leaders have made strides in this direction, there is much room for improvement. For instance, domestic companies need to create global sales and customer-service teams to make inroads into international business. They will need to be able to manage multiple R&D facilities, with centers of competency spread around the world. They also need to enhance their capabilities beyond silicon and invest in areas such as software development, ecosystem management, solutions selling, and reference designs.

Recruiting, training, and retaining the best global talent is already difficult, especially in hardware architectures, firmware, and applications. The situation may be even more challenging in Chongqing, since the most experienced semiconductor talent is typically based in other regions. In cases where talent is brought into a company through acquisition, effective post-merger management is essential. Else, the industry, along with others, will be impacted by a talent drain.

To help retain or recruit the right talent, the government should help create the right incentives and social programs to encourage foreign talent or local talent to be situated in the city. Besides relooking at the Visa requirements to facilitate talent and knowledge exchange by foreigners, the Government should also look into expanding the international school environment, improving residential infrastructure and exploring key facilities that will allow foreign nationals to easily relocate to the megacity. This requires a strong investment to promote the megacity, while improving the current facilities to those already seen in the coastal cities like Shanghai.

Foreign talent is, however, not a long-term strategy. Eventually, Chongqing's attractiveness will be sustained by the availability of local talent. This needs the Chongqing government to invest and shore up its university and tertiary education capabilities. With access to a large talent pool of skilled talent and expertise, the semiconductor/electronics industry can easily meet the MiC 2025 objectives.

All these efforts need to be supported by a strategy to protect intellectual property (IP). This will require each company to have a well-thought-out IP road map separate from its product offerings. In addition, the megacity should encourage the continued strengthening of China's IP regime, both to protect their own innovations and to develop an environment in which multinationals are willing to undertake IP and R&D partnerships with Chinese players.

Companies that can build strong, unified teams from multiple cultures and geographic locations, supported by a strong IP regime, will not only emerge as winners but also have the opportunity to lead the wider industry and become service-oriented. This in turn can encourage the development of specific trade in services targeted at the semiconductor/electronics industry.

Opportunity 5: The need to adopt a technology leader's mind-set

Technology innovation and leadership matter in semiconductors. Due to lower risks and investment requirements, Chinese companies generally focus their efforts on mature technologies, modifying and removing cost from innovations developed by others. While mature products can generate profits, they are not sufficient to transform the industry into a global leader.

A McKinsey survey showed that Chinese companies that purchase semiconductors consistently cite product performance and leading technologies as their primary consideration when purchasing. This means that the leading suppliers to these companies continue to be leaders across multiple areas, including circuit design, product integration, and production processes, as well as “above chip” features such as firmware, reference designs, and software.

To lead, the Chinese semiconductor/electronics industry cannot rely solely on technology transfers and acquisitions to promote indigenous technology leadership. Current export controls and other limits on purchasing key technology do not help. In addition, most of the leading-edge knowledge is tacit and impossible to transfer through contracts.

Furthermore, technology development never stops. Even after the technology is purchased by or transferred into a Chinese company, competitors in other countries will be improving it, requiring the Chinese company to do the same. For the semiconductor/electronics industry to become a leader, it needs to have the right environment to internally develop, commercialize, and scale the science and engineer breakthroughs.

Although talent and IP management (Opportunity 4; see above) are vital in nurturing a leading global industry, it also requires a mindset shift within Chinese semiconductor manufacturers. This shift should occur in a deliberate, measured fashion, allowing the country’s players to keep a strong foundation in their existing businesses even as they invest in innovation and strive for technological leadership.

Such a mindset shift should involve the development of a systematic road map of improvements, tying together business opportunities, technology trends, capability requirements, and skill-building initiatives into one cohesive plan. Here, foreign investors and companies like AT&S can play a major role. As global leaders with facilities around the world, we have also undergone the same mindset shift to become a global trendsetter, by building a sustainable road map to exploring new opportunities and technology trends, while building up our own capabilities to innovate and lead. Meanwhile, our continued focus on governance and sustainability are key reasons why many of our customers consider us as their “first choice” to meet their PCB needs.

Undoubtedly, the Chinese electronics industry, especially the semiconductor industry sector, has a large task ahead. The Chongqing government needs to take a finely balanced approach to encouraging a leadership mindset.

On one hand, the more segments and technologies in which the industry attempts to be number one, the more diffuse the government efforts will be. In addition, the best talent will be spread across too many teams. At the same time, a top-down approach that limits competition may stifle innovation and trap talent in the wrong roles. Therefore, the Chongqing government, along with its investors and foreign investors such as AT&S, should work together to establish the right balance. For example, the government can consider rewarding talents who have shown their innovative prowess; offering a platform for sharing among industry players to develop best practices that may be unique to China; and identifying key segments where the Chongqing government believes the industry should be excelling in (and becoming a global benchmark).

With such a balanced approach, the Chongqing industry will not only be an epicenter for semiconductor manufacturing, but lead the global stage in the industry in terms of innovation and new advances.

Manufacturing with the world

A more innovative, more efficient, smarter and greener China manufacturing sector should become much more competitive in both accessing new markets and attracting investment.

Chongqing already has the pre-requisites to be a global player. The entire supply chain in the electronics industry is located in Asia, primarily in China. This has made production in China a prerequisite to be competitive in terms of costs. China's huge appetite for consumer electronics is also driving local consumption of its own products.

These are the reasons why AT&S has been investing continuously in high-technology and innovation in China over the past 13 years. Since the beginning of the Chongqing plant construction in 2011, AT&S has received vital support from the Chongqing government, and in particular from the Liangjiang New Area Industry Development Zone.

For example, AT&S's Chongqing site consists of two plants: Plant 1 started serial production with one production line in February; Plant 2 is currently still being set up.

At Plant 1, AT&S produces IC substrates, the connection between microchips and printed circuit boards, which are used for microprocessors in computing applications. Since the start of serial production in February 2016, the gradual expansion of capacity and the increase in production volume of the complex technology have been proceeding.

IC substrates serve as a connection between the semiconductor (chips) and PCBs, they "transmit" the nano-structures of the chip onto the PCB (micrometre structures) and are used in microprocessors for computers, communication, automotive and industrial applications.

Substrate-like PCBs are the evolution of high-end PCBs. Their structures are even finer, and with about 20-30 micrometres they have significantly more connectors. They are the prerequisite for new packaging solutions (for example, several chips and electronic components are not separately assembled to the PCB, but the components are mounted to the chips and are combined in a package), which are in turn used for wearables and other potential IoT solutions.

AT&S's experience and know-how in the interconnect solutions industry are important resources for the Chongqing government. Our focus on strong corporate governance, sustainable development, nurturing talent, renowned employee practices, being the most automized manufacturer, strong business roadmap, strategic investments that continue shore up our global presence, close rapport with all industry stakeholders and maintaining the highest industry quality standards have helped us to reap dividends. With our strong commitment to Chongqing we are well poised to offer key expertise and solutions to address the various challenges the government will face. Overall, we are committed to seeing Chongqing becoming a global semiconductor manufacturing base and meet the objectives of MiC 2025 and Internet+.

Conclusion

Chongqing's success relies on offering the right balance of incentives and conditions that allow the different elements of production such as capital, labor, technology, information and service, to interconnect. General economic principles show that this will enhance the efficiency of resource allocation.

In Chongqing, the physical infrastructure is already quite developed. With logistics links being constantly expanded and improved, many manufacturers have moved their facilities to the megacity.

Trade in services, its introduction, expansion and further development, will play a central role in Chongqing's sustainable future development. As the electronics industry, especially the semiconductor industry sector, upgrades itself with new technological advances and services, it will be able to better adapt to a dynamic global economy and rising local demand.

As noted in all the five opportunities above, government support will be vital. Strong policies, planning and strategic financing will help the electronics/semiconductor industry to shift its mindset and become innovative. The government's role will also be instrumental in grooming new talents, enabling academia and the private sector to work together, and allow foreign investors to play a prominent role in the development of the entire industry. To this end, the government will need to study and introduce new strategic incentives and offer more guidelines.

AT&S views these challenges as opportunities and is keen to participate. As noted in the last section, *Manufacturing with the world*, we are ready to contribute to Chongqing's bid to become a strong regional economic and manufacturing hub, especially in advancing the semiconductor/electronics industry. The resulting win-win outcomes will help to develop Chongqing as a semiconductor power house and high-tech electronics base for the world. After all, our future success is tied closely with Chongqing's.

Productive Service: Promoting Industrial Upgrading in an All-round Manner

Susumu Hosoi

Chairman & Representative Director of ISUZU

I. The Necessity of Enhancing the Quality of Economy in the "New Normal" Period

1. The Necessity of Manufacturing Upgrading

After decades of rapid growth, China's economy started to slow down from 2012, and is currently entering the transition period of moderate-speed and stable growth, i.e. the "New Normal" period.

During the period of rapid economic growth, China has strong advantages and competitiveness in the middle and low-end market by virtue of rich labor resources and low costs. Nevertheless, China's working-age population (aged from 15 to 64) reached its peak around 2010 and then began to fall. It's predicted that the population aging process will accelerate in future. Besides, the average wage level in the country is increasing year by year, so that the cost of labor in China has already exceeded most Southeast Asian and South Asian countries.

On the other hand, as developed countries gradually returned to their high-end manufacturing industry and transferred labor-intensive low-end manufacturing industry to developing countries in recent years, China is currently in the dilemma of "being unable to enter the high-end market, protect the middle-end market and quit from the low-end market". In the high-end market, the level of technology is too low, so that China lacks of competitive power; in the middle-end market, China faces the low-cost competition from the emerging countries in Southeast Asia and Latin America and its competitiveness declines; in the low-end market, China faces excess supply.

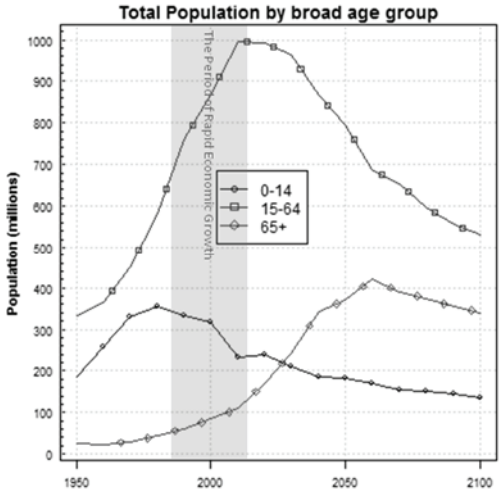
In terms of population, following the period of rapid economy growth (1954-1973), Japan entered the demographic dividend period of about 20 years, and in the next 40 years, the proportion of elderly people (aged above 65) was above 25% all the time. Nowadays, the demographic dividend period of China is already over. It's predicted that the proportion of elderly people will exceed 25% in 30 years. So to speak, to increase productivity and transforms towards industries with high added value becomes the most urgent task now.

In this environment, transformation and upgrading is imperative for China's manufacturing industry.

For this reason, the State Council enacted the strategic policy of Made in China 2025 on May 8, 2015 in order that China could promote technology level, quality level and brand influence in the medium and long term and transit from a big

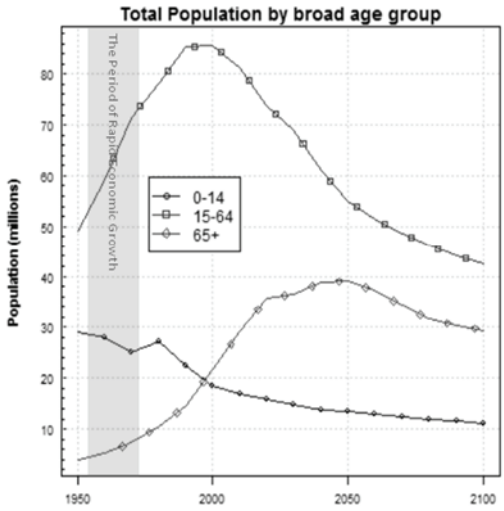
manufacturing country to a powerful manufacturing country. In order to realize the transition to a powerful manufacturing country, Chinese government emphasizes independent innovation and attaches great importance to R&D. According to the Outline of the National Program for Medium and Long-term Scientific and Technological Development (2006-2020), by 2020, the proportion of total R&D inputs in GDP would be increased to 2.5% or above and both the annual number of invention patent grants and the number of citations of international scientific papers would rank among the top 5 in the world.

Fig.1 The Evolution of Total Population in Different Age Stages in China (Unit: Million)



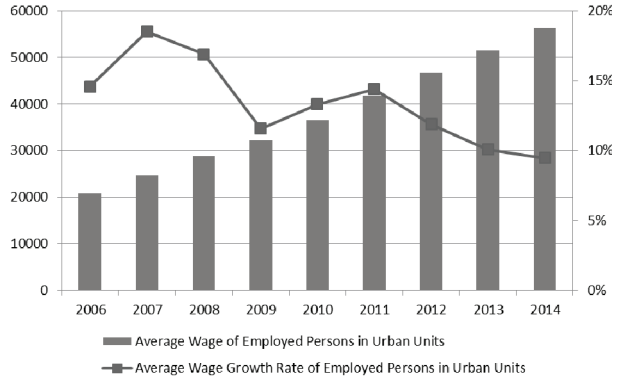
Source: World Population Prospects (the 2015 Revision), the United Nations (https://esa.un.org/unpd/wpp/Graphs/)

Fig.2 The Evolution of Total Population in Different Age Stages in Japan (Unit: Million)



Source: World Population Prospects (the 2015 Revision), the United Nations (https://esa.un.org/unpd/wpp/Graphs/)

Fig.3 Average Wage of Employed Persons in Urban Units in China (2006-2014) Unit: RMB Yuan/Year



Source: China's National Bureau of Statistics

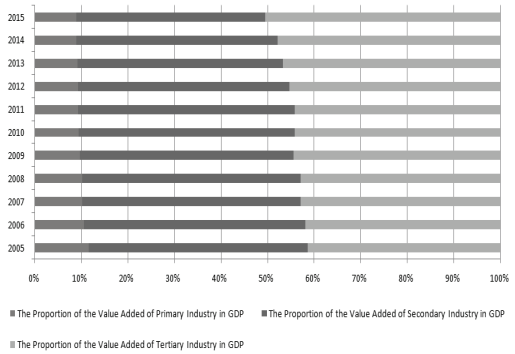
2. The Necessity of Speeding up the Development of Service Industry

From the economic development history of developed countries, it can be seen that the market demand gradually shifts

from the purchase of "commodities" to the purpose of "services" and the economic growth mode gradually shifts from being focused on manufacturing industry and export to being focused on tertiary industry (service industry) with the development of economy. In fact, the contribution rate of China's tertiary industry to GDP shows an upward tendency and the rate in 2015 has exceeded 50%. Moreover, in terms of foreign trade, the total volume of trade in goods decreases year by year while the total volume of trade in services is relatively stable and maintains a growth rate of about 15%.

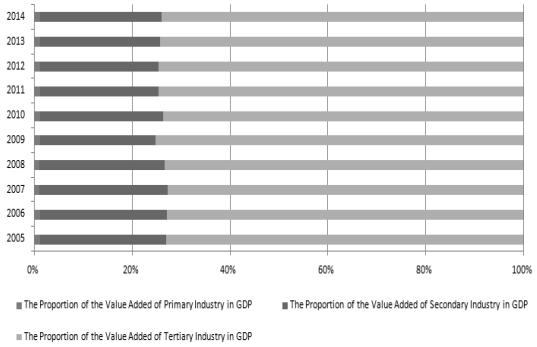
1975 is in the final stage of the period of Japan's rapid economic growth. At that time, the proportion of Japan's service industry in GDP was 56%, but in 2014, this proportion increased to 74%. China's tertiary industry has already begun to expand increasingly, but compared with developed countries, there is still a gap. That is to say, there is still a lot of room for China's tertiary industry to grow. So to speak, the revitalization of tertiary industry is an important support for maintaining economic growth.

Fig.4 The Evolution of the China's GDP Composition by the three strata of industry (1970-2015)



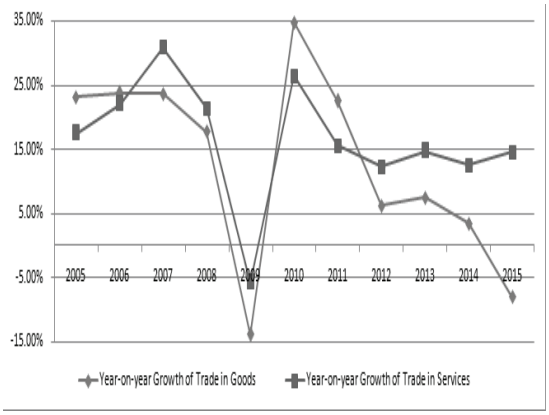
Source: China Statistical Yearbook

Fig.5 The Evolution of the Japan's GDP Composition by the three strata of industry (1970-2014)



Source: The Statistics of Japan's Cabinet Office

Fig.6 The Growth Rate of China's Foreign Trade (The Evolution of the Growth Rate of Trade in Goods and Trade in Services from 2005 to2015)

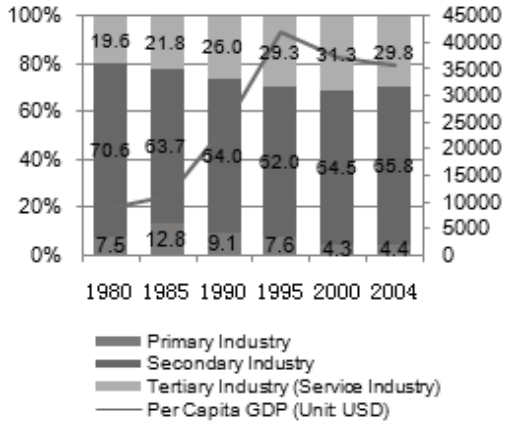


Source: China Commerce Yearbook 2015

In the service sector, productive services are considered as an indicator of economic modernization level. Along with the development of economy, the proportion of consumer services such as accommodation and catering in the service sector

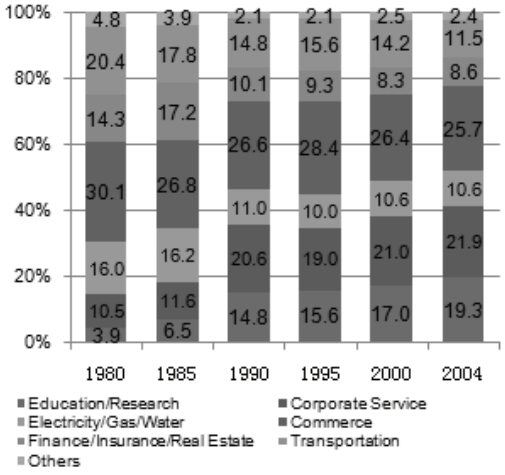
declines while the proportion of productive services shows an upward trend. At present, the proportion of productive services in the service sector in developed countries is greater than 50% while the proportion in China is only 15%.1 Taking Japan for example, after the per capita GDP exceeded USD 10,000, the intermediate input in manufacturing industry generated by the service sector began to increase and the input in education and research services increased remarkably. Productive services cannot only improve the quality and efficiency of economic development, but also meet the demands of consumers and stimulate the domestic demand. The role of productive services to boost economy should never be ignored. The integration of productive services and manufacturing industry can extend the industrial value chain, and in particular, the integration of productive services and information industry can promote the intelligence of production processes, improve the technology level in an all-round manner, and improve the R&D efficiency of cutting-edge technology. Thus, productive services play an important role in industrial restructuring.

Fig.7 The Evolution of Japan's Per Capita GDP and Intermediate Input in Manufacturing Generated by the Service Sector



Source: White Paper on International Trade, Statistics of Japan's Cabinet Office

Fig.8 The Evolution of the Proportion of Intermediate Input in Japan's Manufacturing Generated by Services



Source: White Paper on International Trade

The Chongqing's Thirteenth Five-year Plan points out that Chongqing Municipality should develop productive services vigorously, enhance the integration of productive services and manufacturing industry, and provide professional and high-level productive services such as design centers and inspection and testing centers, in order to better meet the demand of manufacturing industry and promote the transformation and upgrading of manufacturing industry. According to the Plan, the proportion of Chongqing Municipality's productive services in the service sector will reach the target of 60% by 2020.

[1] *The State Council of China (http://www.gov.cn/xinwen/2014-05/15/content_2679778.htm)*

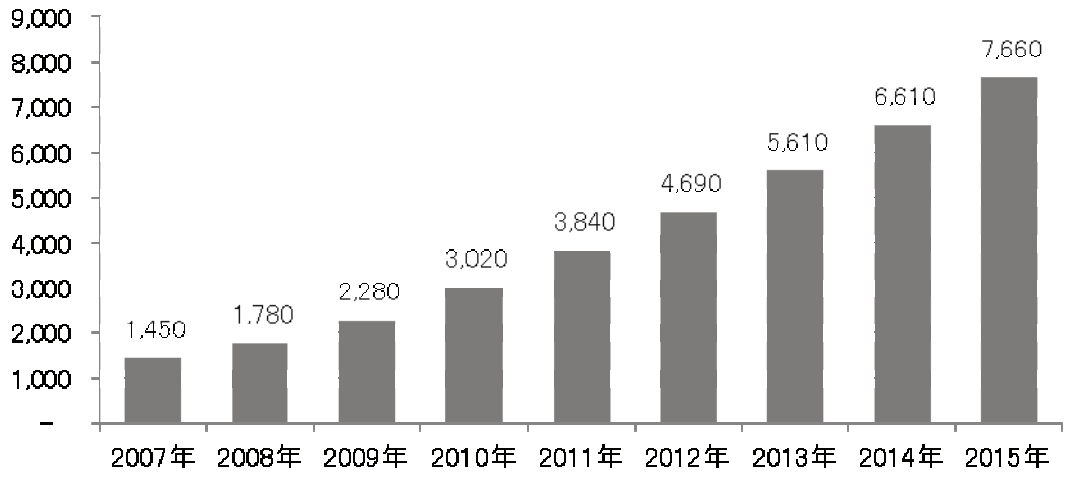
II. Enhance the R&D Level of Commercial Vehicles in the Market Environment

To realize the transformation of industrial structure, it's required to revitalize productive services associated with manufacturing industry. In productive services, information and data are the most important. Besides, through the integration of manufacturing and services, the value chain can form a closed loop, accordingly realizing transformation and upgrading. This chapter takes commercial vehicles for example to discuss the relationship between automobile industry and productive services, the practical use of data in productive services, and the necessity of R&D to China's transition to a powerful manufacturing country.

1. The Relationship between Automobiles and a Broad Range of Productive Services

Compared with other industries, automobile industry is featured by long supply chains and long value chains and has greater influence for economy. In China, "automobile industry" is usually regarded as the traditional secondary industry. However, from the angle of the product life cycle of an automobile, there are various after-sales service needs such as automobile insurance, rental, maintenance, roadside assistance, used car sales, supply of components and modification in the process from the moment when the automobile rolls off the production line to the moment of scrapping. As the number of automobiles owned by China continues to rise, the automobile aftermarket size expands rapidly to RMB 766 billion in 2015 from RMB 145 billion in 2007, in other words the market size increases more than fivefold within 8 years.

Fig.9 The Evolution of China's Automobile Aftermarket Size (2007-2015) Unit: RMB 100 Million Yuan



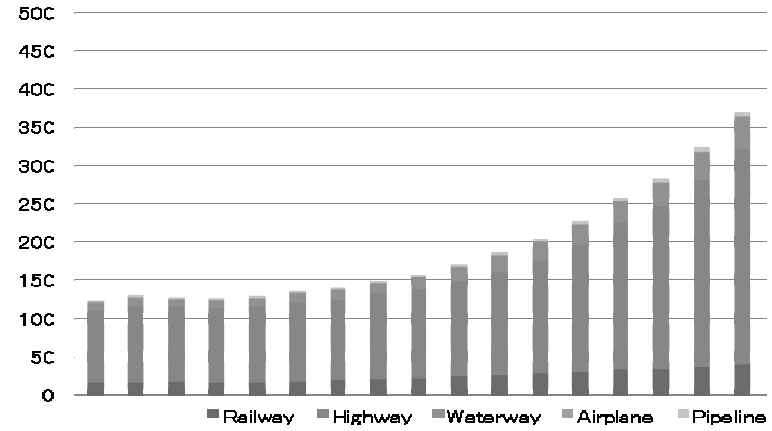
Source: Data Jointly Published by finance.qq.com and JUSFOUN BIGDATA

In terms of automobile industry, the factors of productive services do not only exist in automobile after-sales service, but also exist in product planning and R&D stages in the upper stream of automobile manufacturing. The services such as intermediary services of intellectual property, information service platform and professional consulting services also belong to productive services.

In the context of "Made in China 2025" and "Internet plus", with the emergence of unprecedented brand-new commercial forms and business models, huge business opportunities are ready to come out in the field of automobile-related productive service.

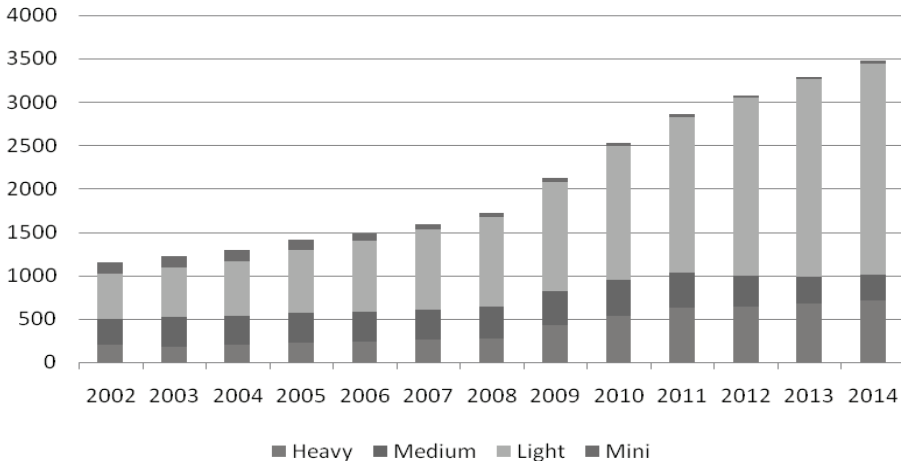
Moreover, commercial vehicles (trucks) are closely related to the important category "cargo transport" in productive services. In recent years, although China's economic growth slows down and enters the so-called "New Normal" period, in the context of continuous growth of consumer market, popularization of e-commerce and rapid development of express delivery industry, the size of logistics industry keeps growing fast. The proportion of highway transportation in China's total volume of cargo transport exceeds 70% and commercial vehicles, as the carriers of cargo transportation, play an important role in supporting economic development. In fact, the number of trucks owned by China increases steadily year by year, and in this regard, commercial vehicles promote the development of cargo transportation indirectly.

Fig.10 The Evolution of China's Volume of Cargo Transport (Unit: 100 Million Tons)



Source: China's National Bureau of Statistics

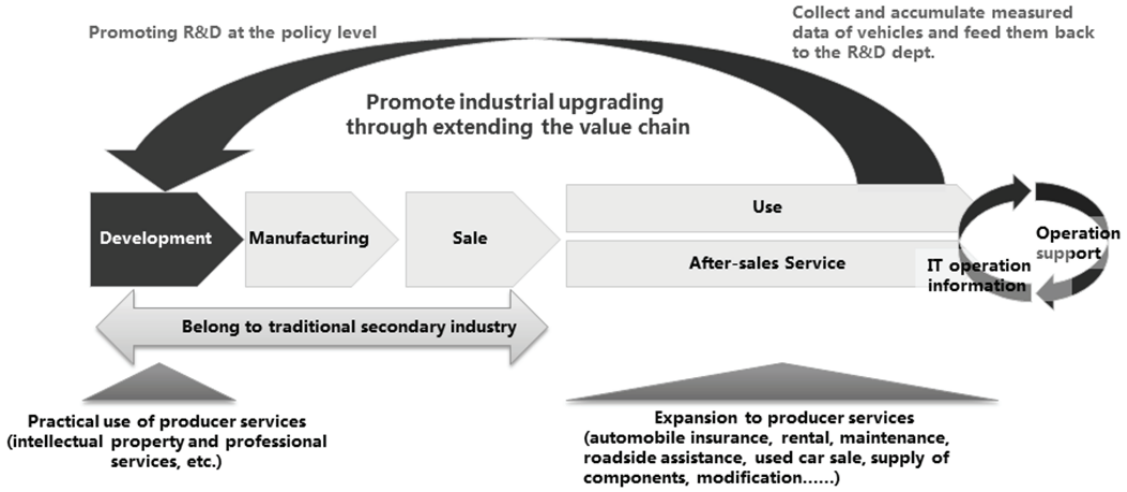
Fig.11 The Evolution of the Possession Quantity of Trucks in China (Unit: 10,000 Trucks)



Note: The data are the summing of loading trucks for civil purpose and loading trucks for personal cargoes.
Source: China's National Bureau of Statistics

In conclusion, automobile industry, including the R&D in the upper stream of value chain and the cargo transportation and aftermarket in the lower stream of value chain, is closely related to productive services. So to speak, automobile industry is of great significance to the development of both manufacturing and productive services.

Fig.12 The Schematic Diagram of Promoting Industrial Transformation and Upgrading through Feeding back Aftermarket Data to the R&D Department



2. The Practical use of Data in Productive Service – Take Commercial Vehicles for Example

As previously mentioned, the radiation range of productive services around automobile industry is very wide. Isuzu Motors is focused on trucks and committed to the research, development and manufacturing of commercial vehicles for a long time. As an automobile manufacturer, in addition to primary business such as product development and manufacturing, Isuzu Motors also provides customers with related services in the actual “transportation” process (life cycle) after selling products, e.g. vehicle repair and maintenance service and efficient operation management system facing users in logistics industry. These services can improve the operation efficiency of vehicles and eco-driving can reduce the vehicle use cost and ease the environmental burden.

The abovementioned services are realized through various actual operation data collected by the vehicle-mounted digital tachograph These measured data can be effectively used as real-time operation information and accumulated, analyzed and fed back to the departments of vehicle modification and R&D of new products, so as to provide better products for customers.

To sum up, the practical use of data is very important for productive services. The following paragraphs will describe how to collect measured data and how to apply such data to vehicle modification, research and development.

1) Utilize vehicle-mounted digital tachograph to collect measured data

The vehicle-mounted digital tachograph can collect various data. The main content of such data is as below:

Table 1 Measured Data of the Commercial Vehicle

Category	Item
The Data about the Running State of the Vehicle (Real-time)	✓ The Current Position of the Vehicle ✓ Traveling Direction ✓ Travel Time ✓ Travel Distance ✓ Vehicle State (outage, loading & unloading, stand-by, empty, laden) ✓ Loading Capacity ✓ Temperature ✓ Vehicle Door State ✓ Fuel Consumption/Oil Cost/Oil Consumption ✓ Environmental Data (Emissions of CO2, NOx, Particulate Matters) ✓ Failure Condition (Position, Frequency of Occurrence)
Driving Operation Data	✓ Traveling Speed (ordinary road and expressway) ✓ Average Speed, Maximum Speed, Average Oil Consumption ✓ Changes in the Times of Stepping on the Accelerator (ordinary road and expressway) ✓ G-value in Braking State ✓ Data about Idle Running (idle time, idle fuel consumption) ✓ The Using Frequency of Each Gear (ordinary road and expressway) ✓ Engine RPM (during upshift)

2) Apply Measured Data in the Research, Development and Improvement Stages of Commercial Vehicles

i. Apply Measured Data to Marketing and Commodity Development

The users of commercial vehicles are all over the world and transport all kinds of goods in a variety of environments (climate and geographic conditions) and road conditions. Thus, the needs of users are diverse, and in order to meet such needs, the manufacturers of commercial vehicles have to supply diverse varieties in small batches.

Isuzu has rich product lines. Although all of the products are called “trucks”, due to the complex combinations of cab + frame + engine + drive mode, there are a great variety of vehicle models. For example, as shown below, there are cabs of different dimensions (i.e. small size, medium size and large size) and different shapes, heights and widths, so that the cabs are of a wide range of specifications. Besides, there are frames of different lengths and engines of different kinds and there are differences in the number of tyres and the drive mode. Taking the baby truck “ELF” series of Isuzu Motors for example, due to different combinations, “ELF” series has more than 1,300 models.

Fig.13 Rich Commercial Vehicle Product Lines of Isuzu Motors

Cabs of Various Shapes | Various Frames | Engine and Drive Mode

Rich Commercial Vehicle Product Line

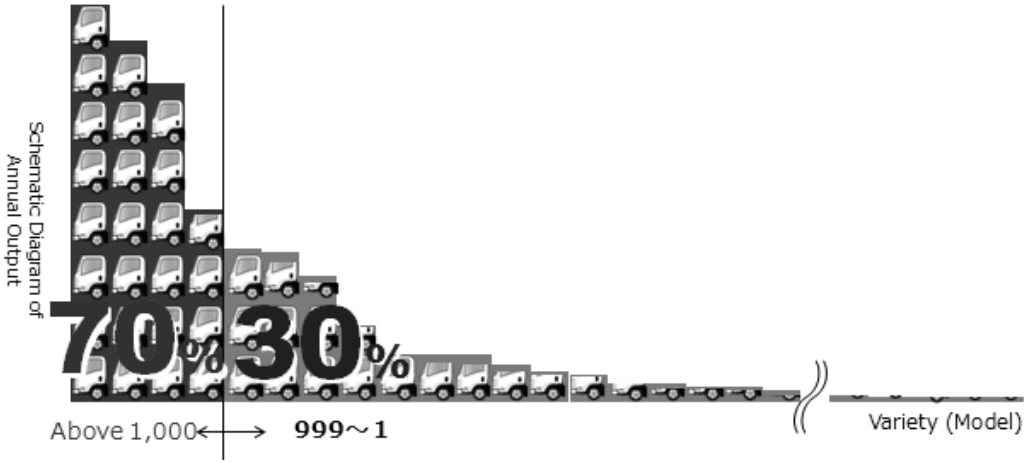
Source: Isuzu Motors

Among the commercial vehicles produced by Isuzu Motors, in terms of output, the products of which the annual output reaches 1,000 or above account for 70% of the total output, but in terms of models, these products account for less than 5% of the total number of models. With regard to some models, Isuzu Motors just manufactures ONE vehicle for each model every year. Isuzu Motors always adheres to the philosophy that it's the mission of a truck manufacturer to meet various needs of customers and provide the most suitable commercial vehicles.

To judge the most suitable model, it's required to understand the aims of customers and the service environment of vehicles. Thus, the application of big data seems particularly important.

Through collection, accumulation and detailed analysis of the running data of commercial vehicles recorded in normal use, Isuzu Motors not only can grasp the product specifications that are the most suitable for different industries, different customers, different purposes and different regions (horsepower, torque, GWV, all kinds of parts,etc.,) accurately, but also carry out commodity development in an efficient way.

Fig.14 Schematic Diagram of Isuzu Motors' Multi-specification and Small-batch Production



Source: Isuzu Motors

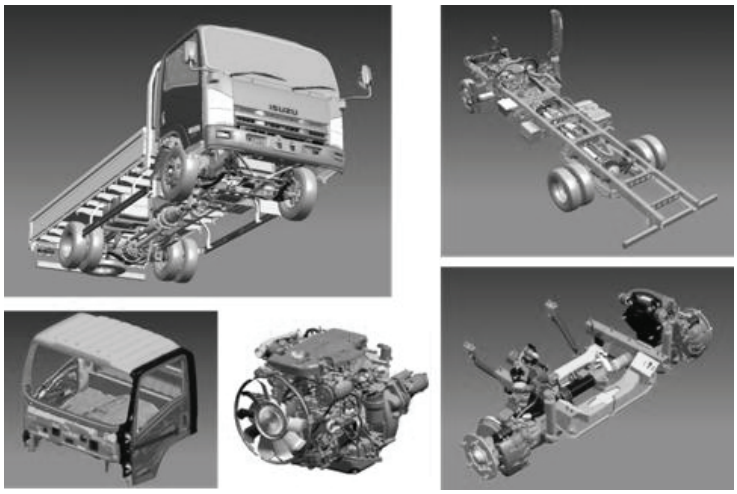
ii. The Practical use of Measured Data in the Improvement, R& D and Design Stages of Products

As previously mentioned, Isuzu Motors develops a variety of commercial vehicles for more than 100 countries with different working environments(climate and geographic conditions) and road conditions in the world.

In the R&D and design of products of different models, if each product undergoes the field test from initial design to entry into target countries of sale, the efficiency will be extremely low. Thus, in order to coordinate the contradiction between multi-specification in small-batch supply and increasing efficiency, Isuzu Motors began to adopt digital development evaluation (virtual evaluation) 14 years ago, i.e. building a model identical to the real object on a computer for evaluation.

In a digital three-dimensional model, the building of appearance, internal structure and even small parts of products can be completed.

Fig.15 The DMU (Digital Mock Up) of Digital Development Examples of Isuzu Motors



The following part will introduce several examples that adopt digital development evaluation:

1) CAE of Bad Road Travel

Through simulating the bad road travel condition of ELF, we can detect the parts with high load and the parts with poor durability and discuss countermeasures in advance.

2) CAE of Handling Stability

Evaluate the handling stability of pickup trucks so as to determine riding comfort and manipulability, and make improvements.

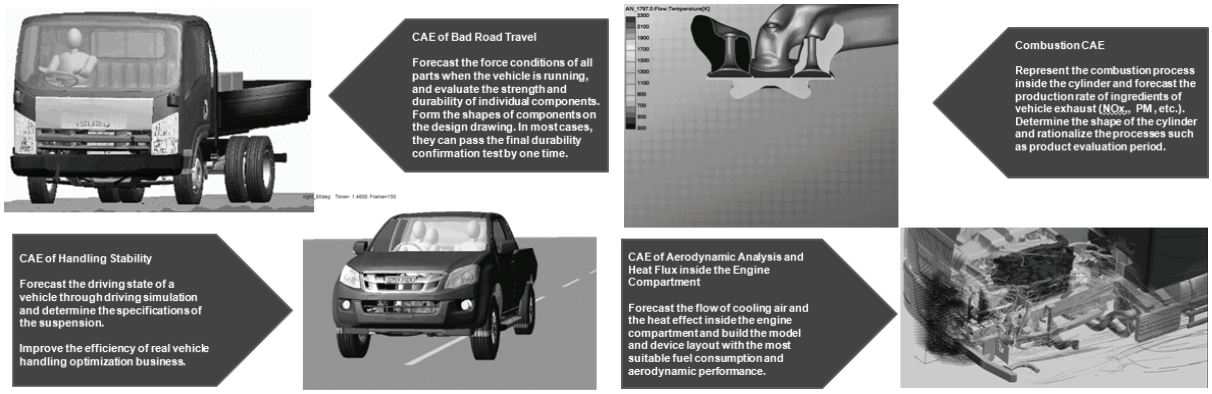
3) CAE of Combustion

Represent the combustion process inside the cylinder and forecast the production rate of exhaust ingredients so as to determine the shape of the cylinder, and rationalize the processes such as product evaluation period.

4) CAE of Aerodynamic Analysis and Heat Flux in the Engine Compartment

Represent the flow and heat effect of cooling air in the engine compartment and build the model and device layout with the most suitable fuel consumption and aerodynamic performance.

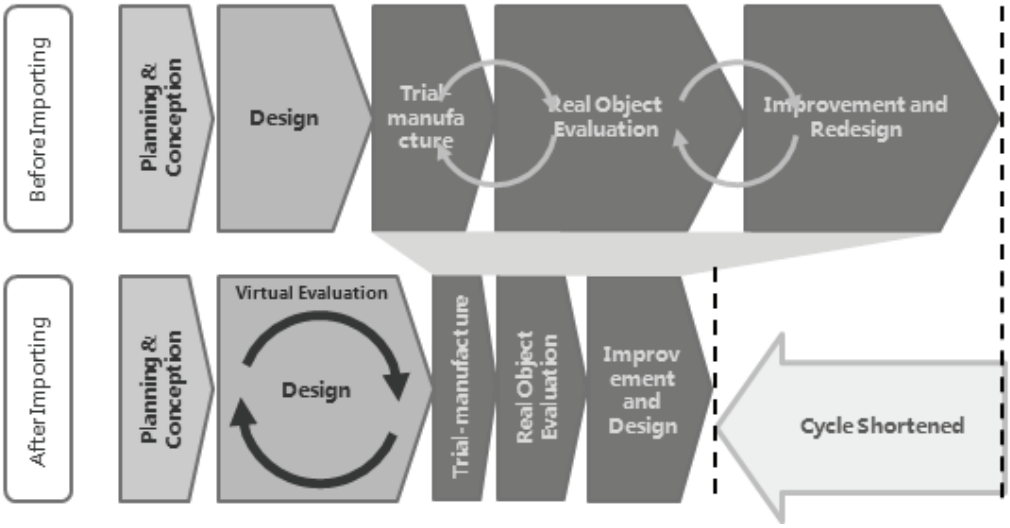
Fig.16 The Digital Development Evaluation Example of Isuzu Motors



Source: Isuzu Motors

As mentioned above, first, produce a three-dimensional design drawing, carry out performance evaluation on the computer thoroughly before carry out evaluation of the real vehicle, try to find out and solve problems in advance, and improve the degree of completion. Next, utilize the equipment that can represent the climate conditions and working conditions around the world and carry out the final confirmation on the real engine and vehicle. Through adopting digital development (virtual evaluation), we can shorten the development cycle by 1-2 years, reduce the trial manufacturing cost by about 50%, and improve the stability of product quality.

Fig.17 The Schematic Diagram of the Effect of Importing Virtual Evaluation



Source: Isuzu Motors

In the past R&D activities, we obtain data through experiments, make improvements and research countermeasures after finding out trouble spots and problems, and then carry out verification through experiments and repeat the process again and again. Thus, before a good product comes out, the R&D needs to be supported by a lot of time and sufficient funds.

In this regard, the data obtained from vehicles running on roads can be called “living experimental data”. If we can collect the measured data of vehicles running in a variety of conditions, we will have no need to carry out actual experiments repeatedly. As long as we apply such data to R&D in a flexible way, we can conduct various necessary verifications. From the cases of Isuzu Motors, it can be seen that digital development that applies measured data in a flexible manner can shorten the R&D and testing time and reduce the cost. Thus, the collection of measured data is an effective means for promoting R&D and improving product quality.

III. Suggestions to Chongqing Municipal Government

At present, China’s economy is in the transition from rapid growth to moderate-speed and stable development, and how to adjust the economic structure and change the pattern of economic growth is a topic to the whole country. In terms of secondary industry (manufacturing industry), it’s required to gain new competitive advantages through improving the technological level. Moreover, from the economic development history of developed countries, it can be seen that the revitalization of tertiary industry is the top priority for the future of China.

Based on the development phase and development status of China’s economy at present and the industrial base of automobile industry and information industry developed by Chongqing Municipality through years of efforts, we set out the efforts made by Isuzu Motors in the aspect of commercial vehicles and provide detailed information on how to collect travel data from commercial vehicles and apply them to R&D in a flexible way in the main body of report. Next, we will put forward two suggestions to Chongqing Municipal Government on the policy support with regard to promoting the mounting

of travel data collection terminal devices to commercial vehicles and the construction of data collection platforms and promoting R&D activities.

1. Promote the Mounting of Travel Data Collection Terminal Devices to Commercial Vehicles and the Construction of Data Collection Platforms

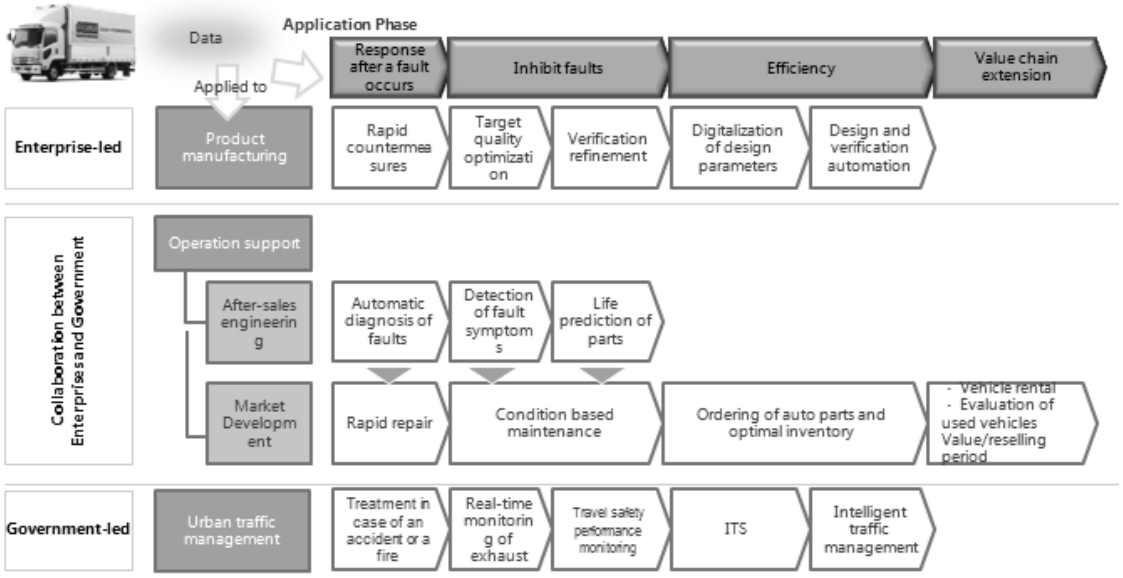
At present, the collection of travel data in China is primarily aimed at vehicle management. For example, according to the Measures for the Dynamic Supervision and Administration of Road Transport Vehicles (No.5 Order of Ministry of Transport of the People's Republic of China, Ministry of Public Security of the People's Republic of China and State Administration of Work Safety in 2014, which took effect as of July 1, 2014), in order to rectify traffic violations and strengthen safety management, passenger transport vehicles, dangerous goods transport vehicles, heavy trucks and tractors shall be equipped with vehicle-mounted satellite positioning systems and submit to dynamic monitoring. Moreover, most civil logistics companies install vehicle-mounted satellite monitoring systems with the purpose of confirming the positions of vehicles and guard against theft. However, from another angle, measured travel data can be called "living experimental data". We can accumulate and analyze such data and apply them to future research and development of vehicles in a flexible way.

Thus, with regard to the collaboration in the value chain of data collection and flexible application of data to R&D, we propose demonstrating the possibility of data acquisition and the effectiveness of flexible application of data through social experiments. When conducting social experiments, Isuzu Motors may develop cooperation with Chongqing Municipal Government in relevant technical elements such as vehicles for experimental use and flexible application of data. We expect that Chongqing Municipal Government can offer support to the implementation of such social experiments.

Furthermore, to improve the usability of measured travel data, it's required to collect extensive data, but if commercial vehicle companies collect data separately, there must be certain limitations in the scope and effect of data collection. Thus, we believe that, if Chongqing Municipal Government can take the lead in promoting the mounting of data collection terminal devices to commercial vehicles, the effect of data collection will be even more significant. Besides, if the government can adopt uniform data collection and analysis systems in the region and provide data and relevant analysis service for the entire industry in the region, the government can give play to its supporting role in industrial upgrading. Thus, the government should take the lead in promoting the integration among the independent IT management systems of all of the companies.

In future, the discussion about the collection and accumulation of measured vehicle travel data should not be limited to the management of vehicles in use, but proceed from a broader prospective, i.e. "promoting R&D". Meanwhile, we should discuss how to feed the actual usage condition of vehicles back to R&D activities and connect the upper stream and the lower stream of the industrial value chain, so as to promote the upgrading of Chongqing Municipality's commercial vehicle industry.

Fig.18 The Schematic Diagram of "Social Experiments" Conducted to Demonstrate the Flexible Application Method of Measured Data



2. Discuss the Policy Promoting R&D Activities

According to Made in China 2025, in order to further improve the competitiveness of China's manufacturing industry, it's required to enhance the innovation ability and promote the integration of industrialization and informatization, which could be realized through promoting R&D activities. In this regard, various reward policies enacted by the government will continue to be effective. Among them, the most effective is the direct reward policies regarding R&D, including R&D grant and tax concessions on experimental research expenditures (containing relevant staff cost).

Besides, conducting R&D activities also need various resources, e.g. R&D facilities. The processing equipment, evaluation equipment and test equipment for R&D are mostly expensive, so that small and medium-sized enterprises with weak financial power cannot afford them and the cost of such equipment is also a major expense for large-sized enterprises. It's learned that some provinces and cities have begun to require universities and research institutes to share their R&D facilities with private enterprises, aimed at building a government-led industry-academy cooperation system, which is also an important measure to support R&D activities.

Furthermore, since the most important resources supporting R&D activities are professionals, it's necessary for us to discuss how to ensure the supply of professionals from two aspects, i.e. quantity and quality, at the policy level. Especially in manufacturing industry, industry-academy cooperation plays an important role in promoting R&D activities. First, from the angle of talent cultivation, we hope that Chongqing Municipal Government could lead Chongqing Municipality's higher education institutions to cultivate and output the talents meeting the needs of key industries at the policy level. Second, from the angle of talent introduction, although Chongqing Municipality has made great achievements, compared with Beijing, Shanghai and other big coastal cities, Chongqing Municipality is still disadvantaged in terms of talent competition and its competitiveness needs to be strengthened. Moreover, the cooperation between higher education institutions and enterprises

can effectively promote combining the research results and technologies of excellent research fellows with social value and economic value. In this regard, we expect that the government could discuss the measures such as how to build a government-lead mutual exchange platform.

To stimulate the vitality of R&D is an important measure to help China realize the transition to a powerful manufacturing country. Through carrying out R&D activities actively, Chongqing Municipality cannot only improve the R&D level, but also vigorously develop productive services, e.g. intellectual property intermediary organizations related to the accumulation of intellectual property rights such as patents, information service platforms and professional consulting services.

Having gone through rapid development, China must enhance the R&D ability to achieve sustained and steady growth. The government should feed the actual use condition and needs of commodities in the market that are different to grasp in the past back to R&D organizations as data and actively provide relevant resources required to carry out R&D activities. This is crucial to industry transformation and upgrading.

In the end, we expect that Chongqing Municipality could discuss and implement the industrial policy in accordance with the economic development stage of the municipality and enhance the future economic development to a higher level.

Recommendations and Outlook of New Service Trade Values with Chongqing Features Centering on Various Links of the Manufacturing Value Chain

Nobuyuki Koga

Chairman of the Board of Nomura Holdings and Nomura Securities

Chapter I The Essence of Service Trade and the Development of Service Trade in Chongqing

Service trade is also known as trade in services. It is the international trade of service import and export. Service trade has both a narrow and broad sense. Service trade in a narrow sense refers to the activities in which a country/region provides direct services to satisfy certain needs of another country/region. Service trade in a broad sense includes both tangible activities (such as labor import and export) and intangible exchanges between service provider and user within physical contact (such as patent and technology trade). Service trade in general refers to the broad sense. Chongqing is located in the pivot of the "One Belt and One Road" corridor and the "Y-shaped" Yangtze River Economic Region. It is the only municipality in Central and Western China and one of the Big Five Central Cities of China as well as one of the Top Six Traditional Manufacturing Bases with advantageous and unique geological conditions and industrial base to develop service trade.

I Major Types and Models of Service Trade

It is recognized that major service trade include three categories: the first is the traditional service trade directly related to trade in goods such as international shipping, international maintenance and repairs, international financial services (mainly trade settlement services), goods wholesale and retailing, the stable growth of which depends on the expansion of international trade in goods. The second category is service trade involving transferring of factors closely related to international direct investments such as security investment returns (stocks and bonds), profits from operation and management, labor export such as building and contracting as well as international credits, the growth of which is synchronized with international economic growth. The last category is the service trade in emerging industries which is comparatively independent from service in goods and direct investment such as services in international tourism, information and network service, design and consulting, audio and video products and intellectual property rights. It is the key driver of the rapid development of modern service trade.

According to the definition of WTO and internationally adopted EPA/FTA, service trade has four models including cross-border supply, consumption abroad, commercial presence and movement of natural persons.

(I) Cross-border Supply

It is the provision of service by the service provider within the territory of one party of the treaty to the domestic consumer of another party. Cross-border here means that the service crosses the border in the form of telecom, mail or internet without the cross-border movement of the service provider, goods and service consumers in modern science and technology environment. Typical cases under such model include electronic clearing and payments in international finance, international telecom service, information consulting services and satellite video services.

(II) Consumption Abroad

It is the provision of service by one party within the territory to the service consumer of another party including patients from the parent country seeing doctor overseas, foreigners travelling to the host country (including sight-seeing, holding/participating in exhibitions and conferences), repairing transportation vehicles (ships and airplanes) overseas or foreign students studying in the host country.

(III) Commercial Presence

It is the provision of service by the service provider of one party via the commercial entity in the territory of another party. It is the most important one of the four models and the most important one in modern service trade activities. Such model mainly involves market access and direct investment. That is, allowing the service provider of one party to establish entities and provide services in the territory of another party, including investment and establishment of joint ventures, joint cooperation or wholly owned entities. Such entities may bring staff from the parent country or employ from the host country including hotels, retail shops or law firms founded by foreign companies or local sales entities, service network, logistic centers or financial branches set overseas.

(IV) Movement of Natural Persons

It is the provision of services by service provider of one party to the consumers of another party at the commercial sites within the territory of the other party via natural persons (employees and experts). Importing party allows the provision of service by individuals within its territory such as the self-employed services of foreign professors, engineers, artists or doctors in the host country.

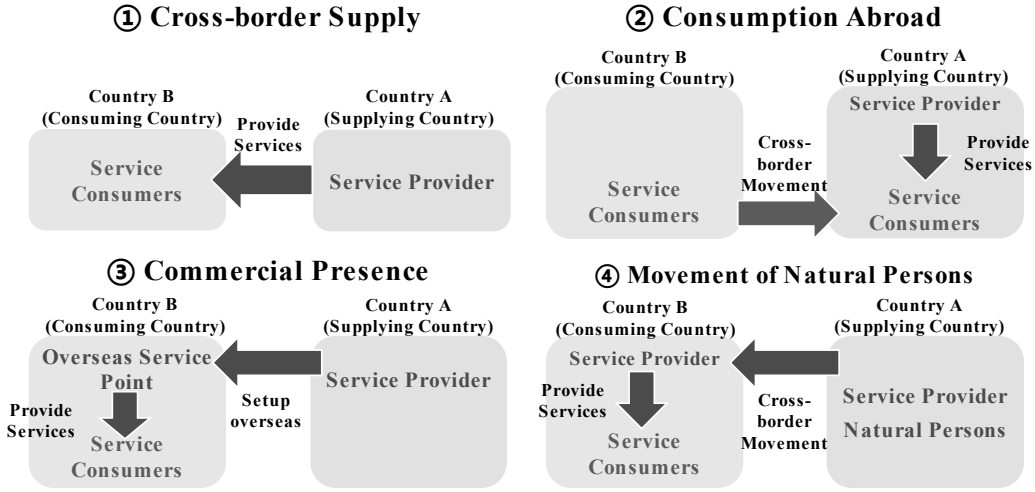


Chart 1: Four Major Models of Service Trade

II Current Status and Development Trend of Service Trade in China

During the twelfth five-year, annual average growth of service trade in China exceeded 13.6%, with service exports totaled at USD713 billion till 2015, accounting for up to 15.3% of total international trade (the sum of import and export of goods and services) with continued promotion of global ranking. Total service trade volume ranks the second in the world.

In 2015, service trade deficit in China reached USD136.62 billion, declining -14.6% compared with the previous period, mainly due to the deficit in tourist trade (USD-123.74 billion) and transportation services (USD-48.8 billion). Service trade of the most surplus includes processing services (USD18.19 billion), telecom, computer and information service (USD15.59 billion) and professional management and consulting services (USD15.18 billion). The proportion of three traditional service trades (tourism, transportation service and building service) further declined (to 51.9% and -10.7% less than previous period).

In terms of global development trend, according to the survey by UN Trade Development Consortium in 2015 World Investment Report, although traditional services still take four among the top five industries of most attractions to foreign investment in developed countries in the future and major cross-border direct investments to developing countries are still in traditional service industries such as building, hotels and resorts, transportation and warehousing, with the continuing breakthroughs in artificial intelligence and telecom technology, cross-border trades in emerging service industries such as information technology and computer services, telecom and consulting are continuously active with high speed growth.

In China however, the rapid development of services has laid a good foundation for the development of service trade with expanding industrial foundation for the development of service trade in economic structural transition and upgrading. New business and commercial models supported by internet information technology are surging with rapid development of offshore service outsourcing and cross-border e-commerce.

At the same time, the enhancement of relevant policy regime has provided strong supports to the development service trade. In December 2014 and January 2015, the State Council promulgated Opinions of the State Council on Promoting Service

Outsourcing Sector and Several Opinions of the State Council on Facilitating Service Trade, clearly specifying the focus on facilitating capital and technology intensive services such as transportation, telecom, computer and information services while consolidating the advantage of scales in labor intensive service exports of tourism and building with a target to increased percentage of such high value added services in service import and export. In February 2016, the State Council distributed the Reply on Approving Innovation and Development Pilot of Service Trade to actively explore the new service trade development model in the background of digitalization. It was decided to run the service trade innovation and development pilot programs for a period of two years in ten provinces and municipalities including Shanghai, Shenzhen and Chengdu as well as the five national development zones including Chongqing Liangjiang New Area supported by big data, internet of things, mobile internet and cloud computing to facilitate the convergence and development of manufacturing and service and across all service sectors. Implementation and promotion of relevant policies shall further enhance service trade management regime in China, the convenience of service trade and service trade scale and quality.

In addition, with the intensive "One Belt and One Road" construction, China has taken an increasing part of service outsourcing in relevant countries along the "One Belt and One Road". At the same time, further cooperation with relevant countries in international production and equipment manufacturing shall strongly promote service trade development closely related to manufacturing such as project contracting, research, development and design and operation maintenance and facilitate the "going out" of service entities such as third party advisory and certification, finance and insurance and logistics and procurement.

III Service Trade Development in Chongqing

In terms of strategic positioning, Chongqing is the only municipality in Central and Western China, the only national central city and the hub city in the upper reach of Yangtze River as well as an important strategic support in the development and opening of western region. In terms of its location, Chongqing is located in the pivot of the "One Belt and One Road" corridor and the "Y-shaped" Yangtze River Economic Region. The "Chongqing – Xinjiang – Europe" international railway has been developed. It is also the Class A interim open railway port, auto import port and the largest railway, roadway and waterway through transport hub planned and built in the upper reach of Yangtze River. In terms of industrial foundation, Chongqing is one of the six traditional industry bases in China. It has recently determined to transform towards high technology industry and service industry with newly developed full industry chains in IT and automobiles. It has developed the "6+1" industrial cluster of CNY100 billion worth such as chemicals and pharmaceutics, equipment manufacturing, materials, consumer goods and energy led by the two industries of IT and automobiles. It has developed ten strategic emerging industries such as display boards, integrated circuit, new energy and intelligent autos, robots and intelligent equipment, cloud computing and internet of things, energy saving and environment friendly industry, new materials and energy equipment as well as ten strategic emerging services such as new financial services (such as RMB cross-border business), international logistics, big data and information service, software design and service outsourcing, cross-border e-commerce and settlement, bonded goods exhibition and bonded trade, headquarter trade and transit trade, professional services, health care and medical service, cultural innovative tourism.

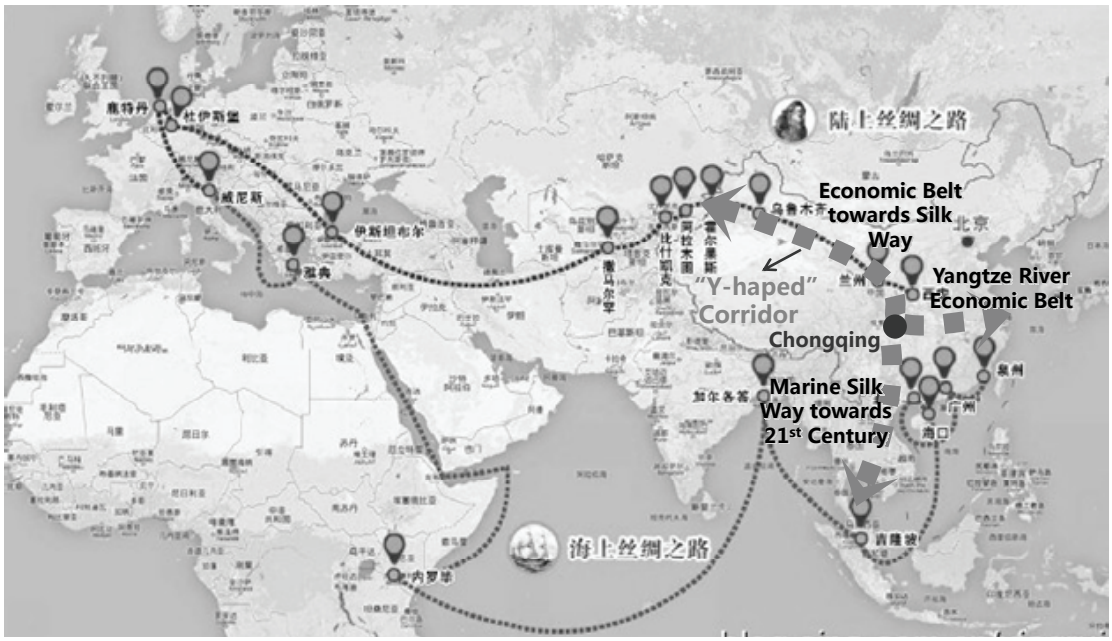


Chart 2: Pivot of "One Belt and One Road" and "Y-shaped" Yangtze River Economic Zone - Chongqing

In addition, in terms of openness, Chongqing is also leading in the region. According to the index regime published by KD Network Data Research Center in February 2016 in the Report on Opening and Development Index of "One Belt and One Road", the opening and development index of Chongqing in 2014 was scored 14.28, taking the lead among the 9 provinces along the "Silk Road Economic Belt" despite of the gap with provinces along the "Ocean Silk Way of the 21st Century" in terms of opening and development score, over-performing the leading city of Shanghai along the ocean silk way in terms of improvement in opening and development.

Leveraging the above advantages, total service trade in Chongqing during the twelfth five-year period increased from USD3.5 billion in 2010 to USD13.1 billion in 2014 with rapid development of annual average growth ratio close to 40%. In 2014, total offshore service outsourcing contract amount recorded at USD1.4 billion, increasing 27% against previous period. According to Implementation Opinions of Chongqing Municipal People's Government on Speeding Up the Development of Trade Service Outsourcing published in July 2015, the short-term planning of Chongqing is to achieve a total service trade import and export of USD30 billion with the contract of offshore service outsourcing with highest added value reaching USD3 billion and annual average growth ratio of 30%. Breakthroughs are expected in the "five special items" such as cross-border e-commerce, internet cloud computing and big data industry, cross-border settlement and investment facilitation, bonded trade and bonded exhibition to build Chongqing into the service trade "highland" in the inner land of China. The mid-term development target is to achieve a total service trade import and export of USD50 billion with the contract of offshore service outsourcing with highest added value reaching USD6 billion and annual average growth ratio of 25% and form a number of large enterprises and groups of core competitiveness and famous brands of international influence. The overall capability and competitiveness of service industry shall be largely enhanced to build Chongqing into an important service trade base of the country.

In addition, with the continuous optimization of trade structure in Chongqing, traditional service trade such as tourism, transportation and labor export accounted for 43% of the total import and export while modern service trade such as patent loyalty fee, computer information network and consulting services accounted for 57% of the total import and export. Major trade partners include USA, Hong Kong, Canada and UK. The seven key areas for service trade and service outsourcing ("five key activities" of service trade, international cultural exchange and offshore service outsourcing) have become the key areas of growth. In fact, the rapid development of the five key activities has driven the growth of service trade by 30% and Chongqing is the only pilot city in China for all the four cross-border e-commerce service models.

In addition, in terms of policies, Chongqing has fully implemented the reform to replace business tax with value-added tax. Zero tax or tax exemption is applied for service exports to encourage service exports. Zero value-added tax or tax exemption is applied to international service outsourcing. Tax incentive policies such as 15% preferential corporate income tax for technically advanced service companies and an up to 8% pre-tax deduction from the total compensation of employees for education have greatly encouraged service trade companies to "go out" and actively engage in high added-value service innovations, facilitating the healthy development of service trade.

Chapter II Project to Improve the Competitiveness of Service Trade in Chongqing and Basic Development Objectives

Being an important port city in Western China, major drivers for Chongqing to enhance its competitiveness in service trade are to follow the new trend of fast development of international service trade, facilitate trade service, encourage service trade in tourism, technology transfer, finance and insurance, international transportation and education and training with enhanced service level and quality. Nomura Holdings hereby proposes the following development objectives based on the four basic models of service trade in view of new value creation in reference to key documents including Opinions of the State Council on Promoting the Fast Development of Service Outsourcing Sector, Several Opinions of the State Council on Speeding Up the Development of Service Trade and Opinions of Chongqing Municipal People's Government on Facilitating Service Trade and Service Outsourcing.

I Key Project to Enhance Competitiveness of Service Trade in Chongqing

(I) Service trade industries of small business scales, scattered capabilities and inferior competitiveness

Advantageous service trade sectors in Chongqing include tourism, project contracting, labor exports, international forwarding and transportation with good exports. However, major exporters in such sectors are generally of small operations, homogeneous competitions and lack of strong competitiveness in the international market. In the analysis of service trade competition advantage index (TC index), TC index of Chongqing in 2014 only scored at -0.11 which is in a weak position in international competition compared to the 0.1-0.2 scores of developed countries such as USA, UK and France, although it is better than the average national score of -0.26 in the same period.

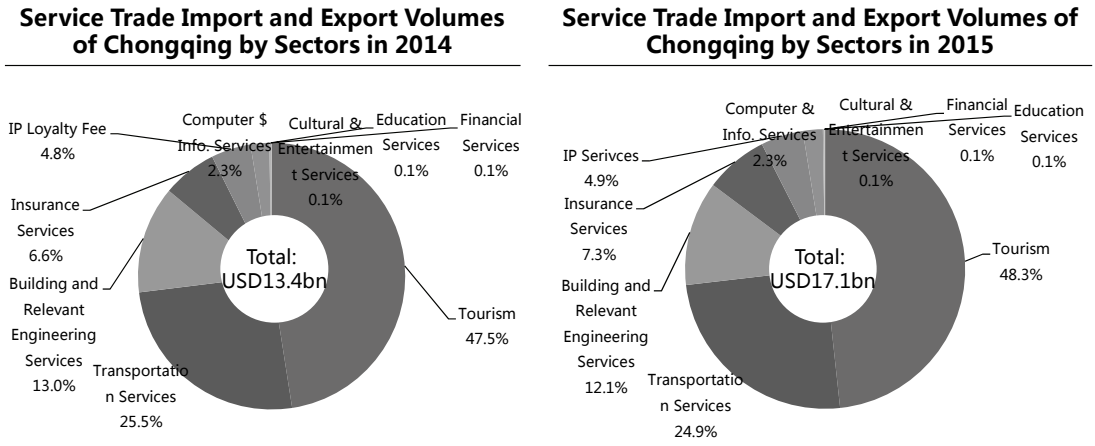


Chart 3: Service Trade Import and Export Volumes of Chongqing in Recent Two Years by Sectors[1]

(II) Low openness and capabilities of service trade market with commercial presence of limited service capability

Foreign direct investments attracted by Chongqing are mainly labor intensive manufacturers while foreign investments in service trade count for only a low percentage. Although the government has been actively introducing foreign investments in key modern service trade of high competition in the recent years such as finance and insurance, professional service, computer information service and service outsourcing, services provided in such areas are still weak due to the late start, small scales and inferior positions in outsourcing chain. Among the hundreds of foreign invested companies and institutions established in Chongqing, many are small processing trade companies with very limited number of service trade companies of low added values. Foreign invested institutions mainly "collect information, contact clients and develop market" for their parent companies in the parent countries and have limited capabilities to serve local customers. It is also pointed out in Report on "One Belt and One Road" Openness and Development Index that Chongqing has to further develop in economic cooperation and talent exchange. Therefore, compared with the services of high added values in developed countries, Chongqing still needs to develop the potential of commercial presences in Chongqing.

(III) Higher proportion of traditional services with modern service activities lagging behind

Looking at the service trade export industries in Chongqing, top three are traditional service trade industries, taking a higher proportion in overall trade. However, new service industries such as consulting and design service, financial service, patent loyalty and permission charging are growing slowly. On the other hand, in the service trade related to manufacturing, service trades such as processing trade in the middle of the value chain and of low added values account for a higher proportion. According to the surveys and statics of the municipal foreign trade and economic commission, among key industries developed by Chongqing such as automobile, chemicals and pharmaceutics, materials and new energy, design services of higher added values only account for 2% in the total outputs. Among the information industries in Chongqing, despite of the high growth,

[1] *Prepared based on data provided by Chongqing Foreign Economic and Trade Commission.*

relevant service outsourcing still concentrates in ITO (Information Technology Service Outsourcing). Major forms of BPO (Business Process Service Outsourcing) are call centers which are of lower added values. In terms of KPO (Knowledge Process Service Outsourcing) of higher added values, due to the long investment cycles, companies lack incentives to enter relevant market if no government supports are provided.

In view of the 2025 Made in China and "Internet Plus", it is the key to the leap forward development and structural improvement of service trade to grasp the great opportunities of digitalization, intelligence, network and servicing development, release the dependency on labor intensive and capital intensive trade, and facilitate the development of knowledge intensive service.

(IV) Weak foundations for service trade development and backward region of service trade in the country

Total service trade volume in Chongqing has developed rapidly in recent years. However, due to the weak foundations, despite of the high growth, we still need a long transition period to realize the promotion of status. Total service trade of Chongqing in 2014 amounted to USD13.1 billion, accounting for 2.17% of the national service trade volume (USD604.3 billion) with apparent gaps compared with other three municipalities and the developed coastal areas and no advantage against top provinces in Central and Western China such as Sichuan (USD11.7 billion). Objective factors causing the lagging behind status of trade service in Chongqing are its location in inner land, under developed service industries and late development in service trade. Subjective factors include the lack of focus on service trade compared with trade in goods, lack of talents required to develop service trade as well as the lack of initiatives and enthusiasm from companies.

II Basic Development Objectives to Enhance Competitiveness of Service Trade in Chongqing

(I) Basic Development Objective of Cross-border Supply

In November 2015, Joint Statement between the People's Republic of China and Republic of Singapore on the Establishment of an All-around Cooperative Partnership Progressing with the Times was released and the most eye-catching part of it is the release of the framework agreement on "Sino-Singapore (Chongqing) Strategic Interconnection Demonstration Programs" as the third inter-government project to be signed between the parties, defining Chongqing as the operation center for the full cooperation in financial services, aeronautics, transportation and logistics and information telecom technology, leveraging the framework to actively learn from advance experiences of Singapore in above modern service trade to create new service trade of Chongqing characteristics taking its own advantages in manufacturing, which shall definitely facilitate the building of Chongqing into the finance center, digital center and inner land highland of openness in the upper reach of Yangtze River and inner land of China and further facilitate the transition and upgrade of "cross-border supply" service trade.

Other basic development objectives of "cross-border supply" for Chongqing include the cluster, branding, high-end development of offshore service outsourcing industries, and development of modern service trade such as headquarter trade, international finance, science and technology innovation, research and development design, cultural creations, education and training and legal consulting.

Specific measures include enhancing competitiveness in technology trade, supporting technology introductions by companies of "new technology, new industry, new model and new pattern", facilitating the "going out" activities of small and medium private enterprises of strong technology, specialties, innovation and strong technology trading capabilities into the global innovation chain, developing cross-border professional service provision, fostering comparative advantages in key professional service areas (particularly management consulting, accounting services and legal services), speeding up the introduction and fostering of professional service talents, leveraging the market allocation function of various HR agents, developing and fostering quality agents for professional service trade talents, fully exploring digital trade with a focus on digital services based on cloud computing and bid data including mobile applications, software telecom services delivered via internet and digit services (data processing, data storage) and computer platform services for cloud delivery.

(II) Basic Development Objective of Consumption Abroad

It is proposed to develop ecological tourism, featured culture in the ecological development area in northeast of Chongqing and ecological protection area of southeast Chongqing and large international exhibitions and conference for various advantageous industries and service industries in urban functional areas and urban functional development areas to attract overseas tourists and business people to tour and consume in Chongqing and promote exchanges.

Specific measures include guiding the tourist services to expand channels and cooperate with relevant provinces and cities to enhance immigration service regimes, improve convenience for tourists traveling to Chongqing, actively explore the intelligent tourism development within internet plus supports, promote the joint development of exhibitions and conferences, business, tourism and cultures, further expand international influence of well-known tourist festival activities such as "Chongqing Urban Tourist Festival and Inter-city Tourism Exchange" and further understand "One Belt and One Road" tourist resources with a focus on exploring overseas tourist markets.

(III) Basic Development Objective of Commercial Presence

It is proposed to leverage the existing transportation infrastructural resources to build new model of logistics services. Chongqing not only has the dual national strategic supports in the "One Belt and One Road" construction and development of Yangtze River Economic Belt. It also has gradually developed its advantages as a new inner land logistics hub with the "three in one" advantageous conditions for opening including three transportation hubs for aeronautics, railways and inner waterways, three state open ports and three bonded areas. Leveraging the above advantages, Chongqing shall actively develop various third party logistics agents for logistics services using airlines, railways and waterways, set up logistics centers, rally centers and distribution centers overseas, build multimodal transportation cross-border corridors, further develop international logistics services of high intelligence, efficiency and security to satisfy the upgraded needs of key logistics clients including various manufacturing enterprises to lead the continuous development of service trade in Chongqing and build it into an international logistics hub and new operation center.

The "Chongqing-Xinjiang-Europe" International Railway in particular is the bridge for economic cooperation of inner China and Germany in Europe. Being an important logistics platform along the Silk Way Economic Belt, after five years development, with its mature goods source organization and the port construction has Sino-European "security and intelligence

trade" pilot, international coordination mechanism of "pass through card" involving customs of several countries, and "1+N" operation and distribution model, it has become an important foundation for Chongqing to develop key service trades such as cross-border e-commerce logistics, parallel trade (such as parallel import of automobiles), bonded goods exhibition and trade, international transit trade and financial settlement (including new business pattern of bonded leasing).

Specific measures include facilitating the development of international logistics, growing a batch of large logistics companies with featured principal operations, advanced operation models, full and healthy overseas networks, strong competitiveness and development trend to comprehensive logistics business, fostering specialized international logistics companies with specialized foundations, innovative operation and processing models, expanded service items and advantageous specialized services to form an international forwarding market of reasonable structure, multiple business patterns, quality services and ordered competition, supporting overseas trade integrators engaged in registration, custom declaration, settlement, tax payment and rebate in Chongqing to set up regional headquarters and increase transit trade volumes, introducing relevant facilities such as financial settlement and accounting firms leveraging the international trade at the port hub and exporting such high value-added services to overseas presence to create new service trade opportunities and applying for the establishment of China (Chongqing) Free Trade Pilot Zone.

On the other hand, it is also necessary to actively support local advantageous manufacturing and service companies to "go out". With the development of physical economy in Chongqing, service trade shall also develop with physical economy. Taking processing trade for example, after the local manufacturing of parts, processing trade industry chains clusters and the number of processing trade also indicates equivalent service trade opportunities. According to the development rule in developed countries, when manufacturers taking majority roles in physical economy start to explore overseas market, service companies providing relevant services locally will follow and set up commercial presence overseas to provide full supports and services for existing customers. As time goes, when they have laid a solid foundation, such service companies will independently explore the local market to obtain new customers and identify international development opportunities.

In addition, attracting leading overseas service companies to set up business in Chongqing shall facilitate service trade development in return. Full leverage of foreign investments and technology spillover effects such as the demonstration, staff training and industrial chains of such foreign invested companies in new service trade department shall help enhance technology and management of local service companies and optimize service trade structure in Chongqing.

(IV) Basic Development Objective of Movement of Natural Person

While maintaining and consolidating exports of low labor costs of the labor intensive service trade such as project contracting, it is also proposed to facilitate the international exchange and service of high-end service talents with skills and rich experience to promote the development of knowledge intensive services.

Measures may include promoting the diversified development of cultural exchanges with a focus on trading of cultural information, creative designs, games and animation copyrights, facilitating cultural exchange such as performance arts, films and video production, digital publication, dealing of arts, creation and entertainment, expanding cultural exchange channels,

supporting cultural enterprises of Chongqing characteristics to sponsor and participate important international culture exhibitions and festivals both at home or abroad to expand influences and explore overseas market.

Chapter III Proposal on Building the Leading Advantages of Service Trade in Chongqing Centering Around Manufacturing

Apart from the three factors including technology, capital and labor, intermediary service factors (such as design, purchase, marketing and etc.) are increasingly vital to the increase of added values in manufacturing. Manufacturing service has high elasticity and the industrial growth shall be highly likely to exceed the overall growth of service industry. In fact, in developed countries, the "dual 70% phenomenon" is prevailing, i.e. service industry output accounts for 70% of GDP while manufacturing service output accounts for 70% of the entire service industry output, and hence manufacturing industry is regarded as the foundation of service outsourcing and service trade. According to relevant investigations and surveys, services only account for less than 10% of the total operating revenues in manufacturing industry in China while the percentages in developed countries exceed 30%. For some leading companies such as GE which adopts "technology + management + service" model, services account for nearly 70% of the total output. IBM for example has fully transformed from equipment provider to global information solution provider. Driven by 2025 Made in China and "Internet Plus" policies, demands for customized, digitalization and networking at manufacturing and logistics sites and personalization and service at consumption sites have increased, which shall drive all links of the manufacturing value chain towards high efficiency and high added values, facilitating innovations in production organization models (intelligent designs, massive ventures and R&D, synergized production, and network-based real time services).

On the other hand, with the further globalization, productivity of global manufacturing has improved, leading to the sharp drop of profitability of simple processing and manufacturing. At the same time, Chinese manufacturing enterprises have suffered from pressures of increased cost of factors (such as labor), weakened demands and economic slow-down and the traditional competition model of large productivity and low costs has come to an end. It is time for the transition of manufacturing towards service and digitalization. In July this year, the Ministry of Industry and Information Technology (MIIT) distributed Guidance on the Special Action to Develop Service Oriented Manufacturing jointly with State Development and Reform Commission and China Academy of Engineering, pointing out that enterprises shall transform from processing and assembly towards "manufacturing + services" and transit from simple product sales to "product + service" and effectively enhance all links of the value chain for service oriented manufacturing. Four actions and ten tasks are proposed. Under the new norm of economic development, facilitating the development of service oriented manufacturing is to help manufacturers to upgrade along the smiling curve of the value chain towards two ends of high added values. It shall form the new driver of economic growth and help the transformation from Made in China to Created in China, from China Speed to China Quality, and from Chinese Product to Chinese Brand.

In addition, manufacturing related digitalization is stably progressing. In the Guidance of the State Council on Actively Promoting "Internet Plus" Action, it is pointed out that the second key action plan is "Internet Plus" Synergized manufacturing, including specific tasks in developing intelligent manufacturing, large scale customization, and network synergized manufacturing. Other tasks related to manufacturing include "Internet Plus Highly Efficient Logistics" and "Internet Plus

Artificial Intelligence".

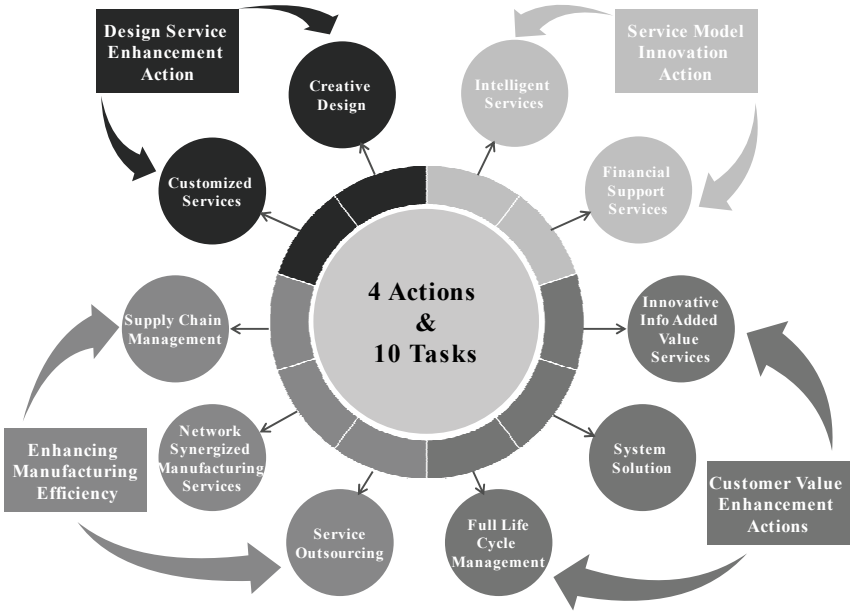


Chart 4: 4 Actions and 10 Tasks in Guidance on Special Act to Develop Service Oriented Manufacturing throughout the Manufacturing Value Chain[1]

With such change, information technology and manufacturing technology shall further integrate, and numerous new leading service patterns may emerge around manufacturing with consistent value addition and expansion of impact, separating from manufacturing and becoming professional social services to provide more specialized knowledge service and facilitate the continuous upgrade of manufacturing with enhanced competitiveness. At the same time, demands for factors such as knowledge and technology by manufacturing industry also drive the development of services for manufacturing with interaction and mutual promotion. Such new service patterns may be promoted to the world once developed and matured in the local market and formed opportunities for new modern service trade. In fact, information and data being an important capital in manufacturing in the future is far from adequate in companies in Chongqing. It is pointed out in Implementation Opinions of Chongqing Municipal People's Government on Facilitating Service Trade and Service Outsourcing that it would promote the in-depth integration of internet, cloud computing, big data, internet of things and modern manufacturing and actively expand service outsourcing industries, develop service outsourcing in software and information technology, cloud computing and big data, data processing, labor and industrial designs. Therefore, Nomura Holdings hereby makes relevant proposals on researches and exploration of service value creations along the value chains of manufacturing industry (upstream, midstream and downstream) in the background of "2025 Made in China" and "Internet Plus", leveraging the advantages of Chongqing in manufacturing and its location as the logistics hub with focus on developing telecom infrastructures, data centers and cloud computing and internet of things.

[1] *Developed based on the Guidance on Special Actions to Develop Service Oriented Manufacturing.*

I Upstream: Value Creation in Designs

(I) Background Introduction

In the time of diversified demands and when all products facing individuals and corporate will enter into the "One to One" Ear, customized production and full design capabilities for individuals shall indefinitely become very important. Innovative designs include not only the research and development design, system design, processing procedure design and manufacturing equipment design of the products but also design and innovation in supply chain, business model, service and brands for enterprises to continuously launch new products, improve product quality, optimize production procedures, enhance product image with enhanced post sale services. Being a soft production factor without defined boundary, the essential function of cultural creation and design services is to realize the "delivery of values" and such is one of the key drivers of competition in manufacturing. Once integrated with manufacturing, it shall change traditional manufacturing from "production of functional products" to "creation of values from multiple dimensions", constituting the strong driver to promote production innovation and development, increase added values and profitability, enhance market competitiveness of products and realization of branding.

For example, in the study in the value distribution of Apple, it is found that Apple Corporate does not directly produce mobile phones but enable to obtain nearly 60% profit of a mobile phone with its core technology, processing planning and brand operation. It does not include the enormous profits from the controls over mobile phone operation system and application stores. Factories involved in the processing and production however, only obtain less than 2% via investment of labors. Hence, guiding companies to strength innovation and design is to improve capabilities in research and development of higher added values and stride towards the higher end of the value chain.

For example, ARM from UK is a semi-conductor intellectual property rights provider, focusing on development design and intellectual property rights authorization. It is not engaged in the production and sales of semi-conductor chips at all. However, over 95% intelligent mobile phones and panel computers around the world use the framework of the company and over 20 billion ARM framed chips have been sold today.

As R&D design is indispensable in the production of any product, design services apply to any industry. However, due to the difference in industrial characteristics and in links the company is in the value chain, the importance of design service varies. It is more important for knowledge and technology intensive industries than labor intensive and general capital intensive industries. It is more important for industries of stronger market competition than for industries of mild competitions. It is more important for industries of fast changing and differentiated user demands than for industries of stable and less differentiated user demands. In Chongqing, key industries such as automobile, electronic information and equipment manufacturing undoubtedly have strong demands for design services.

Computer aided design, system simulation and the maturing virtual reality, enhanced reality and 3D printing technology emerging with the development of information technology provide R&D design tools of low costs and high efficiency. Designers can make synchronized design development with fast protocol upgrade and hence digitalized and virtual product development. On the other hand, customized services made universal in the background of Internet Plus. There are numerous internet users around the world. Manufacturing companies can collect and process customer demands leveraging information

technologies such as internet of things, cloud computing and big data as well as user experience, online design and big data mining to make dynamic customization to standardized parts and modules based on flexible transformation of manufacturing. Such shall lead to the high synergy between production and demand and B2C or C2C start to transform towards large scale of customized C2B. E-commerce starts to transform from a trading platform to a production platform. The US garment company Knot Standard, for example, tailor-makes clothes based on the design and size of clothes uploaded by customers or digital pattern designed by customers.

In China, customization has been popular in the sales of furniture and garments and pilot customization has started in equipment manufacturing. However, manufacturers still need to leverage information and telecom technology to enhance designs and flexible transformation to achieve high synergy between manufacturing and market demand, enhance user experiences, upgrade product values and form a new design-production and service model having dynamic understanding of consumer needs. Information technology has enhanced the efficiency of innovative design and production and enabled manufacturers to provide customized services upon the acquisition of customized needs of consumers via product development system and highly flexible production lines based on big data on the scattered but close links between consumers and manufacturers.

Therefore, it is pointed out in the Guidance on Special Action to Develop Service Oriented Manufacturing that the upgrade of design services shall guide manufacturers to increase factor investment in the upfront of value chain to promote the integration of design and manufacturing and consumption and production, and actively develop innovation capabilities and core competitiveness. Such actions include promoting the development of innovative design and customized services, both of which have some foundations in China and may have breakthroughs within 3 years according to the projection of specialists from MIIT.

(II) Positioning of Chongqing and Core Service Functions

The positioning of Chongqing Municipality proposed by Nomura in the design value creation in upstream of manufacturing value chain is to serve as an industrial design and product design center in inland China to create unique culture of design and provide advanced design, pilot production, customization and certification services to industries and areas of corresponding demands and promote design products and experience of Chongqing characteristics around the country and the world once local successes and experiences are accumulated.

It is more than leveraging modern information technologies such as internet, big data, cloud computing, virtual reality and 3D printing to reform the procedure and organization of design and processing, facilitate design and development and realize more refined product design, but also digitalization, informatization of production related design, exploration of intelligent cloud design and internet synergized research and development. That is to guide the establishment of open online design centers, explore and develop new research and design models based on demands, crowd sourcing, crowd design and crowd ventures to ultimately enhance product quality and added values.

Specific design usually starts from product function and utilizes technologies such as man-machine engineering,

computer-aided design and system simulation to form a completely module based design system and integrated digital research and development platform via the research and development process of demand analysis, material analysis, pattern analysis, system design, process planning, virtual design and virtual laboratory. However, leading hardware equipment such as 3D printing has provided fast manufacturing technologies to validate the industrial product design before mass production, which is a strong technological support to the change of perceptual design to rational design.

For design services for equipment manufacturing for example, leading design companies are able to provide completely production simulation and computer based simulations of all stages of the product life cycle including product design, process planning, processing and assembly. Digitalized design technology based on simulations can effectively project the performance of products in real usage to optimize product design, shorten product research and development cycle and realize the maximum value of investment. In addition to traditional CAE and CAD environment, leading design platforms enable users to start product design from the bottom of raw materials in a multiple dimensional material simulation environment based on material science platforms.

In addition to the provision of software and hardware resources, design centers generally need technical support teams of expertise to provide full set of technical solutions to users in solving engineering problems. Therefore, close cooperation with various industrial research institutions in Chongqing is fundamental to provide targeted design services, and build the advantages in design service trade for manufacturing while promoting the transformation and upgrade of key industries in the city.

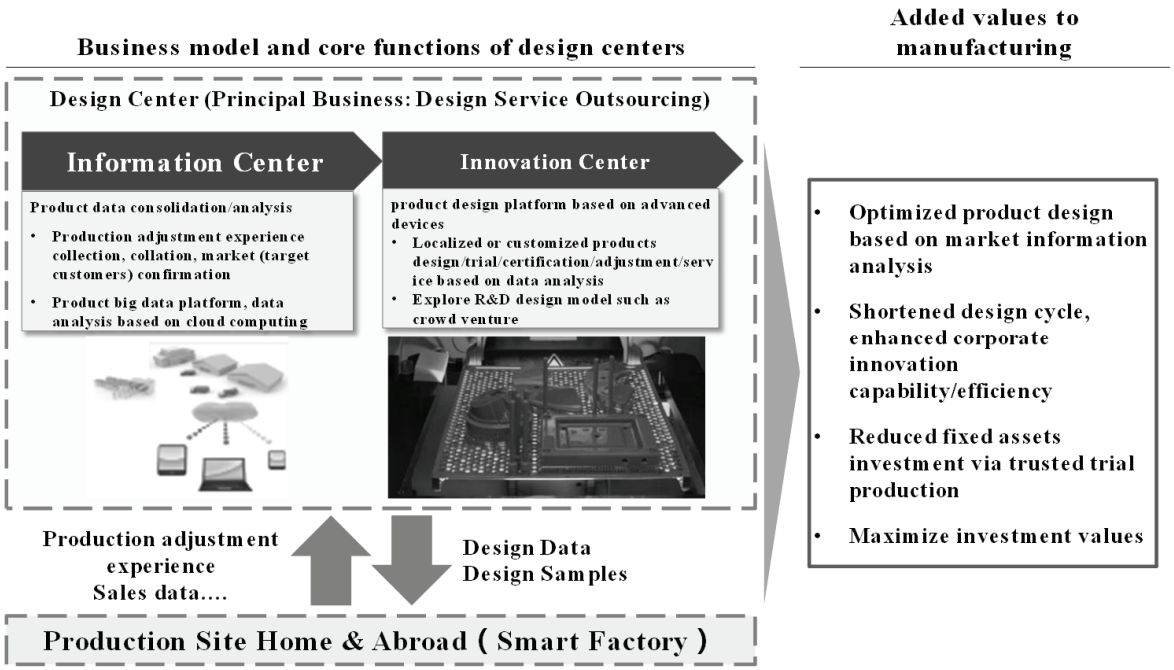


Chart 5: Business Models, Core Functions of Design Center Model and Contributions to Manufacturing

II Midstream: Value Creation in Optimization and Efficiency at Manufacturing Site

(I) Background Introduction

With the digitalization and systematization of production sites, demands for optimized and highly efficient production lines are increasing. However, the facts are that most production sites are unsatisfactory in China.

With the increase in labor costs and reduction in labor resources, digitalization and systematization of manufacturing production sites have increased demands for optimization and efficiency of product lines. However, most production sites in China do not have such capabilities. In some key industries, process control and manufacturing implementation system have been popular with nearly 50% of digitalized controls of key process and enhanced capabilities in fine manufacturing, extreme manufacturing and agile manufacturing. However, overall digitalization model is still unitary and far from the target of 2015 Made in China in terms of digitalization and informatization. Informatization of most manufacturing companies is in Stage 2.0 or 3.0 and very few companies are able to develop applications for internet based synergized manufacturing and précised supply chain management.

Informatization, particularly the extensive penetration of new generation information technology in industries, has expanded the development space of service oriented manufacturing. Industrialization 4.0 from Germany, Industrial Internet from USA or Robot Strategy from Japan all emphasize the highly integration of information technology and manufacturing technology to build a physical information system closely integrating resources, information, materials and man to realize the interconnection and synergized operation of value chain systems in the manufacturing industry with enhanced system service capabilities of the manufacturing system. There are some industrial companies in China actively practicing the new production model based on industrial internet. Some internet companies have sped up the exploration into manufacturing design and services. Some infrastructure telecom companies and software service companies also strengthen provision of comprehensive solutions to industrial companies. However, the transformation of manufacturing from equipment providers to system solution providers is slow and no system integration providers such as Siemens and GE for intelligent manufacturing have developed. Leading companies in above countries have realized interconnection of manufacturing equipment, interconnection of equipment and product, interconnection and integration of products based on matured information network applications to lead the model innovation of intelligent manufacturing and services while manufacturers in China including companies in Chongqing are still have less interconnections of manufacturing links and weak in business model and service model innovation and data integration and innovation leveraging information technology.

At the same time, multinationals in developed countries are actively adjust strategies to concentrate resources more in services to further transfer manufacturing to developing countries of more comparative advantages. Cross-border acquisitions such as the acquisition of IBM personal computers by Legend, Motorola Mobile from Google and acquisition of GE Home Electric Appliances by Haier and acquisition of Toshiba Home Electric Application by Media are indication of globalization of Chinese companies and to some extend reflect the transformation of multinational manufacturers in developed countries from traditional manufacturing to service oriented enterprises.

With the cross-border transfer of manufacturing links, new trend in the international transfer of production service also emerges. Progress and population of information technology enables untradeable services locally performed to trade across the border and some multinationals not only transfer low end services such as data input and document management to developing countries but also outsource production services such as production reform, risk management, financial analysis and research and development of higher technology and added values and such shall have enormous impacts on the labor of division in global manufacturing.

In the critical moment of good development opportunities from transformation and upgrade or falling into the bottom of value chain if being conservative, action to enhance manufacturing efficiency in Guidance on Special Actions to Develop Service Oriented Manufacturing has specified the focus on medium end manufacturing with a target to improve quality and efficiency at production end to lead the enhancement and overall upgrade of the bottom end of the value chain. Such actions include three tasks of optimization of supply chain management, promotion of network based synergized manufacturing services and support of service outsourcing, emphasizing the stress on the leading position of manufacturers in supply chain, promotion of synergized integration of information flow, capital flow and goods flow and enhancement of overall efficiency and profits of supply chain. Cloud manufacturing service and intelligent logistics model are still in the initial period. However, they are expected to prosper in the future. Hence, Nomura think it is the time for Chongqing to leverage its advantageous resources in manufacturing and information industries to develop production site optimization and efficient value creation services and build advantages in relevant new service trade in the country and even in a greater region.

(II) Positioning of Chongqing and Core Service Functions

Chongqing may take its advantages and experiences in manufacturing, particularly in the key industries, flexibly leveraging product and production related data including design parameters as well as advanced information processing technology (ICT), artificial intelligence and network technology (industrial internet, internet of things) to realize real time monitoring of production lines and provide speedy technical support in case of breakdown alerts, improving production parameters, equipment operation efficiency, proposing manufacturing site maintenance and updates, improving production from design in order to ultimately achieve highly automation and self-adaption of factory control, quality management and production equipment optimization and build Chongqing into a technical highland of IT services for manufacturing production management and site environment improvement and convert its services advantages into new service trade models for exports. On the other hand, regardless of the level of automation, breakdown of equipment or minor adjustment, data interpretation and application still require management operation of excellent engineers and such talents in such areas with practice or fostered in Chongqing shall be the major trade service driver for the export of advantageous services of Chongqing.

Nomura has proposed 2 core concepts for the reform of manufacturing production sites in Chongqing with reference to the leading factory reform cases in Japan. That is the Smart Factory and Digital Engineering. Smart Factory mainly reinforces the collection and effective management of large basic data in the manufacturing process and structural analysis with information measures such as cloud services to create more values for new product development, production process improvement, production efficiency enhancement and service extension. Digital engineering however is to focus on the products, aiming at improve production function and product quality. They shall closely coordinate and are inseparable.

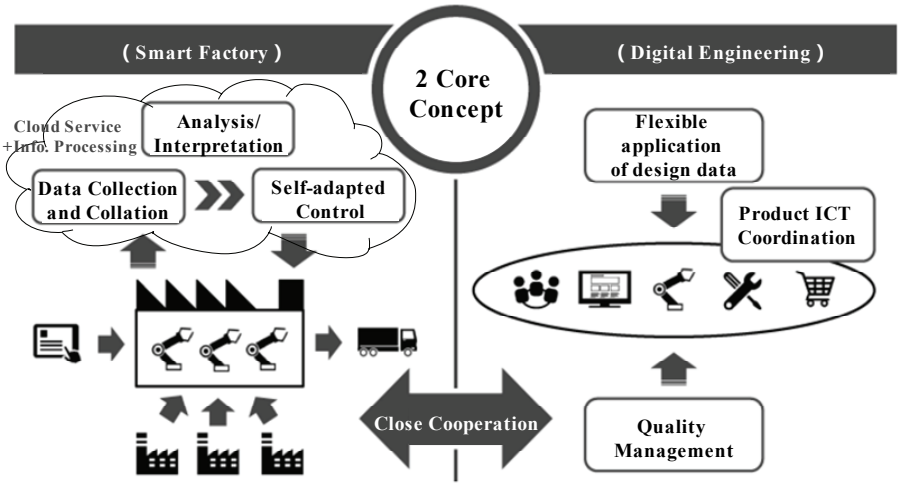


Chart 6: 2 Core Concepts and Connotations of Manufacturing Production Site Reform in the Background of Internet Plus and 2025 Made in China

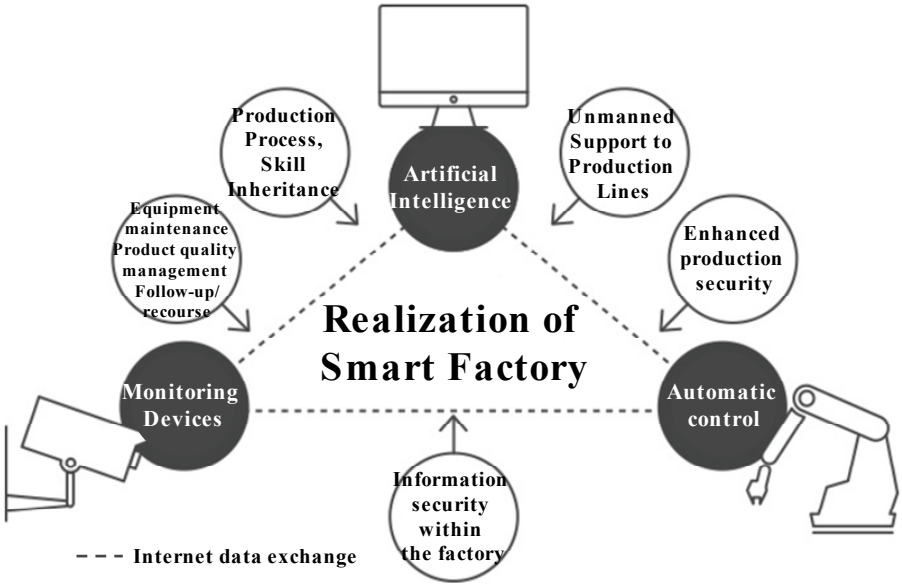


Chart 7: Intelligent Factory Realization Factors and Contributions to Production Site Optimization and Efficiency

III Downstream: Value Creation in Logistics

(I) Background Introduction

Driven by the diversification and concentration of industries, highly refined logistics services of transparency and security for varieties of small amount raw materials, precision machines and parts become extremely important for domestic and overseas companies to improve efficiency and reduce costs.

(II) Positioning of Chongqing and Core Service Functions

Chongqing has airlines, railways (connecting countries along "One Belt and One Road") and roadways (directly connected

with all Southeast Asia countries) interconnected with the world and all around China. It is proposed to leverage the above advanced transportation network and the internet of things, robots and cloud service technology to accurately capture the transportation and status of individual product with integrated management of domestic and overseas transportation and inventories to realize network based real time logistics service and build new intelligent logistics service bases to provide safer logistics and supply chain management services for domestic and overseas companies.

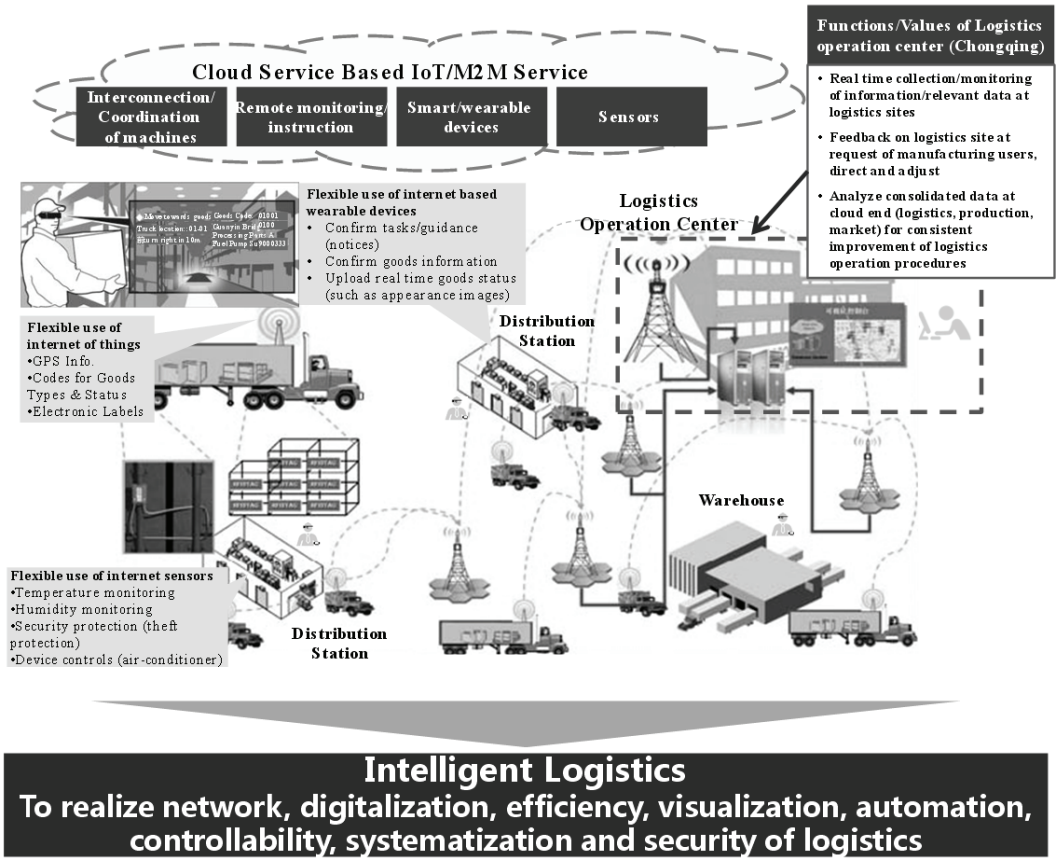


Chart 8: Smart Logistics Vision and its Function Realization

Connotation and core service functions of such smart logistics service base shall include modern information technologies such as internet of things for industrial applications, sensors and big data, assisting manufacturers to strengthen cooperation with upstream and downstream enterprise and third party logistics companies for logistics outsourcing services or strategic alliances using intelligent logistic equipment and warehousing equipment for services such as order management, material distribution and delivery and warehousing, optimization of production management, enhanced supply chain market response, guaranteed raw material and stable product sales and warehousing. Such model has changed the market competition pattern, making industrial value chain more prominent and facilitating the transformation from traditional competition of companies to competition of industrial chains. Lee & Fung Group from Hong Kong for example is a modern multinational trade group famous for its supply chain management. It has optimized its supply chain operation leveraging information system to enhance time efficiency, reduce costs of procurement, transportation and warehousing.

Chapter IV Preliminary Proposal on the Specific Projects of Derivative Service Trade Center for Manufacturing

Based on the above proposal to enhance service trade competitiveness of Chongqing around the three key links of manufacturing value chain, Nomura Holdings hereby further proposes the following three platform projects for Chongqing with highly intelligent manufacturing support center as the vehicle of service trade to promote new service creation for all links of the manufacturing value chain and export advantageous service industries formed thereafter. The support center shall mainly provide various support activities for three platform projects, namely manufacturing design platform, manufacturing production engineering outsourcing platform and manufacturing intelligent logistics control platform.

I Manufacturing Design Center

Purpose: to develop designs in the upstream of manufacturing in Chongqing to both enhance values of manufacturing and design services of high added values

[Case I] "Kobe - the City of Design" Recognized by UNESCO

Kobe is embraced by mountains and ocean and a city of exotic styles. Due to the introduction of foreign cultures in the history, the local customs and practices full of openness and freedom. It has developed manufacturing with featured products such as shoes, western cookies and pearls. Surviving from the Osaka-Kobe Earthquake and aging society with low fertility, population greatly reduced and massive consumption model became inappropriate in the beginning of the 21st century. Therefore, in order to facilitate industrial upgrade, improve living quality of residents, an innovative city strategy of "Kobe - the City of Design" and aging society was finally adopted to sustain and enhance comprehensive competitiveness of the city.

Cities adopting innovative city strategy have the common target to create a virtuous cycle to leverage the local characteristics and advantages to attract creative talents who shall in turn create new industries and cultures and ultimately enhance the overall values and branding of the city and inject vitality and charms to the city.

The innovative city image Kobe is targeting at is to "attract innovative talents for creative activities in various areas of cultures and industries to inject vitality into the city and enrich and improve living quality of the citizens".

"Kobe – the City of Design" Strategy has a clear roadmap and the enhanced capability of design not only depends on the cooperation between government, corporate and schools and research institutions to attract creative talents, but also requires an atmosphere to understand and reasonable assess such creative activities to foster the general mood of "happy creation" among citizens and hence new industries and cultures created by qualified designers of both internal quality and external capabilities and enhance vitality and charm of the city for a sustainable development.

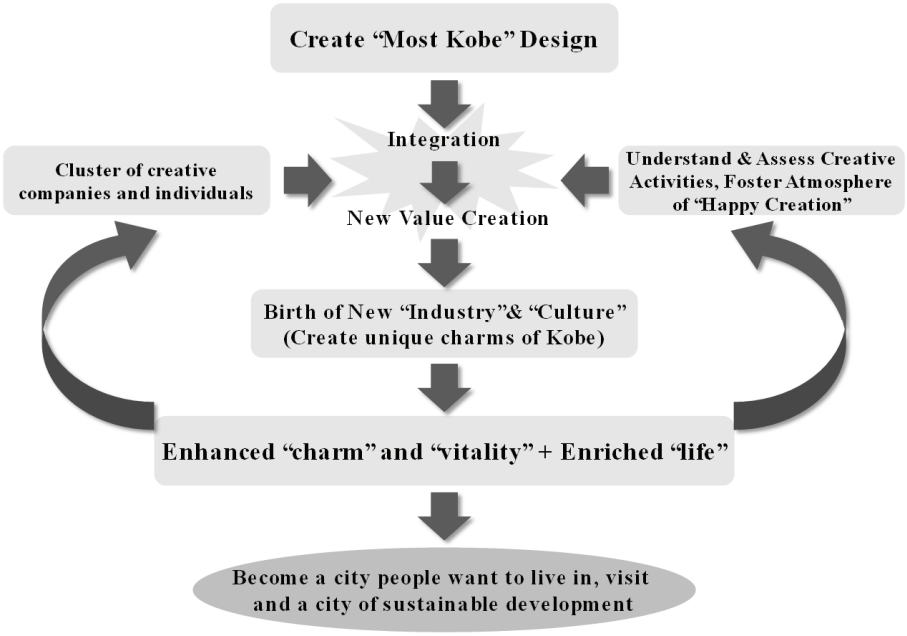


Chart 9: Roadmap for Realization of the Design Based Innovative City Strategy - "Kobe, the City of Design"

The design policy shall focus on a balanced coordination of "beauty, pleasure, simplicity and comfort" to create new charms that satisfy the inner heart. That is the so called "most Kobe" design to differentiate the city from other cities.

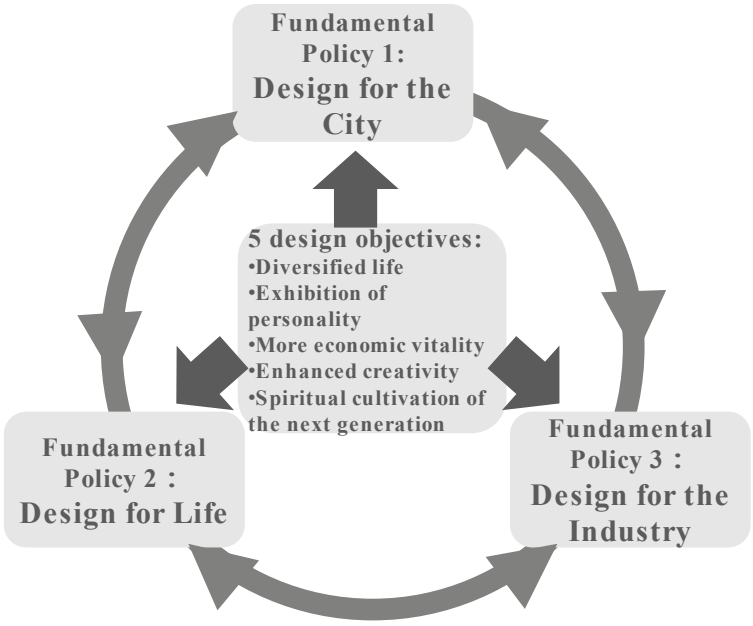


Chart 10: Relationship of Five Design Targets and Three Fundamental Policies of "Kobe, the City of Design"

The fundamental guideline of "Industrial design" in particular shall be based on excellent design skills to support high added-value manufacturing and build an industrial city of health and vitality via creating new markets. As mentioned above, manufacturing in Kobe is mainly closely related to products of high styles close to daily life and cultures, not only fashions and

garments but also all areas of dressing, foods, living and travels, aiming at awakening industries of living and cultures with sustainable new products of design.

The “Draft!” initiative was launched in 2002 to help young designers to exchange with department stores and boutique stores and create opportunities for the “interactions between excellent design and corporate”. In addition, in order to further support “application of design in manufacturing technology”, promotion of design was made towards small and medium sized manufacturers in the city in 2005. Academic institutions such as Kobe Design University and Hyogo Industrial Technology Center jointly launched “KOBE Industrial Design Guideline Project” to support outstanding designs.

Furthermore, in order to promote the brand new “Kobe Brand” based on outstanding design capabilities, Kobe Chamber of Commerce launched “Kobe Renaissance with Design” with the assistance of famous designers to engage professional designers to give guidance to industries related to local life and cultures such as pearls, western cookies and European furniture and exhibit works around Japan. At the same time, Kobe Chamber of Commerce also organized “Kobe Designer Network” (with registration of around 270 designers), aiming at establishing a network to attract and agglomerate cross disciplinary Kobe designers and creators and promote the matching of individuals and local corporate based on personal talents and corporate demands.

In reference to the above case and considering the advantageous industries and resources of design institutions and research and development institutions of respective industries in Chongqing as well as the policy supports to high added value production service in the upstream and downstream of manufacturing including design, we hereby propose the specific development roadmap, means of realization and ultimate target of the manufacturing design service platform projects as follows.

- **To integrate existing resources and realize synergy effect**: to integrate industrial design resources and industrial manufacturing demands in Chongqing and build a comprehensive and innovative manufacturing design service platform in the city and start the building of “capital of design” of international influence from such platform (using existing industrial clusters such as Chongqing Industrial Design Corridor) to enhance design service industry in scale and clustering and radiating capabilities to improve innovative design ecologic system via exchanges and cooperation among upstream and downstream companies in research and development design.
- **Key industries may start pilot projects to gradually improve the service system**: it may start from key industries of such demand to foster industrial design and innovation capabilities for specific industries (such as the “6+1” manufacturing industries, Top 10 strategic emerging industries in Chongqing), fully integrate high level cultural creation and design services into research and development design, equipment processing and production and develop capabilities in overall design, system integration, testing and applications and support applications of new technology, new process, new equipment and new materials in industrial designs with enhanced practicability and tastes and improved cultural connotations and added values along the following development roadmap:

· To facilitate the transition from design to production and train a number of industrial design benchmark companies with replication of industrial experience;

· To form design industry clusters of leading advantageous in China and abroad;

· To transform from leading areas to high end comprehensive design services;

· To promote design services to more industries and regions and expand design market and build design service system of comparatively full classes, improved sets and full coverage.

- **To strengthen technical research and development and explore standardization**: to strengthen research and development of common key technology in design and explore the development of industry standard for industrial design.

- **To facilitate talent introduction and training:**

· To introduce or set up education and research institutions able to attract design talents and set up design service related majors in high education institutions and facilitate training of design service talents in high education and vocational colleges.

· To foster design agent markets and encourage various professional service agents;

· To develop talent identification conditions, set up supporting mechanisms (awards and allowances) and build creative and venture talent pools.

· To organize key companies to recruit from regions and key colleges of design service talents;

· To develop preferential policies and convenience services in public services such as housing, settlement, social security, medical security, schooling of children and employment of couples to design service talents of high level/urgent needs according to relevant standards;

· To support companies to build industrial design base and order based talent training base and develop industrial design talent pools for companies;

· To incentivize initiatives and creativities of talents via reform and innovation of organizational structure and compensation system such as encouraging start-up within companies, shareholding of senior designers and compensation adjustment based on innovation performance.

- **To introduce leading overseas companies**: to support the presence of leading institutions and companies in industrial design from both home and abroad and development of various incentive mechanisms to guide companies to leverage information technology to promote innovation and design with high efficiency;

- **To foster local companies**: to actively foster local industrial design institutions, speed up the building of professional and open industrial design companies and service centers to form a cultural atmosphere encouraging and accommodating innovations;

- **To encourage design service outsourcing**: to encourage manufacturing companies to outsource design via commercial cooperation with professional design institutions and convert designs into production to upgrade products, explore markets and build brands via purchasing excellent industrial design initiatives, jointly production and processing, acquisition of patents and sales distributions;

- **To strengthen cooperation between government, industries and academies and construct public service platforms**: to strengthen cooperation between government, industries and academies and build synergized innovation design development platform, build public service platforms such as more cloud service platforms of similar industrial designs and industrial consumer behavior research centers to provide services to small and medium enterprises and design companies;

- **To build platforms for international cooperation**: to actively promote industrial design exchanges and cooperation across regions and around the world, sponsor various professional conference and exhibitions such as international design contests, international design week and cultural innovative design fair and exhibitions of world level to provide platforms for the exhibition, promotion, trading and exchanges and cooperation in innovative designs.

- **To expand financing support channels:**

· Design service has a low entry threshold but requires high investment and involves high risks. Companies need

corresponding financial supports to overcome the pains in short-term due to high proportion of design activities.

· Funds for design may come from the accumulation of the companies or venture capitals attracted by the outstanding initiatives or models;

· It is possible to cooperate with universities and research institutions and develop strategic alliance between companies or leverage external innovation resources via crowd sourcing and crowd ventures to form a new pattern of competition and cooperation between companies and synergized innovation between industries and research institutions to reduce costs;

· Policy supports such as preferential policies on corporate income tax, application for patent support funds in application for patent and special allowance for science and technology patents.

- **To strengthen protection of intellectual property rights**: to strengthen the application and protection of intellectual property rights, facilitate the conversion of intellectual property rights and effective exchanges, address fight against infringements, build incentive and protection mechanism for innovation, creation and design and improve property right regulations benefiting cultural creation and design services.

- **To build design industry of Chongqing Characteristics**: to persistently the integration of protection, inheritance, development and innovation and incorporate local cultures into the creation and design concept, strengthen the incorporation of traditional cultures and modern fashion to form a creative design style of local Chongqing characteristics and diversified and differentiating design industry.

- **Ultimate Target**: to build regional design centers oriented to manufacturing industries to serve Center and Western regions of China and countries along "One Belt and One Road" (of similar preference of design)

Expected Project Values and Deliverables:

- To realize optimized product design from the design stage based on market information analysis;
- To shorten design and production cycle and enhance corporate innovation capabilities and efficiencies;
- To enrich industrial products and brands with higher added values;
- To reduce burden of mass production decision via technical supports to production process;
- To return to domestic manufacturing and maximize the use of equipment and materials made in China and locally produced in Chongqing in the projects
- To maximize the values of investments;
- To promote the optimization and upgrade of industrial structure and achieve the transformation from Made in Chongqing to Created in Chongqing and Brand from Chongqing to lead the development of design service trade.

II Manufacturing Project Outsourcing Service Base

Purpose: to develop production engineering service outsourcing the midstream of manufacturing industries in Chongqing to create and expand engineering services for manufacturing production sites improvement based on advanced information technology.

[Case II] Outline of ESO Industry Development in India

India used to be famous worldwide for labor intensive, low cost and cheap products. However, under the pressure of international competition, India has realized the potential and importance of service trade incorporating information technology,

design and engineering and launched relevant policies such as Policy on Computer Software Export, Software Development and Software Training, Information Technology Act 2000 and State Design Policy and put Designed in India, Made in India and Service from India closely incorporated with IT industry as the three pillars for state economic development. Throughout the development in recent 30 years, software and information service outsourcing industry has become most conspicuous. In 2013, India's market shares in ITO, BPO and KPO recorded 75%, 34% and 70% respectively and engineering service outsourcing (ESO, one form of KPO) for manufacturing is the service developing fastest with highest potential.

ESO contains both the characteristics of IT activities and ET activities and differs largely from ITO or BPO. In general, ESO requires the service provider to have strong expertise and rich experience and requires business secrets such as product design and competitive edges as the materials and supports and hence, in a long period of time, ESO has not become as popular as BPO after its birth.

ESO in India now mainly undertakes outsourcing services such as process design, product engineering, hi-tech diagnosis system (product testing and quality control) and product life cycle management (PLM) from leading western manufacturers (mainly automobile and other industries such as hi-tech telecom, pharmaceutics, industrial production, aeronautics and consumer electronics). Being the third party companies, major ESP (Engineering Service Provider) from India such as HCL Technologies，Infosys，TCS，Wipro are not only able to provide genuine point to point product parts design, but also able to participate in the building of overall systems which requires extremely high industrial expertise and such service trade has higher added values.

Competitors of India software outsourcing providers such as China and China Taiwan are not able to close the gap in the market in short time because in such areas, expertise built on experience is the key factor of success and is driven by the demands of companies for hi-tech but cheaper resources. Different from software industries of other countries generating from local operation models, India has very clear global positioning in developing ESO industry from the very beginning. On the other hand, in hi-tech industries, dynamism is also a challenge and with the progress of manufacturing process, consistent modification is required and it is very vital to manage the process.

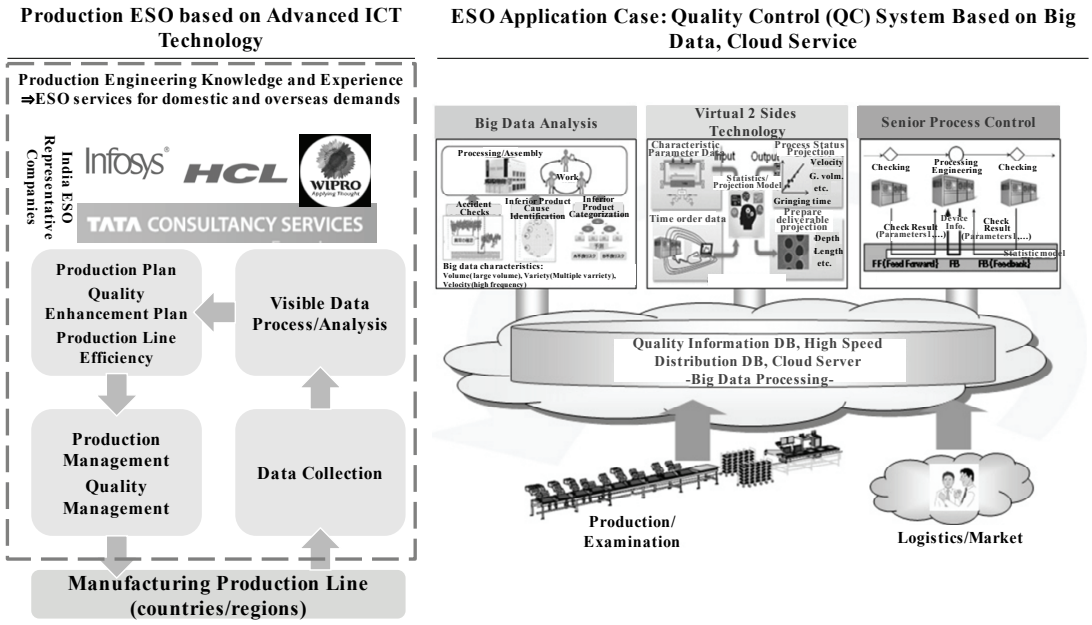


Chart 11: Brief Introduction and Application of ESO Services in India （QC system）

TSC developed the concept of Global Engineering Design Center (GEDC), which has won the IT and engineering design services for the company from Ferrari for its Ferrari Formula 1 racing development. Such centers are the "seamless extension" of engineering design departments of the clients in India.

In addition, many industrialized countries in North America and Western Europe have reduced production costs via offshore manufacturing. Cooperating countries with the in-depth understanding of manufacturing have gained corresponding capabilities and are able to provide upstream services, which helps to further reduce the overall costs of production.

In recent years, acquisition of high-end consulting services is an important step for India outsourcing companies in business transformation and upgrade and overseas expansion. Such not only extend the existing software industry chain but also expand the service outsourcing scale and realize the progress towards core business area of IT services.

The success of India service outsourcing benefits from good policy environment, complete intellectual property rights protection measures, full-fledged industry park service system, sufficient talent supply and professional service outsourcing associations:

1. **Good policy environment:** India government has attached importance to software industry and service outsourcing and develops preferential policies on taxation, public finance and financial services to software industry, supports IT export companies and strongly drives the development of IT industry in India. Costs of service outsourcing in India are 30% lower than in China and companies almost have "zero tax" burden which to some extent, forms the advantages in undertaking service outsourcing in terms of costs.

2. **Focus on and support to intellectual property rights protection:** India government takes the legislation for intellectual property rights very seriously and has effective protection of intellectual property rights including fights against

copyright pirating which has established good international reputation for software outsourcing companies. Such not only protects the interests of foreign investors but also software industries in the country. In order to ensure the healthy development of IT industries in India, maintain a good market order, India government has developed and modified a full set of legal regime such as intellectual property rights and information technology security as well as contract laws and trade laws.

3. **Comprehensive industry park service system:** first of all, there are excellent infrastructures in the industry parks. In terms of hardware, there are high speed digital telecom lines and satellite ground reception stations in the parks. In terms of software, the government has set up management centers in industrial parks with simplified approval and export procedures, infrastructures and public service facilities leased at low rents and full services for small and medium enterprises such as business centers. In addition, policies in the parks are complete in system with preferential taxation polices. India Reserve Bank provides multiple convenience policies in fund usage and equity disposal.

4. **Multi-level Talent Training System:** India has numerous English-speaking talents. There are 253 universities and nearly 700 academies generally teach in English with high education quality. Key universities such as University of Delhi and Jawaharlal Nehru University and seven polytechnic colleges and six management schools in particular are as good as world famous universities. These universities have played important roles in the education of cheap but excellent information technology talents and talents in business and management.

5. **Professional service outsourcing associations:** NASSCOM, India Association of Service Outsourcing established in 1988 is a non-profit association of IT software and service industry in India. It has provided the industry a platform for discussion on development trends and exchange of experience. At the same time, it is also the authority to make industry surveys, government communication, international cooperation, corporate negotiation assistance, intellectual property rights protection, industry and academy cooperation and industrial data publication. The association also provides advisory services to government decision making.

In reference to the above case and considering the existence of pillar industries such as automobiles, electronic information and equipment manufacturing as well as existing resources of IT information and software development companies in Chongqing as well as the stably developing infrastructure construction of hardware for cloud services such as data centers and the policy supports to service outsourcing, we hereby propose the specific development roadmap, means of realization and ultimate target of manufacturing production engineering service outsourcing platform projects as following.

- **Infrastructure building and utilization**: this pilot platform project requires the speeding up of new manufacturing base such as automatic control and sensing, industrial cloud and intelligent service platform and industrial internet, flexible utilization of built data centers and real time collection, storage, mining and analyzing of data relevant to the processes of manufacturing production lines in order to provide solutions for improving efficiency of production lines, optimize design and amend production plans in factories.
- **Key industries to take pilot for the gradual improvement of the service system**: pilot projects shall start from the three pillar industries to promote the building of smart manufacturing units, smart production lines, smart workshops, smart factories and accumulate IT engineering technology and experience for the improvement of products and production lines with model effect, which can be expanded to cover other industries and provide ESO services to large key manufacturing companies in relevant industries both from home and abroad.
- **To drive initiatives of enterprises by sample projects**: to select key industries to build sample projects and successful

cases to demonstrate the production of high efficiency and improved responsiveness brought by informatized productions and drive initiatives of other companies in the same industry to use engineering service outsourcing.

- **Support the transformation of companies**: to support companies with the conditions to transform from companies providing equipment to master contract service companies providing system integration, from companies providing products to companies providing overall solutions develop a number of system integration service providers for automobile, electronic information and machinery, full leveraging the system solutions as stickers for the integrated development of manufacturing and internet and hence promote the engineering service industry development.

- **To encourage introduction of hardware and support construction of platforms**: to promote the full interconnection of production, quality control and operation management systems by encouraging companies to closely integration of internet and all links of the industry chain via subsidies and budget supports, speed up industrialized development of sensors, process control chips and programmable logic controllers, build physical information system reference models and comprehensive technical standard system, build testing and validation platforms, support compatible adaption and interconnection and mutually operable testing and validation.

- **To encourage manufacturing companies to set up service branches**: to encourage large manufacturers to invest and establish production engineering service entities or have system solution business spin-off or restructuring to provide professional, scale and marketable services to the industry including factory/factories' design, production innovation technology development, engineering contracting and system controls.

- **To promote professional engineering service outsourcing**: to encourage companies to provide or purchase professional production engineering services, support IT information and software companies to undertake outsourcing of production process management and production line enhancement from manufacturers based on advanced information technology and encourage information technology service companies to provide system design and business process rebuilding and provided complete solutions of integrated software and hardware and combined management and controls based on customer demands.

- **To speed up the building of public service platforms**: to speed up the development of a number of key vehicles, building a number of public service platforms of public service outsourcing technology, information service, trade promotion and intellectual property rights protection for industrial engineering services, facilitate the clustering of high-end factors and provide full high-end production engineering services for manufacturers based on the fundamental and common production engineering services needs of manufacturing industries. The government shall lead the construction of a number of manufacturing engineering data center in key areas to provide companies with open and shared services of innovative knowledge and engineering data, plan exchange platforms and assist manufacturing companies in the exchanges with IT information and software companies.

- **To promote the cooperation between industries and academies and speed up talent development**: companies participating in the pilot projects shall set up talent training mechanism together with key universities and colleges to facilitate the development and reservation of talents in IT and ET. Innovation platforms for key industries shall be well developed and advantageous research resources from relevant universities and research institutions from home and abroad to facilitate the conversion and promotion of technical research and development and science and technology deliverables and innovations of the industries and companies.

- **To support companies in overseas business exploration**: to encourage capable service outsourcing companies to explore overseas market and foster a number of production engineering service outsourcing companies known to the

international market.

- **Ultimate target**: to provide customized ESO services for specific industries as the first ESO industry cluster for relevant large manufacturing companies both home and abroad.

Expected Project Values and Deliverables:

- To realize production management optimization;
- To improve production of high efficiency and demand responsiveness;
- To reduce losses and security risks caused by equipment breakdowns;
- To obtain knowledge capital and access to market in the destination market of outsourcing services.

III Comprehensive Logistics Control Center

Purpose: to introduce advanced intelligent equipment into the logistics sites and enhance logistics comprehensive service capability and quality leveraging ICT technology promoted by Chongqing Municipality in existing logistics services.

[Case III] Airline Logistics Assistance Project Jointly Developed by Japan Airline and Nomura Research Institute

Introduction of smart equipment to logistics sites and enhanced digitalization and networking of logistics using advanced ICT technology are the development trend of modern logistics. In recent years, leading countries have launched pilot projects in some key logistics nodes and the airline logistics assistance project jointly developed by Japan Airline and Nomura Research Institute has entered into the pilot operation stage. Equipped with wearable smart devices, staff on the logistics sites can send information identified via images to the cloud and realize exception testing via big data processing and cloud computing to realize exception examination and facilitate real time monitoring and instruction of the logistics operation center in the country for a highly efficient, secured and safe logistics services.

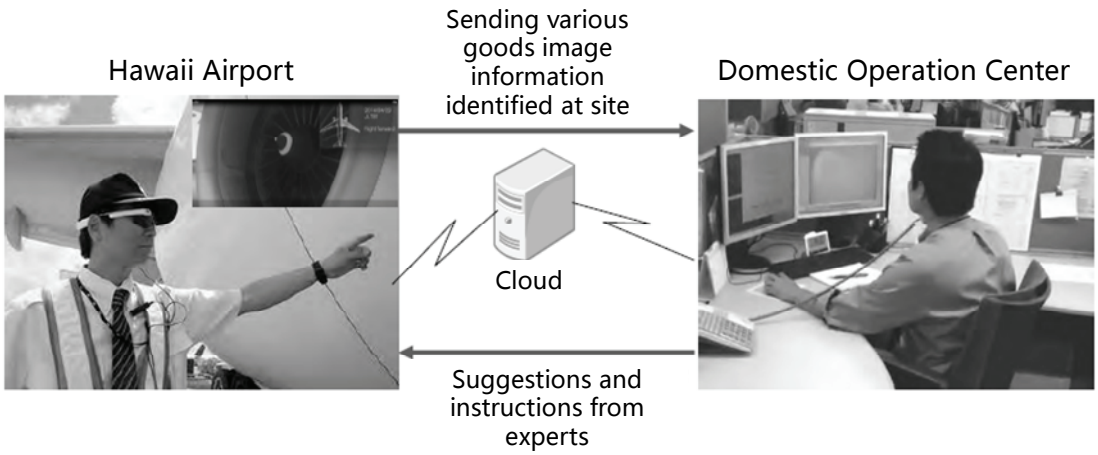


Chart 12: Airline Logistics Assistance Project

In reference to the above case and considering the location of Chongqing as the logistics hub of Central and Western China

and existing resources such as the comprehensive logistics information platform under developing as well as the facts such as encouraging and supporting policies on developing data center warehouse technology, sensor technology, robot and cloud computing industries, we hereby propose the specific development roadmap, means of realization and ultimate target of intelligent logistics control platform development project for manufacturing as follows.

- **To improve existing logistics information platform structure and level**: to capture the latest status of goods via advanced ICT technologies such as cloud computing, big data, mobile internet, internet of things, Beidou Navigation and geographic information (including the actual or real-time goods disposal status not able to be captured by existing comprehensive logistics information platform), and strengthen networking and digitalization of logistics management services. In addition, manufacturers shall be provided with integrated services such as supply chain planning, supply chain logistics, supply chain finance, supply chain e-commerce and information recourses to realize the full process identification and follow-up of raw materials, spares and parts, semi products, finished products and product consumption.
- **To introduce advanced smart devices**: to introduce advanced smart devices such as wearable devices to logistics sites within the region and capture real time status (actual status, location of goods) and give integrated instructions via control platform leveraging the new logistics system built on existing technology and experience including robots, cloud computing, sensors and data centers to ensure high quality transportation.
- **To develop demands of specific industries**: to develop logistics demands for special manufacturing industrial products such as precision machines to guide the synergized development of industrial logistics and industrial bases and implement industrial logistics demonstration projects.
- **To enrich types of logistics companies**: to guide and encourage large manufacturing companies and business and trading companies in automobile, chemical and pharmaceutics industries to spin off logistics business and foster and develop professional and social third party large logistics with enhanced supply chain management services and encourage small and medium logistics company to provide professional and refined logistics services and guide large logistics companies in integrating business and resources to build full process logistics.
- **To optimize supply chain management services**: to support a number of large modern leading companies with high professional service level, strong integration service capabilities and regional influences to improve digitalization, informatization and precision of delivery and distribution services of logistics companies, focusing on improving supply chain management services for manufacturing to promote the highly efficient flows of information, goods and funds and modern corporate management model such as zero inventory management to form demonstration effect.
- **Pilot projects along key logistics routes**: pilot projects can be considered along major cargo routes within the region such as “Chongqing-Xinjiang-Europe” International Railway and promote innovative technology and successed experience to all logistics nodes within the region and finally provide services for domestic and overseas demands.
- **Ultimate Target**: to promote technology and management experience to more logistics nodes, warehouses of corresponding domestic and overseas demands (such as special goods movement) and apply integrated management for logistics services with automation, efficiency and security.

Expected Project Values and Deliverables:

- To achieve high efficiency of logistics:
- To improve reliability via transparency of transportation management;

- To improve security of logistics services to move precision machines and parts of which is higher difficulties.

IV. Highly Intelligent Manufacturing Support Center

The highly intelligent manufacturing support center proposed by Nomura Group for Chongqing aims to support the construction of three platform projects including above mentioned manufacturing design service platform, manufacturing production engineering service outsourcing platform and smart logistics control platform for manufacturing in six aspects including system/mechanism structuring, policy supports (on public finance and taxation), financial services (financial assistance), intellectual property rights protection system, talent training/introduction plan development, exchange platform (for industries and regions) building.

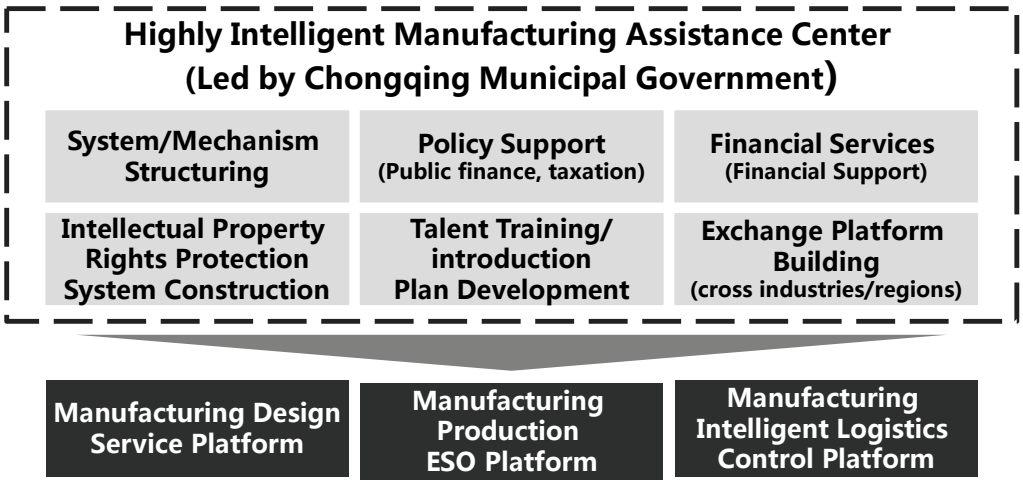


Chart 13: Functions of Highly Intelligent Manufacturing Assistance Center

- **System and Mechanism Structuring:** to promote simplified regulation, balance of regulation and free development, optimized service reform, relaxed market access of new product and new business pattern with enhanced regulations in the process and post implementation and enhanced service capabilities and levels for companies. The linkage function of industrial association and agents shall be utilized, following the informatized manufacturing service development trend.

- **Policy Support:** to leverage existing funding channels within public finance of the municipality to set up specialized capital and funds to promote service trade related to manufacturing and increase investments in key links and areas in service oriented manufacturing and production service development and provide supports to demonstration projects by implementing equipment intelligent rebuilding for qualified companies. Third party information services for procurement of manufacturing companies shall be encouraged. Preferential taxation policies for key projects shall be developed and VAT deduction scope for manufacturing companies shall be expanded in the pilot of fully promoting business tax replacement with VAT. Preferential policies on VAT shall be implemented to support manufacturing companies to develop new internet based business or have joint investment and corporation with internet companies. Additional deduction of research and development design costs and preferential income tax policies for hi-tech companies shall be studied.

- **Financial services:** to assist companies to resolve possible funding difficulties in the digitalization, network and intelligence reform from multiple financing channels to share risks corporate is facing. A number of key companies may be

selected for trial cooperation between industries and financial channels with financial products and service innovation such as clean loans, financial leasing and security against pledges. Financial institutions are encouraged to provide one-stop systematic financial services including settlement, financing, wealth management and consulting to further promote intellectual property rights pledge and innovative securities and actively explore diversified credit risk sharing system.

- **Development of intellectual property rights protection system:** relevant policies, regulations shall be developed for intellectual property rights protection in new business models to build intellectual property rights operation service network of reasonable structure, clear arrangements and sustainable development.

- **Development of Talent Training/Introduction Plan:** to support universities to set up relevant majors of innovative design, Internet Plus and production engineering and strengthen talent training of high end applications. A number of professional talent training bases for integration of industries, academies and applications shall be set up in key universities and colleges, large companies and industrial parks with active promotion of new prentice pilot projects similar to the dual system of Germany vocational education and provide preferential talent attraction policies to attract high end talents in specific fields to work and live in Chongqing.

- **Exchange Platform Development:** to encourage cooperation and exchanges cross industries, cross disciplines and cross regions and promote new alliances between government, industries, academies and research institutions to make breakthroughs in key common technology, develop integration standard and build public service platforms. Joint promotion of service trade derived from Made in China and exploration of overseas market by industrial associations, industrial alliances and companies shall be supported in the implementation of key national strategies such as “One Belt and One Road” to enhance capabilities of “importing” and promote new service trade development leveraging innovation resources such as global talents, technology and intellectual property rights and learning from international advanced operation management models.

Applying "Internet +" Advantages, Creating Re-export Trade and Headquarters Trade

Chey Tae-won

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Chongqing is located in western China, it is the only municipality in the Midwest. Because it is landlocked, the development of international trade and international logistics has been far behind the eastern coastal areas. However, "One Belt One Road" Corridor completely changed this situation. Now, high value or time-sensitive goods such as the car, special steel came from Central Asia, the EU and other regions, being transported through this channel to Chongqing or other countries and regions transiting in Chongqing. Meanwhile, the high value-added products from other regions are also through Chongqing, export to Europe by the "Yu Xin Ou" Railway more quickly and efficiently. "One Belt One Road" Corridor is being pushed to the front of the Chongqing international trade.

Chinese government is implementing the "Internet +" program. We hope that through the integration of the Internet and traditional industries, promote industrial upgrading and transformation. By analyzing the development of international trade and the Internet trade experience, and combining the advantages and disadvantages for Chongqing local conditions, this paper will explore the application of "Internet +" advantage, and referable path of the development of re-export and headquarters trades.

1 The development experience of international re-export and headquarters trade

1.1 Concept and form of international re-export trade

The concept of "re-export" in international trade generally refers to the import and export transactions of goods carried out through third countries resale transactions. Trading goods can be shipped to a third country by the exporting country, without processing (change packaging, sorting, selecting, sorting and other processing omission on) in a third country and then sold to the consumption countries; or may not be through a third country and transported directly from producing countries to consuming countries, but does not occur trading relationship between producer and consumer countries, rather than the transit countries occur trading relationship respectively with producing and consuming countries. The re-export country (Country C) signs import trade contract with the exporting country (Country A), and signs export contract with the importing country (Country B), this means that the trade contract completed by the international trade process from Country A - Country C-Country B, which shown in FIG 1.

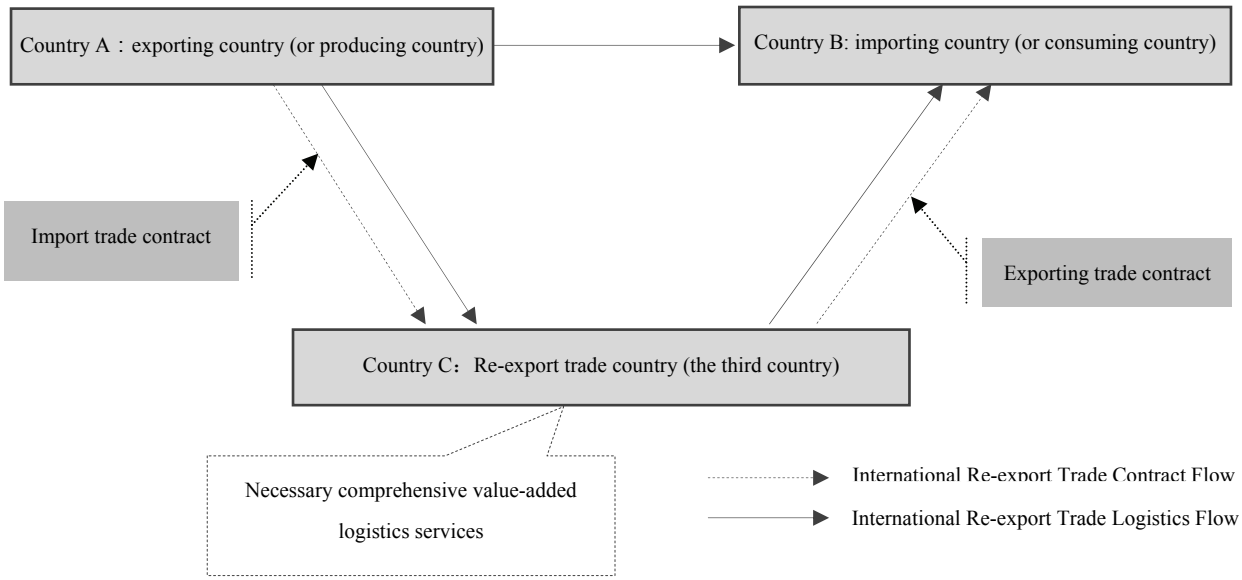

FIG 1 Schematic Diagram of International Re-export Trade

According to practice, we can define "re-export trade" further into regions. The foreign trade By one country transiting to the region, could be included within the re-export trade scope of the region of the transit of, and belongs to the category of re-export trade.

In terms of third countries broker, can bypass some re-export trade barriers and may not be subject to customs duties and VAT, reduce the transaction costs, and also can bypass the import and export license, trial price, quality and other aspects, accelerate the speed of the flow of goods. So, more and more foreign trade enterprises have set foot in this area.

Re-export activity reflects the economic connection between different regions and interregional economic links between the region and outside, including the economic relations between the international and domestic regions.

1.2 Development experience of international re-export trade

International re-export trade is an important form of international trade, which generates and develops along with the development of international trade. Especially since the 1980s, it has become the most important form of international large-scale international transport in Hong Kong of China, Singapore, Cologne, Hamburg and Amsterdam (more than 40% and even 70% of the cargo out of the port), and became one of the most important dynamics of national or regional economic growth.

Some experts believe that the construction of the transit environment, especially the policy environment is crucial for re-export, its performance showed in the implementation of free trade policy and financial freedom policy.

The following are a few of the more successful cases of regional development of international re-export trade, and their successful experience can be used for reference.

1.2.1 Hong Kong

One of the important reasons to maintain Hong Kong's re-export trade advantage is the non-intervention policy it pursued. At present, the policy embodies in the "four freedoms", namely free trade, free enterprise system, free foreign exchange system and the free entry and exit system. Except few field and behavior limited by handful of local laws, the economic activities substantially are out of interference, enjoying a high degree of freedom.

1.2.2 Singapore

Singapore is also an important international re-export trade center. A central location and excellent port provide favorable conditions for Singapore re-export trade.

By strengthening and modernization of port management continually, Singapore promotes to increase the levels of the port electrification, mechanization and computerization.

Actively expanding the business partners and build up the establishment of trade relations of cooperation is an important contributing factor to the development of Singapore's re-exports. With the FTA, Singapore has attracted more than 80 countries and regions, to establish specialized trade agencies in the local.

1.2.3 Dubai

Compared with Hong Kong and Singapore, Dubai is the world's third largest trading port.

Compared with Dubai, other Muslim countries have more commerce and trade restrict, while infrastructure, logistics and financial services system is not sound. Therefore, traders from neighboring countries are willing to transfer into or out of the cargo via Dubai, or directly buy stock and sell their goods from around the world to the professional market brokers in Dubai.

In addition, as a re-export port, Dubai has the following advantages:

Firstly, geographical advantages: Dubai is an important strategic position of "five seas three continents", the midpoint of the East-West transport routes and trade hub, it radiates to more than 30 countries including the Middle East, Africa, southern Europe and Xi Yada. In Dubai we can find the businessmen from all countries and regions of the world;

Secondly, the economic policies and trade environmental advantages: UAE economic policies are open and free, its stable market gets long-term development; re-export tariffs are free; its import and export are not implemented cargo quota restrictions.

In summary, the advantages of re-export countries and regions may be determined by a variety of conditions, including natural conditions, economic and social conditions, and so on. We Can summarized it as two categories of tradability and re-export factors:

(1) Tradability factor conditions

Commodity Tradability can be decided from the following factor conditions: the internal elements such as production cost (whether there is a stable and price-competitive goods origin), distribution costs, sales and administrative costs, and the outside elements such as ariffs, taxes, market accommodating (whether there is stable goods demand or the hinterland support).

(2) Re-export factor conditions: Including aspects of natural endowments, institutions, policies and services.

① Natural endowments

Whether it is located in the main hub of international routes between or around; whether they have sufficient scale open harbor or pier and cargo terminals; whether there are maritime transport, river transport and international road transport capacity; whether equipped with modern port facilities and efficient logistics services.

② Institutions, policies

Open economy institution and free port policy. Whether to take the free-trade policies, such as free port, free trade zone, so that the transfer fee will not be too high; whether there are legal protection of local and international standards and stable political environment and social order, to ensure security of trade and goods and fair transactions.

③ Services

Whether there are developed and complete service systems of finance, insurance and information.

International Finance issues from international trade, international trade appears earlier than international finance. Re-export trades mainly focus on bulk products, so high-value goods occupy a large amount of money, need to be supported by banks. Some offshore operations services related to re-exports, for example, banking offshore settlement requires supporting of the financial services industry.

In addition, whether the informatization construction of the port and trade meets the demands of modern trade patterns, the customs and other administrative services are efficient and f provide fast, convenient and simplified work environment for business. These are factors that influence the development of re-export trade.

In short, according to local conditions, use of the existing natural conditions actively and create new economic, social and political conditions will be conducive to develop the advantages of re-export.

1.3 Advanced development experience of international "headquarters trade"

"Headquarters trade" corresponds to "trade center". According to different operating modes, the regional headquarters can be divided into production type, R & D type, trade type and logistics type. Among them, the trade type headquarters refer to a single or a combination of headquarters procurement which is equipped with distribution, marketing, billing, logistics and other business functions in domestic and foreign enterprises of certain regions of China, it contains both traditional trade enterprises and platform type trading enterprises with internet-based information technology, engaging in matchmaking trading or providing support services.

Trade type transnational corporation regional headquarters have the following characteristics: Firstly, there is no production entities in the host country, its production bases mainly are arranged in the domestic or other areas; Secondly, the host country is mainly engaged in import and export, product sales and other trading and investment activities; Thirdly, the regional headquarters under the jurisdiction of the value chain generally involves marketing, service and other basic functions.

Gathering the headquarter corporations constantly could be an important driving force of regional economic growth. The main features are shown as follow:

(1) Tax contributions effect. VAT, income tax and urban construction tax, additional education of headquarter corporations are all paid in the enterprise registered place, where the headquarters located. It is also including personal tax contributions of headquarters employees.

(2) Industry pulling effect. Trade type based headquarters settle in the region continually, directly promote local business

development, and also attract the ancillary finance, insurance, logistics and other business groups to settle, which will facilitate rapid formation of industrial clusters.

(3) Consumer driven effect. Mainly reflects on two aspects:

The first one is a variety of supporting consumption necessary for the business activities of the headquarters and protecting the business activities. Business activities, will inevitably bring about the development of office equipment, communication facilities, transportation equipment, and also hospitality, catering and entertainment industry; gathered headquarters attract talented people to join, which will inevitably bring about the development of the real estate industry, and so on.

The second one is the personal consumption of headquarters staff, including housing, transport, children's education, health, tourism, shopping, etc., which plays an important role to promote regional economic development.

Trade type headquarters are the benchmarking and leading companies, have a significant influence on the industry, they are the main force of local trade center construction. Trade type headquarters, strengthen distribution hub function of flow of regional goods flow, capital flow, talent flow and information flow, and promote the construction of regional trade, financial and shipping center, which can effectively enhance the hub and competitiveness areas.

As an international metropolis, Singapore and Hong Kong are successful cities of free trade and headquarters economy joint development. Practices and successful experiences in these areas have important reference value for the development of headquarters economy of Chongqing.

1.3.1 Development experience of international headquarters trade: Hong Kong

From the example of Hong Kong, it comes into being interaction between headquarters trade and the free port of. Entering of multinational companies Headquarters is ascribed to the Freeport background of Hong Kong. Freeport brings convenient transportation, the level of information, legal environment, human resources, services systems (such as the TDC, etc.), has become a hotbed of development of headquarters trade. Similarly, the business of headquarters make Hong Kong's trade international and shipping center position have been strengthened, so that Hong Kong really become an international financial center and an international trade center.

As the world's largest free trade zone, Hong Kong has its successful experience on promoting economic development of headquarters:

Firstly, Hong Kong promotes trade freedom, investment freedom and financial freedom, and creates a completely free business environment. Hong Kong escalates Manufacturing headquarters development model to the service of economic development mode, the fundamental reason lies always adhere to in the concept of free trade and non-intervention policy.

Secondly, low tax rate promotes economic development of headquarters. According to the survey, of all the main factors affecting the development of multinational regional headquarters in Hong Kong, simple and low tax regime, free flow of information and the integrity of the government are the top three, and the factors of favorable geographical position and the status of free port, etc. are at the back.

Thirdly, provide headquarter corporations required "hardware" and "software" for normal operation. The hardware includes the construction of docks, airports, roads, communications facilities; the software includes popularizing education, training labor, providing advisory services.

1.3.2 Development experience of international headquarters trade: Singapore

Singapore develops linkage relations of Free Trade Area and headquarters economy, its success are:

Firstly, the development of the FTA improves the financial system and modern services, creates a high quality, high efficiency, low cost of operation and management environment for headquarter corporations.

Secondly, the common development of gathering headquarters economy and regional economic cooperation: Singapore uses the production factors such as cheap labor, resources and land of neighboring countries, enlarges their own free trade zone facilities, constantly optimizes the division layout of headquarters and manufacturing base, enhances the radiation force of headquarters economy.

Thirdly, Singapore implements effective economic development policies of headquarters. In order to attract more multinational headquarters, the Singapore government has taken various measures targeted promotions based on different categories of headquarter corporations. For example, develop the "Authorized international trade plan" for the trade headquarters; develop different incentives respectively for the commercial headquarters and business headquarters; and so on.

When analyzed of the problem of re-export trade, Chinese Embassy in Singapore re-stated that multinational companies were the main force of re-export trade in Singapore. These multinational companies through its regional headquarters marketing in the global market network, not only take Singapore as their intermediate product processing center, and also run a lot of re-exports, turn the country into a transit point for import and export.

Some successful experience of Hong Kong and Singapore has some inspiration and reference for the development of Chongqing headquarters trade.

First, the development of the FTA has great promoting role to headquarters trade.

Second, the FTA does not restrict the size and the investment amount of the headquarter enterprise.

The third one is incentives and financial freedom policy and tax policies.

1.3.3 Development experience of international headquarters trade: Beijing of China

Both as the Chinese inland provinces and municipalities, Beijing’s experience of international headquarters trade has direct reference to Chongqing.

According to the volume ranking provinces of China's import and export trade in recent years, Beijing was the only trade inland provinces of top five. It dues to the huge contribution of re-exports (accounting for about 60 percent of Beijing's total import and export share). State-owned enterprises have greatly influenced the change in Beijing re-exports. The reasons for this are as follows:

The First one is the principle of territorial statistics. International trade regulations are summarized in registered businesses, regardless of trade place and port clearance of goods. Beijing is the registered headquarters of a large number of state-owned enterprises, the turnover of goods necessarily summarized in Beijing;

Second, the state-owned enterprises can take advantage of Beijing abundant financial resources, through a variety of ways to get import and export credit loan, insurance and letters of credit from financial institutions to enable foreign trade full financial support;

Third, Beijing's state-owned foreign trade enterprises have maintained business advantage of international trade conferred

by system. Some state-owned enterprises have a monopoly on foreign trade. Further, as the corporate headquarters typically have extensive trade network and a strong purchasing power, which has established a good reputation in the customers, so domestic and foreign traders and manufacturers are willing to choose this type of companies to complete the import and export business.

Thus, the headquarters of multinational companies, large foreign trade companies, foreign trade and business associations are gathered in Beijing, this provides guarantees and advantages for the re-export trade development.

2 Conditions of Chongqing developing international re-export trade and headquarters trade

2.1 Opportunities and challenges to Chongqing development given by deepening regional economic cooperation of "Yangtze River Economic Belt"

Yangtze River Economic Belt stretches across central and western China, from Shanghai to Yunnan, passes by 9 provinces and 2 cities such as Jiangsu and Zhejiang. Watershed area is about 2.05 million Km^2, more than 1/5 of the land area of China, its population and total economy are more than 40% of China, so it is a huge economic belt.

On January 4-6th, 2016, General Secretary Xi Jinping researched in Chongqing, he pointed out that, and promoting the development of Chongqing Yangtze River economic belt provides the important carrier for Chongqing integrating into central and eastern better, development of Chongqing has tremendous potential and bright prospects. Yangtze River Economic Belt will bring many opportunities in Chongqing, while Chongqing will meet the more severe challenges.

2.1.1 Opportunities of Chongqing

(1) Gather new energy to improve the comprehensive transportation system in Chongqing.

During the Yangtze River Economic Belt construction, our country will coordinate development of waterways, railways, highways, civil aviation, pipeline and other major infrastructure construction, to promote the channel, high-speed channel, Intercity Express Railway and airport construction for Chongqing, improve the quality, efficiency and modernization of the city's comprehensive transportation system.

On September 25, 2014, the State Council issued the "Comprehensive three-dimensional transport corridor planning of Yangtze River Economic Belt". On August 31, 2015, adopted the "Chongqing implements Three-year Action Plan of the state""One Belt One Road" "strategy and the Yangtze River Economic Belt Construction ". A series of plans and programs inject new energy for improving the comprehensive transportation system in Chongqing.

(2) Inject g new impetus for promoting economic restructuring and upgrading of Chongqing.

During the Yangtze River Economic Belt construction, our country will use policy instruments of national investment, industry, environment and land, promote the central and western regions orderly undertake and transfer to the coastal industrial, provide good opportunities for Chongqing to expand industrial belt along the Yangtze River and promote industrial clusters upgrade.

(3) Build new platforms for the open upgrading of Chongqing.

Construction of the Yangtze River Economic Belt is conducive to play a demonstration effect of Shanghai FTA, the additive effect of regional economic integration and expanding effect of opening up, build the inland open-type economy

highland. For example, Chongqing is to be achieved to open from five aspects of large platform, major thoroughfare, customs clearance, big industry and big environment.

(4) Provide new support to enhance the ecological advantages of Chongqing.

Construction of the Yangtze River Economic Belt puts the Yangtze River ecological security in a more prominent position, strengthens integrated watershed environmental governance, and builds green ecological corridor. Meanwhile, the various provinces and cities to establish mechanisms of the ecological environment cooperative protection and governance, enhance cooperation, which offers great opportunities for Chongqing to innovative cross-regional ecological cooperation mechanism and promote the construction of urban ecological economic zone.

2.1.2 Challenges of Chongqing

(1) The economic strength needs to further enhance.

According to statistics, Chongqing capita GDP 52550RMB in 2015 is 51% of Shanghai, 60% of Jiangsu, 67% of Zhejiang. In the development stage view, the Yangtze River Economic Belt coastal areas have entered a post-industrial stage, while Chongqing has just entered the mid-industrialization, so the economic strength needs to further enhance. Chongqing's economic growth in recent years has been continuously in the forefront of our country, showing a rapid catch-up momentum.

(2) Regional competition is intense.

Yangtze River Economic Belt regional competition is intense. Influenced by siphonic effect, large number of high-quality talents, resources of Chongqing easily absorbed into the Yangtze River Delta region. In addition, serious industrial structure phenomenon between Chengdu and Chongqing area (up to 90%) resulted in inefficient allocation of resources. What's more, repeated construction of the Yangtze River wharf, ignored not only the market demand, but also the maximum navigable pressure that the dam can withstand. In short, under the background of strong regional competition, Chongqing is more difficult to achieve rapid development by relying on the Yangtze River in Economic Zone.

(3)Need to further excavate the potential for innovation, and enhance regional innovation capability.

Due to historical reasons, Chongqing innovative foundation is weak. In addition, since the degree of integration of the Yangtze River Economic Belt is not high, many barriers hinder orderly flow of innovation subjects and innovation resources, which resulting in Chongqing regional innovation capability lags behind that of the eastern coastal provinces (in 2015, Chongqing ranked eighth in the country). Because of the huge potential of innovation in Chongqing (in 2015, its innovation potential ranked first in the country). Chongqing needs to further tap its potential and improve the regional innovation capacity in the future.

(4) International trade professionals need to be further enriched.

Due to the landlocked Chongqing, international professionals in the history were inclined to inflow eastern region. With the establishment of Chongqing bonded port and future free trade area, the demand for trade professionals will increase. International professional talent pool needs to be further enriched.

(5) Ecological civilization pressure increases.

As an industrial city of Chongqing, a large-scale heavy industrialization generates external diseconomies on water resources, atmospheric environment, biological diversity. Yangtze River ecological environment poses a potential threat, the construction of ecological civilization pressure increases.

2.2 Advantages and disadvantages analysis of Chongqing developing international trade and headquarters trade

2.2.1 Advantages conditions analysis (Strengths)

As an important strategic fulcrum of the Silk Road Economic Belt, industrial hinterland of the Maritime Silk Road and the switch center of western Yangtze River Economic Belt, Chongqing need to clear its own advantages and effects, in particular its geographical advantages with the golden waterway, and the Three Gorges Reservoir.

(1) Possess the advantage of tradability feature

First, the Chongqing has the cost elements of developing re-export trade. Overall, compared with international standards, the labor costs and the transaction costs are lower in Chongqing.

Secondly, Chongqing has functional elements of business center of developing re-export trade. In, total import and export Chinese provinces area rankings of 2015, Chongqing ranked first in the 12 western provinces and autonomous regions. It was up nearly 1/4 of western Sichuan, which ranked the second. Chongqing's status of the western trade center is gradually prominent.

(2) The advantages of re-exports elements

① Unique geographical advantages

Location factors: Chongqing in the important junction point of "One Belt One Road" and Yangtze River Economic Belt "Y" shaped big channel of China-Indochina Economic Corridor, has the unique geographical advantages of taking over the east and west, connecting the north and south, it is not only the important strategic fulcrum of the Silk Road Economic Belt, but also the western hub of Yangtze River Economic Belt and the industrial hinterland Silk Road on the sea, so Chongqing has a unique geographical advantages in the western provinces.

"One Belt One Road" makes Chongqing increasingly important as the international logistics node. In recent years, Chongqing International Logistics scale has expanded rapidly in 2015, "Yu Xin Ou" cargo is up to 2.1 million TEUs, which achieved an increase of 97%, and highlighted the status and role of Chongqing as an international logistics node.

② Transportation advantages

Chongqing has "Yu Xin Ou" west railway line, east to the Yangtze River waterway. It has road, rail, air transportation hub in southwest region, is the shipping center of the upper reaches of the Yangtze River. Therefore, Chongqing provides a good foundation for the development of transit trade function.

③ Platform advantages

Inland has the only national level three-ports of "water, land and air" (railway Port, Seaport, Airport Port) in inland areas and three free trade zones (West Wing comprehensive bonded zones, Cuntan bonded port, Two-way Airport Free Trade Zone),they combine mutual support effectively.

④ Policy advantages

As the only municipality and the center city of the country in western China, Chongqing with both the country's unique provincial rural comprehensive reform pilot area and following the Tianjin Binhai New Area, China's third state-level new area - Liangjiang New Area. On the basis of established bonded port area, Chongqing is planning to apply for to establish "China (Chongqing) free economic zone."

⑤ Talent advantages

Chongqing owns the research institutions such as Chongqing University, Southwest University of Political, and is equipped

with talent advantages.

⑥ City brand advantages

Chongqing gets the rapid development in the last ten years, is economic and trade center of the upper Yangtze River, west industry highland, shopping capital, fashion capital, gourmet capital, exhibition capital ..... becomes Chongqing city card, make the visibility and competitiveness of the city of Chongqing rise day by day. This will help to further attract headquarter corporations to settle, boost headquarters trade develop.

⑦ Environmental advantages

"Chongqing Promoting Ecological Civilization Construction Forestry Plan (2014-2020)" proposed goal of building important ecological barrier of the Yangtze River Basin. In 2014, the city's forest coverage rate reached 43.1%. Improved ecological environment will help to further attract headquarters corporations to settle.

2.2.2 Disadvantages conditions analysis (Weaknesses)

Chongqing is a mountain city, lies in rugged terrain and is inaccessible, though there are already improved than before, but also need to continue to strengthen. Secondly, as a municipality, Chongqing is a typical big city with a large rural, urban dualization is outstanding. Finally, the industry innovation and creativity of Chongqing financial development is weak, also, small size and overall structural imbalance and other issues, have become the bottlenecks of construction of the western financial center of the upper Yangtze River:

① Financial system is imperfect;

② Lack of listed companies resources, capital markets short board is more serious, and is far from the target of western China construction and the Yangtze River financial center;

③ Lack of financial professionals;

④ Chinese people mainly aggregate in the economically developed eastern coastal regions, located in the western region-Chongqing does not have regional advantages and economic basis of for the competition about talent with the eastern region, and emerging industry is a sunrise industry, the competition for talent between regions is increasingly fierce.

3 Applying "Internet +" advantages, creating re-export trade and headquarters trade

3.1 Promoting role that the Internet gives to international trade

"Internet +" means "Internet + various traditional industries." In virtue of the information and communication technologies and the Internet platform, Internet and traditional industries get in-depth integration, which can create new ecological development. On June 24, 2015, Chinese State Council executive meeting approved " ‘Internet +’ Action Guidance", which marked the "Internet +" action plan began to implement.

With the explosive growth of the Internet, big data, cloud computing and other information technology, the information, warehousing, logistics, payment, security and other upstream and downstream industries and traditional industries, modern services being fully integrated, Internet + trade become an irresistable trend.

"Internet +" new model applied in foreign trade, can improve competitive advantage of foreign trade in the short term, promote international trade and innovation, to make a major shift in international trade patterns.

Cross-border e-commerce is a new trade activity and pattern, it refers to the transaction parties use modern information technology to all kinds of cross-border transactions in digital domain, through e-commerce platform to fulfill the transaction and payment settlement, and through cross Habitat logistics delivery of goods, to complete of an international business transactions.

With the rapid development of e-commerce, a new type of trade represented by network platform has become an important integral part of international trade, and in the future it is expected to become a new international trade system that integrated with intensive production, trade, finance, logistics and service.

Data from the China Electronic Commerce Research Center data show that in 2013 Chinese cross-border electricity supplier transaction size is 3.1 trillion RMB, year-on-year growth is 31.3%, accounting for 11.9% of total import and export trade. In 2014 Cross-border electricity supplier transactions reached 4 trillion RMB, year-on-year growth is 30.6%. Far higher than in 2013 and 2014, China's foreign trade growth rate (year growth rates of only 7.6% and 2.3%) in 2016, Chinese cross-border electricity supplier transactions will reach 6.5 trillion RMB, accounting for 20% of the entire foreign trade scale, the average annual growth rate of nearly 30%.

The e-commerce represented by Internet reduces transaction costs and prices costs, improve increase transaction efficiency and create additional business opportunities, thereby contributing to the development of international trade. Freund and Weinhold (2004) used cross-sectional data regression in 56 countries from 1995 to 1999, found that development of the Internet and foreign trade growth during 1998 and 1999 were significantly correlated. When each increase gets 10 percent in host country, exports will increase by 0.2 percentage points.

Due to the development of Internet technology, global transportation management system optimizes trade flow through the supply chain. Improvement of the logistics chain improves the efficiency of the global transportation.

Internet technology allows cross-border customers to access account more conveniently, cross-border payment and settlement capacity is increased, which give birth to the professional cross-border payment services and bring development needs of the financial industry.

As "Internet +" continues to develop, will make the market before the traditional labor-intensive industries less competitive. In order to "Internet +" era of development of foreign trade, China's foreign trade enterprises have to seek transformation, new high-tech future participation in foreign trade will become mainstream. China's foreign trade industry structure will also be adjusted to the high-tech industries.

3.2 Recommendations of applying "Internet +" advantages, creating re-export trade and headquarters trade of Chongqing

Chongqing's foreign trade has been dependent on the traditional model, which limits its development to some extent. Chongqing is still in its infancy about using the "Internet +" in foreign trade, so it needs to foster the competitive advantages urgently.

3.2.1 Cultivate the tradability and re-export elements of Chongqing re-export trade

(1) Cultivate tradability feature.

Full use "Yu Xin Ou" Railway and the Yangtze golden waterway, truly reduce logistics costs, while also reduce the

administrative costs; actively explore Central Asia, Europe, the ASEAN and Chinese markets to expand trade in the hinterland.

(2) Build an international hub ports, promote the growth of re-circulation of elements of service, and promote the re-export trade. Build a modern logistics system, increase network infrastructure construction. Strengthen the logistics channel construction, overcome the inland disadvantages.

Improve cross-border logistics system. By connecting "Yu Xin Ou" and Chongqing Airport, the Yangtze River waterway and land access, expand the electricity supplier freight transport corridor.

① Further strengthen "China-EU trains", exchange cooperation with sister cities, dredge a large international trade highway from Chongqing to Southeast Asia, really integrate into Indochina Economic Corridor.

② Increase opening of the Upper Yangtze River shipping center, and increase the proportion of international transit port of Chongqing.

(3) Develop bonded zones, domestic and international re-export trade in bonded port, promote the growth of Chongqing re-exports gathering elements.

① Implement several policies to help bonded zones and bonded port's transition to free trade zones and free ports:

The first policy is the offshore financial policies;

The second one is the policy of free trade. On the existing basis, further improve product privileges, exempt import and export tariffs, simplify customs procedures, accelerate the promotion of headquarters economy, integrate with shipping headquarters economy and trade headquarters economy to promote the development of re-export trade;

The third one is the free flow of goods policy, bonded Logistics Park in Free Trade Zone, Bonded Port to create a environment of "Release the first-line, tube the second- line, loose in area, flow freely", simplifying administrative segments and procedures for re-exports.

② Attract international companies to gather in Chongqing, to carry out headquarters trade and re-export trade. Famous foreign shipping agencies, foreign shipping companies gathered in Shanghai's, which will help Shanghai to attract large amounts of foreign transit sources, aggregation of large number shipping companies will further drive the company's re-export trade.

(4) Optimize and innovate Chongqing port services, and promote the development of re-export trade.

① Create a good social environment for economic development, attract more domestic, international logistics and trade enterprises to settle down, and expand transit trade.

② Deepen and promoting the "customs clearance" construction. On the one hand, speed up the "e-port" construction process, facilitate convenient customs clearance of goods. On the other hand, explore the customs administration reform and innovation actively, and improve service regulatory model.

③ Generalize the cross-border e-commerce payment system applications. Encourage local banks and payment institutions to accelerate product innovation, expand the scope of cross-border electronic payment service providers, and improve the efficiency of payment services. Accelerate the "cross-border e-commerce online payment platform" construction and popularize the application to cross-border e-commerce business enterprises in the city.

④ Construct cross-border electricity supplier clearance service system, promote electronic port construction, speed up the construction of cross-border e-commerce platform for customs clearance services. Construct and improve cross-border e-commerce services customs clearance system, and achieve its exchange with cross-border electronic customs clearance services provider platform data, and dock with cross-border electronic business platform, e-commerce enterprise, logistics

companies operating system. achieve cross-border electricity supplier goods convenient customs clearance and customs control through a single declaration (orders, waybills, list), list releasing, set loose single newspaper, etc..

3.2.2 Enhance government and business innovation and industrial optimization through the development of "headquarters trade"

(1) Enterprises should actively integrate themselves into the development of electronic commerce.

① Raise awareness of e-commerce development, strengthen the application of "Internet +" in the foreign trade enterprise management.

② Promote the information construction of enterprise from the implementation of infrastructure.

(2) The government should create a "Internet +" favorable environment for development

① Improve the level of e-government functional of departments' personnel, laid a good foundation for the smooth development of e-commerce has.

② Formulate some guide and encourage policies, so that enterprises can enjoy high-quality development environment for the e-commerce. The government introduces incentives, to provide "Internet +" virtual service business, give more preferential policies and special support.

③ Cultivate the growth of cross-border e-commerce platform and cross-border e-commerce leading enterprises. Vigorously introduce the well-known domestic and cross-border e-commerce platforms and well-known e-commerce enterprises, promote the development of cross-border e-commerce industry.

④ Promote the economic and trade enterprises to deepen the traditional e-commerce applications. Support large traditional trade enterprises to build online store through self, acquisitions, mergers, etc., combine the online and offline, to deepen the traditional foreign trade enterprise e-commerce applications, and promote the transformation of traditional foreign trade enterprise to upgrade the cross-border e-commerce.

⑤ Speed up the construction of the e-commerce software and hardware, strengthen the network infrastructure construction, promote the process of information. Improve the e-commerce laws and regulations in international trade to safeguard the healthy development of e-commerce.

(3) Government should create a favorable environment for the "trade headquarters" gathering.

① Influenced by factors that the application of the FTA test area, try to attract more higher-level corporate headquarters located in Chongqing; at the same time, relaxed the shackles of the existing headquarter corporations, to play its potential energy, which make them firmly be rooted in Chongqing.

② Cultivate industrial clusters with special advantages, develop ten strategic emerging industries, build renewable and new potential industries open systems. Endeavour to high Value trade orders for local.

③ Train the traditional foreign trade personnel and make them become the main backbone of cross-border e-commerce business. Intensify efforts of the universities trade disciplines, cultivate foreign-based professionals. Optimize the policies of talent introduction to attract international trade professionals.

By creating a development environment of "Internet +" and trade headquarters, we devote to forge Chongqing into e-commerce transaction center, financial settlement center and logistics center of cross-border trade in western China.

4 Conclusion

"One Belt One Road" strategy has brought new opportunities for the development of Chongqing's foreign trade. In order to promote the development of local re-export trade and headquarters trade, Chongqing should actively cultivate the two elements of local tradability and re-export trade. At the same time, on the base of positively applying for the establishment of the Free Trade Area of Chongqing, it should create a good economic and social environment favorable for headquarter corporations' settlement.

The "Re-export trade" and "Headquarters Trade" development experiences of Singapore and Hong Kong is significant for Chongqing, Chongqing need to fully absorb these experiences and actively try the possible cooperation among locals.

"Internet +" is a new idea that the current diverse businesses are using. It also has been used In foreign trade. As a new application model, "Internet +" is capable to promote foreign trade and enhance trade competitiveness, and accelerate the flow of various resources such as goods and services between regions. Chongqing should make full use of the advantages of "Internet +".

Due to historical reasons, re-export trade and headquarters trade in China have been gathered in the eastern coastal provinces. As the global sourcing hot spots gradually shifts into western China and the development environment of Chongqing port is optimized, Chongqing is expected to become another growth pole of foreign trade of China's western inland areas in the future.

Efforts to Utilize FinTech Effectively in China

Koichi Miyata,
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Abstract

- How to realize improvements in productivity by strategically harnessing the benefits of IT is a key issue facing China in its quest to achieve sustainable economic growth and development.

- In the past few years we have seen the rapid acceleration of IT innovation in the financial sector in addition to the emergence of FinTech.

- Major financial institutions no longer follow the traditional strategy of self-sufficiency but now collaborate with IT start-ups to enhance the quality and range of their services. This has contributed to the progressively borderless nature of the financial sector. As a result of being home to the largest Internet user population in the world, various business models that merge the Internet with finance/industry and enjoy economies of scale have arisen in China.

- Given China's substantial landmass, it was not viable for traditional financial institutions to establish financial infrastructure on a nationwide basis. As such, FinTech plays an important role in delivering financial services to individuals who could not access such services offered by conventional banks.

- Financial institutions must anticipate the future landscape of the financial services sector and adopt a proactive approach over the medium-to-long term regarding these new technologies. SMFG is strengthening efforts to promote innovation under the "Open Innovation" concept.

- On the other hand, when one considers that there is the possibility that new financial services such as those discussed in this paper will grow to such a scale that they impact the entire financial system, the establishment of a regulatory/administrative framework that balances the encouragement of innovation in new products and services with risk management and user protection is necessary. In this regard, this year's amendment of Japan's Banking Act to promote collaboration between banks and IT firms can be used as a reference. Furthermore, sufficient care must be taken from the perspective of consumer protection, AML (anti-money laundering), monetary policy, and capital flow controls.

- We cannot deny the possibility that as a result of advancements in ICT (information and communications technology), the volume of information and services that circumnavigate major cities located in the coastal regions will increase in the

future. Given this backdrop, in order to ensure Chongqing's further growth and development, initiatives such as: (1) attracting competitive IT firms to Chongqing and (2) securing skilled, qualified HR to support these firms must be implemented.

- China and Japan, who each have built up a substantial presence in East Asia's regional economy, should consider partnering with each other to take a leadership role in the construction of an international framework for promoting innovation.

1 Introduction

- China's economy cannot continue to rely on labor intensive industries or massive capital injections if it is to smoothly transfer to the "new normal", enter a stage of sustainable development, and continue driving global economic growth. To achieve this goal, China must realize significant improvements in productivity via continuous technological innovation which will only be possible by strategically harnessing the benefits of the Internet.

- Over the past few years, the Internet has increasingly become an integral part of a wide range of industries in China. This integration is no longer limited to industries such as communications and retail that were early in their adoption of the Internet, but now also encompasses industries such as finance and transport. The increasing integration of the Internet with business is making its citizen's lives more convenient, as well as contributing greatly to expanding added value. Given China's announcement of a national "Internet Plus" policy in the National People's Congress's Report on the Work of the Government last year, even more innovation can be expected as the Internet increasingly integrates with business.

- Having said this, economic revitalization and the enhancement of growth potential via innovation are also key issues for Japan, a country that has already experienced the transition to a stage of slower economic growth and is now dealing with a mature economy. The increased integration of IT and the Internet with society has not only brought about technological innovation but also the diversification of customer needs. As a result, the financial sector is rapidly undergoing major changes. The introduction of new services which integrate finance with IT and the entry of players from outside the financial sector are some examples. China should be able to benefit by referencing the various initiatives undertaken by Japan and other countries regarding FinTech and its impact on the financial sector.

2 The Integration of Finance and the Internet

- The financial sector is experiencing a rapid increase in IT innovation represented by the rise of FinTech, a contraction of "finance" and "technology". The World Economic Forum has defined FinTech as "the use of technology and innovative business models in financial services". For example, with the recent advances in ICT, IT start-ups are offering convenient, low-cost financial services to customers by developing new software and solutions; currently with a focus on online payment and remittance services.

- Banks have traditionally focused on building a sound business platform by applying stringent controls on the execution of financial transactions such as payments and the managing of customer accounts. In addition, they have realized

efficiencies by integrating loan, deposit, and settlement services; this also allowed banks to meet the basic financial requirements of society. The significance of the spread of FinTech is that advances in IT have made possible the "unbundling" of the above services, representing the possibility of the growth and spread of new business models in the financial sector.

- Major financial institutions around the globe are endeavoring to acquire FinTech. In addition to the traditional method of buying FinTech firms, financial institutions are engaging in new methods such as investing in FinTech start-ups and holding pitch contests to identify promising FinTech firms. This represents a marked departure from the traditional principle of self-sufficiency to one of collaboration. Through such collaborations, financial institutions are aiming to enhance the quality/scope of their services by addressing increasingly diversified and sophisticated customer needs with a sense of speed and flexibility. This has also contributed to the progressively borderless nature of the financial sector.

3 FinTech in China

- As a result of the rapid spread of smartphones in recent years, China is now home to the largest Internet user population in the world, boasting more than 600 million users. China's vast Internet user population has allowed for the creation of various Internet-based business models. Prime examples of such business models are major IT firms, such as Alibaba and Tencent, adopting a financial products sales model for services such as payment and asset management by leveraging their substantial customer base and service platforms; or creating an alternative lending market that utilizes P2P and other online platforms to connect asset management and funding needs.

- Given China's substantial landmass, it was not viable for traditional financial institutions to establish financial infrastructure on a nationwide basis. As such, FinTech plays an important role in promoting financial inclusion: the delivery of financial services at affordable costs to segments of society who could not access such services when offered via conventional methods. Many financial transactions can now be completed on a smartphone. As a result, users residing in regions with limited financial infrastructure, for example no bank branches, and the younger generation have easier access to financial services. Furthermore, the spread of FinTech has led to the fall in transaction fees.

- The introduction of Alipay, an online payment service, in 2003 by Alibaba marked the start of a rapid increase in not only the number of IT firms entering the financial services sector but also in the products and services they offered. For example, Alibaba commenced handling insurance products online in 2010 followed by the introduction of its online money market fund, Yu'ebao, in 2013.

4 Issues Facing Financial Institutions in the Application of FinTech

- "Landscaping UK Fintech", a report commission by UK Trade & Investment, breaks down the banking sector into the following three segments: (1) Products, (2) Activities, and (3) Customers, and lists the business areas within each segment to which FinTech can be applied.

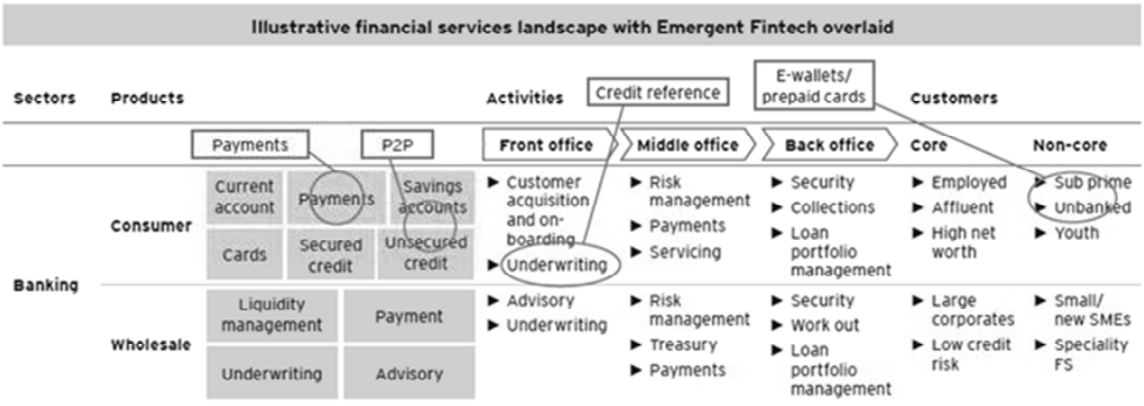
- If we look at China within the above context, for "Products" we can see the introduction of new payment services

such as Alipay, and the rise of P2P in the unsecured loans market. For "Customers" we see an increase in the number of young users and users who do not use services offered by conventional banks. Within traditional banking operations, these business areas have not always been considered to be of importance. As such, FinTech can be viewed as improving the quality of conventional banking services or supplementing such services.

- Going forward, FinTech will affect an increasing range of products and services as a result of expanding/accelerating initiatives that are not bound by the conventional norms governing the current financial services sector. Such initiatives would be achieved under the "Open Innovation" concept and via collaborations with non-financial corporates. By proactively reacting to such trends and addressing the increasingly diversified and sophisticated needs of customers, financial institutions have ample opportunity to turn FinTech into a new source of growth.

- From this standpoint, the adopting of a proactive approach over the medium-to-long term by anticipating the future landscape of the financial services sector is crucial, even in fields which currently have little connection to finance, or technologies which will not generate revenues in the short term.

- SMFG and its banking unit SMBC have established a department with the specific goal of ensuring that the latest technologies in the financial services sector are being applied to our products and services. Entering into capital/business tie-ups with Silicon Valley IT firms and industry-academic alliances with universities are examples of such efforts. In 2013 Sumitomo Mitsui Card Company, a SMFG subsidiary, entered into a strategic business alliance and concluded a capital tie-up with Square, Inc., a pioneer in the North American mobile payment market. We are strengthening our efforts to promote innovation under the "Open Innovation" concept, focusing on actively utilizing external knowledge, and pursuing new business models through alliances with non-financial corporates.



(Excerpt from: UK Trade & Investment, "Landscaping UK Fintech")

5 The Spread of FinTech and Policy Issues

- As China's economy shifts to the "new normal", the spread of individual financial services is necessary to realize China's goal of establishing a domestic demand driven economy. When one considers that only 79% of China's population, in comparison to 97% in Japan and 96% in Hong Kong, have a bank account, (The Global Findex Database 2014, World Bank),

the robust development of online financial services will surely contribute to the rapid improvement of China's retail financial services environment.

- Given the increasing amount of financial assets held by IT firms, Yu'ebao being a prime example, it will become increasingly important that such firms implement proper risk controls. Should financial assets held by IT firms continue to growth at the current pace, they could grow to such a size that if they are inappropriately managed, the entire financial system would be affected. As such, the establishment of a regulatory framework that balances the encouragement of innovation in new products and services with risk management is necessary.

- From a regulatory framework perspective, separate entities are currently responsible for regulating the banking, securities, and insurance sectors in China. As IT firms offer a wide range of financial products and services via a common platform, the effectiveness of the current vertically divided regulatory framework needs to be reexamined. However, it is no easy task to update regulations given the exceptional rate at which FinTech is evolving, creating new services, and transforming transaction. As such, rather than adopting a very strict approach via the stipulating of detailed rules and regulations, it may be more effective to adopt a principle based approach under which broad, easy to understand principles are established. The underlying ideals and values of the principles would be applied on an individual basis to promote flexibility.

- Until recently, Japan's Banking Act strictly limited the scope of companies banks can turn into subsidiaries or affiliates. A bank and its subsidiaries were not allowed to hold a combined stake of more than 5% in a FinTech company. In the case of a bank holding company, it was capped at 15%. However, in view of the rapid pace of technological innovation in recent years, the Act was amended in May of this year. Under the Amendment, banks and bank holding companies will be permitted, subject to regulatory approval, to acquire stakes exceeding the above limits in FinTech and other companies that contribute, or is expected to contribute, to the growth and development of the banking sector.

- In April this year, with the aim of supporting innovation at high-tech firms, the Chinese government implemented a pilot program targeting five regions that allows certain banks to invest directly in high-tech firms. In addition to expanding the scope of the program (subject regions and financial institutions), easing restrictions that currently hinder the adoption of FinTech by financial institution will encourage its further application – for example, simplifying the approval process when a commercial bank attempts to acquire a stake in a company that engages in operations that will contribute (or is expected to contribute to) the enhancement of the bank's services.

- Regarding customer protection and AML, Mt. Gox, a Bitcoin exchange in Tokyo, filed for bankruptcy protection in 2014 leading not only to the loss of customer's Bitcoins but also of their Fiat currency deposits. Against this backdrop, Japan's Payment Services Act, which regulates cryptocurrencies, was amended this May to strengthen customer protection, AML and CFT (counter financing of terrorism) measures. Under the Amendment, cryptocurrencies have been defined as possessing "asset-like value" that can be used to make payments. In addition, cryptocurrency exchanges will now be registered with and regulated by the FSA. Going forward, various initiatives will be implemented to create a robust regulatory framework. For example, cryptocurrency exchanges will be subject to new financial regulations such as: (1) separately administering customers' Fiat currency deposits from cryptocurrencies, and (2) minimum capital requirements. Furthermore, they will be required to follow know-your-customer practices and report suspicious transactions to regulatory authorities.

- In 2013 the PBOC added cryptocurrency exchanges to entities subject to AML and CFT regulations in addition to banning financial institutions from engaging in cryptocurrency related businesses. Furthermore, the PBOC announced this January that it was studying the possibility of issuing a cryptocurrency which it would administer. Whilst various nations are introducing regulatory frameworks on cryptocurrencies, there has been no uniform position taken by key countries.

- Since the beginning of 2015, there has been a rapid increase in the volume of cryptocurrency transactions conducted in China as a result of the sharp fall in the Chinese stock market and value of the Yuan. The volume of cryptocurrency transactions conducted in China now account for nearly 80% of the global total. Taking into consideration various factors such as the above transaction volume, it can be surmised that trends in the Chinese cryptocurrency market will have a material impact on cryptocurrency markets around the world. As such, it is hoped that China will not treat its cryptocurrency related initiatives as being purely a domestic issue, but take into consideration how such initiatives would impact Japan and other countries, and play a leadership role in the building of a truly global framework.

- Another important issue that must be considered is the compatibility of new cryptocurrency related regulations and frameworks with existing ones. For example, China limits the amount of foreign currencies individuals can transfer overseas to USD 50,000 per year. It is unclear whether the effectiveness of regulations enforcing the above limit can be maintained while at the same time maintaining anonymity that cryptocurrencies offer. As such, it has been pointed out that cryptocurrencies could be used to circumnavigate such capital flow controls. Furthermore, sufficient care needs to be taken in regards to the impact cryptocurrencies may have once their circulation volume has increased beyond a certain point on (1) the implementation of monetary policies, (2) the overall financial system, and (3) circulation mechanisms, among others.

- Furthermore, it is crucial that efforts are undertaken to heighten consumer literacy – IT literacy to maximize the benefits of financial innovations and financial literacy to minimize any accompanying demerits. In other words, while financial products and services based on cutting edge financial technologies provide users with substantial benefits, if users do not possess sufficient knowledge of those products and services, the overall economy and society may be detrimentally impacted if risks associated with such products and services are realized. As such, efforts must be made on a national level to improve financial literacy. Given this backdrop, the role which banks must play, as a core provider of financial services, is by no means a small one. We will continue to make every effort to further increase the customer's understanding and awareness of our products and services.

6 The Spread of FinTech and Decentralization

- Of the numerous FinTech technologies, Blockchain, the base technology of cryptocurrencies such as Bitcoin, has become a particular focus of attention. Although the application of Blockchain is currently focused on the financial sector, the technology is viewed as having a wide range of future applications in fields such as public administration, and the registration of property and automobile ownership. Financial transactions are currently routed through servers centrally administered by a trustworthy entity, such as a central bank or an established financial institution, due to security and other concerns. However, Blockchain makes obsolete such entities with centralized authorities, as users cooperate with and supervise each other as equals.

- As illustrated above, it is very possible that the spread of the Internet and corresponding evolution of FinTech will

encourage the abandonment of highly centralized business models that are currently in place. As a consequence of China's substantial landmass, economic development has focused on the coastal areas and there is a substantial economic disparity between the coastal and inland regions. However, as a result of advances in ICT, there are increasing opportunities for providers to directly deal with consumers so products and services no longer need to pass through major cities. In comparison to the coastal regions, electronic commerce (E-commerce) in the inland regions are experiencing higher growth. The spread of E-commerce has drawn out previously dormant consumer needs and wants in the inland regions.

- The following two points are crucial to transforming Chongqing into the financial hub of inland China: (1) attracting competitive IT firms to Chongqing and (2) securing the skilled, qualified HR to support this transformation.

- In regards to point (1) above, since Chongqing has traditionally relied on the manufacturing sector to drive growth as one of China's six major industrial areas, there are clear benefits for local firms to work with and absorb the know-how built up by foreign IT corporates. In order to attract a diverse field of foreign corporates to Chongqing, it would be worthwhile to not only ease regulations restricting new market entrants, a practice employed at free trade zones, but to also consider the granting of financial incentives such as tax breaks and other preferential treatments.

- In regards to the second point, a large number of financial institutions have established a presence in Chongqing, mainly in the Jiangbeizui CBD, in addition to a large number of high-tech firms given Chongqing's status as the world's largest manufacturing base for personal computers. Chongqing should be able to experience further economic growth and development by encouraging the current trend of moving away from highly centralized business models that focus on the coastal regions and attracting businesses to Chongqing by leveraging these advantages and securing a wide range of IT HR - not just in relation to PC manufacturing.

7 Industrial and Commercial Innovation and the Creation of an International Framework

- New financial services that are offered through the Internet are spreading without being bound by the concept of national borders. The faster the speed of technological innovation, the greater the impact speed in which regulatory/legislative reforms are implemented have on a country's international competitiveness. As such, innovation on a global level cannot be accomplished by taking a wait and see approach. Thus, it is important for governments to not only coordinate with domestic stakeholders, but also for key countries to work together to establish common rules and regulations on a global basis.

- In the past, there have been instances in which China's financial systems and infrastructure were viewed as being inferior to those of the West and Japan. However, in regards to FinTech, China is home to the largest Internet user population in the world and a vast number of Internet corporations that possess cutting edge technologies without being burdened by legacy systems. It is highly likely that China will become a global leader in FinTech.

- The efficient application of FinTech is a major challenge facing East Asian countries as they work to strengthen the interconnectivity of their economies given the increasing linkage between people, goods, and money in the region. From this viewpoint, East Asian countries should consider working together to establish common rules and frameworks. China and Japan, with their substantial presence in the regional economy, should consider partnering with each other to take a leadership role in such efforts.

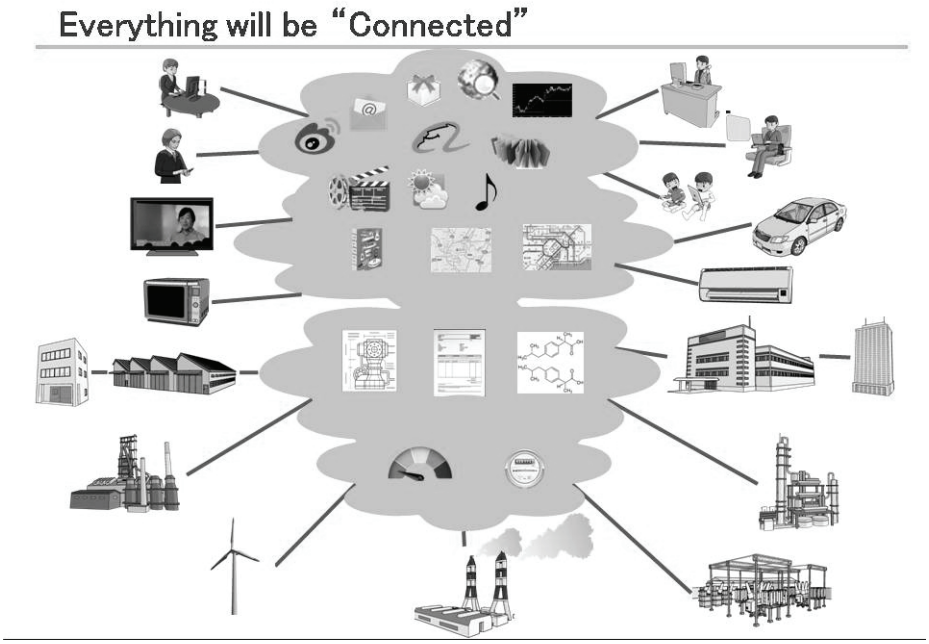
Service Innovation and Risk Management of the Manufacturing Industry

Shuzo Sumi

Chairman of the Board, Tokio Marine Holdings, Inc.

1 Changes to Be Caused by Things Connected to the Networks

Due to the advancement of computer networks such as the Internet, we have been experiencing drastic and various changes; enormous data now can be stored, exchanged, and processed more easily, and equipment such as home appliances and automobiles, or plants and energy infrastructures have become connected through the networks. In this way, those facilities can work together while related information is being exchanged. As a result, productivity and quality are expected to be improved and the impact on environment to be reduced.



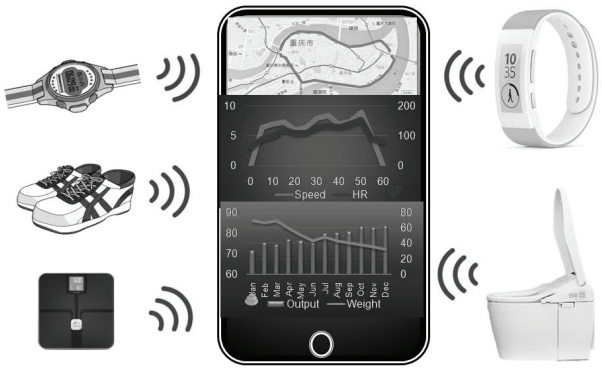
2 Product Sellers to Service Providers

Manufacturers will not be just manufacturing and selling products any more. A set of products can be used for comprehensive services. For example, a wrist watch, shoes, and an activity tracker can communicate through the network to share the data of GPS, motion sensor, and heart rate to provide comprehensive exercise monitoring services, and users can see

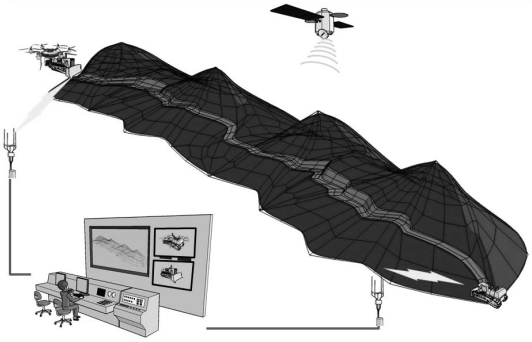
the information such as the route, velocity, heart rate and exercise load on a smartphone display. It is also possible to provide preventive care services[1] by monitoring data of weight, body fat percentage, urine protein and fecal occult blood acquired from scales and the lavatory basins through the network.

Such services cannot be realized if manufacturers focus only on making and selling those products. Another larger-scale example of combining products with services is construction equipment. One of the Japanese manufacturers has its bulldozers and power shovels equipped with GPS and sensors so that the operation center can collect information such as location, operating time, utilization of the engines, fuel usage, and lubricant amount and its temperature. In that way, the manufacturer can offer various services including theft prevention, breakdown prediction, recommended maintenance, and advice for more efficient operations.

We will be selling services, not products (1)



We will be selling services, not products (2)



The manufacturer also launched a service to automatically list up the most optimized set of machines by collecting three dimension geographic data by drone to establish an operation plan, and transfer the plan to each machine to semi-automatically operate those machines. This is a significant change from just selling machines to selling operation services (Construction as Services). Thus, we need to always consider how we can incorporate services into products.

3. Issues in the Networking Society

Objects connected through the networks give us various benefits but we also have to be aware of emerging issues to work on: safety of AI and cyber security.

(1) Safety of AI

We used to enjoy science fiction movies in which AI acted beyond human beings. Now it is coming to be a reality.

In 1997, Deep Blue of IBM defeated Garry Kasparov,

AI is surpassing human

1997 Deep Blue (IBM) vs Garry Kasparov, the world chess champion

2011 Watson (IBM) vs Champion of *Jeopardy!* (American quiz show)

2010 Akara 2010 (Information Processing Society of Japan) vs Ichiyo Shimizu, Women's Osho title holder

Alpha Go (Google) vs Lee Se-dol, ninth go ranker of Korea

[1] *A Japanese startup company, Symax has developed a sensor device which can be installed to lavatory basin to collect data as many as 17 kinds of data including glucose and protein in urine. http://symax.jp/ja.html*

the world chess champion in a match, and in 2010 Akara 2010 of Information Processing Society of Japan defeated Ichiyo Shimizu, Women's Osho title holder. In 2011 Watson of IBM defeated the champion of *Jeopardy!*, an American quiz show, and in 2016 Alpha Go of Google defeated Lee Se-dol with ninth go rank of Korea.

Alpha Go utilizes the technology called deep learning, in which machines themselves learn what the best move is in each case from the move records without being taught by humans, and they can further improve their go skills by experiencing test matches among machines with AI millions of times. As a result, the AI defeated humans with the moves that humans could never come up with. Now it is proved that machines can learn higher level of intelligence without human's help.

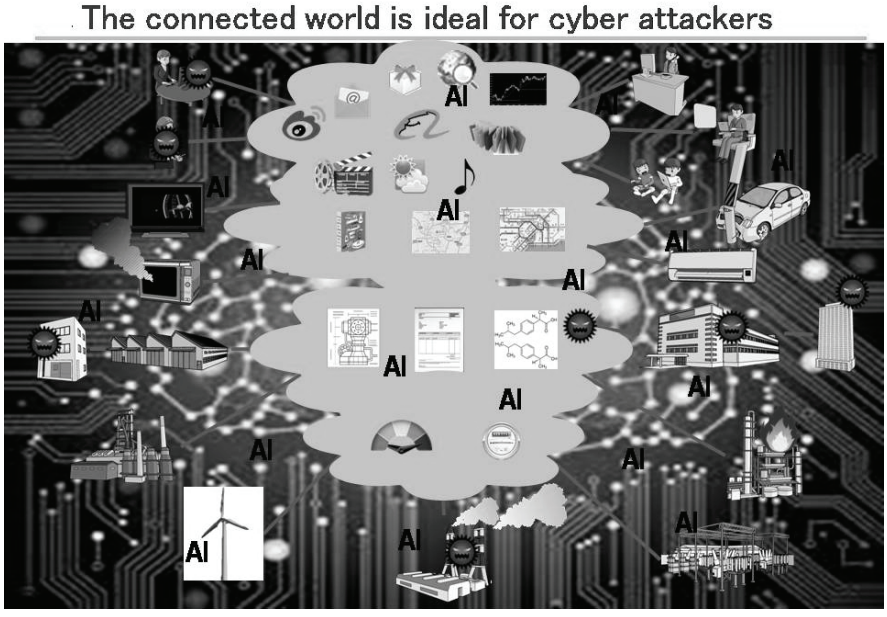
AI will be embedded in various products such as home appliances, automobiles, and robots to control such equipment with higher level of complication and precision. However, there are possibilities that machines with AI attack humans or infrastructure of human society if someone with malicious intention fraudulently uses those machines. Furthermore, some worry that AI itself may have its own intention to attack humans. Therefore, we need to start the discussion on ways to safely control AI[1].

(2) Cyber Security

Protecting objects and infrastructure from cyber attacks is one of the most important keys to the success of "Made in China 2025," and further R&D and training are required.

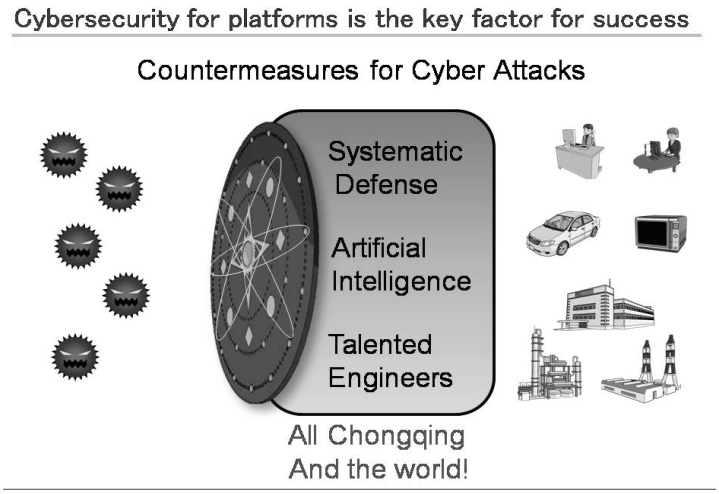
AI embedded in various objects will make both cyber attacks and its preventive measures more complicated because AI technology can be an ecu to automatically protect from cyber attacks by analyzing cyber attack patterns, but at the same time, it also can be a pike to attack the network since it can automatically detect vulnerability of the network.

Also, the world where everything is connected through the networks is very efficient and helpful for cyber attackers. There are multiple entrances and once entry is successfully done, they can attack wide range of the network at one time.



[1] *Elon Musk, the founder of Tesla Motors and SpaceX said "We need to be extremely cautious because AI could be more hazardous than nuclear weapon," and he announced that he was going to donate 10 million dollars to the global project which is aiming to develop "AI for human being's sake."*

4 What We Have to Do



It is not possible for one organization individually prevent from such cyber attacks since cyber attackers usually cooperate with other cyber attackers exchanging information to systematically attack the target together. Therefore, we also need to cooperate to systematically protect ourselves sharing information. We may also need to utilize AI to take the protective actions as attackers may use it to attack us. AI can automatically produce attack patterns which humans can never imagine as it did in Alpha Go, and that is why we need to utilize AI to protect against those attacks. That means, we need to grow human resources with higher skills and knowledge of both cyber security and AI.

It is not feasible for one organization to establish all the systems for systematic protection against cyber attacks, utilization of AI, and growing the human resources. So, I would like to propose that the City of Chongqing develop such structures with cooperation between the government and local corporations.

Additionally, cyber attack is now a worldwide issue and all of the top executives gathering in the Conference have to cooperate to make our world secured and safe place.

Industrial Service Innovation in the Internet Era

Bernhard Jucker,

Executive Vice President & Member of the Group Executive Committee of ABB Ltd,

I Introduction

The world is at the beginning of a fourth industrial revolution that is fundamentally changing the way we work, live and relate to each another.[1] This transformation is already noticeable in manufacturing industry, where a new industrial ecosystem is emerging, driven by the increased availability of data, ubiquitous connectivity between and among machines and people, and the exponential growth in processing power. Advanced manufacturers are embedding digital technologies in their assets to pre-empt service interruptions and optimize operations as well as to identify opportunities for greater flexibility, higher productivity and efficiency.

As the world's largest manufacturing economy, China is embracing this trend to revitalize its growth under the New Normal. In 2015, the government released the long-awaited *Made-in-China 2025 Plan*, an ambitious 10 year strategy to comprehensively upgrade its industries. In addition to calling for internet-based production processes, it defined three goals to advance the role of service in manufacturing: first, to change manufacturing from a production-oriented to a service-oriented activity; second, to extend the average manufacturing service chain; and third, to develop customized services with higher input.

With heavy industry as its backbone, Chongqing is the largest industrial city in southwest China[2] and, despite the national slowdown in manufacturing, the city is still performing very well compared with its peers. Last year, the growth rate of its added value in the industrial sector (10.8 percent) was the second-highest in the country, and accounted for nearly 37 percent of the city's GDP growth.[3] However, like other cities in China, its manufacturers have seen growth rates decline, albeit from a high level. In response, the municipal government has developed a series of mid- and long-term measures to take Chongqing's manufacturing to the next level. These include: "guiding industrial enterprises to invest in their services capabilities," "integrating the information technology application with industrialization," and "promoting the construction of industrial cloud service platforms". The target is to develop a "smart manufacturing industry ecological environment characterized by opening-up, sharing, and collaboration."[4]

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[1] *The Fourth Industrial Revolution, Klaus Schwab, World Economic Forum, 2016*

[2] *http://www.chongqingnow.com/*

[3] *The background information of 11th Annual Meeting of CMIA*

[4] *Ibid*

This paper explains why service is playing such a critical role in the future of manufacturing in the fourth industrial revolution and considers ways in which manufacturing enterprises can extend their value chain to the service sector. It also looks at the potential added value that that service innovation can bring to customers, drawing on three case studies, and concludes with recommendations that may be of interest to Chongqing policymakers.

II Finding the value of industrial service in the internet era

The *Industrial Internet* is one of the most widely used terms to describe the convergence of the industrial system with the power of advanced computing, data gathering and analytics, and the ubiquitous connectivity brought by the internet. It was first coined in 2008 by US manufacturers who envisaged using interconnected equipment and big data analytics to reduce unplanned downtime, product defects, and plant inventory so as to maximize profitability.

At the Hanover industrial fair in 2011, German industry players introduced *Industry 4.0*, a more ambitious concept in which manufacturing would not only be optimized through digital technologies but even made "intelligent". They envisaged "smart" factories, enabled by the "Internet of Things" (IoT), where all equipment, systems and processes would be seamlessly linked together to maximize efficiency and productivity, and minimize waste. At the same time, these smart factories would be flexible, able to adjust specifications to meet specific customer needs.

Five years later, both concepts are on their way to becoming a reality and the possibilities and ambition levels have gone beyond IoT-enabled industry to embrace what ABB calls the "Internet of Things, Services and People", or IoTSP. Under IoTSP, advanced manufacturers are extending their offerings beyond products to provide an integrated product and service offering that delivers value in use. Key drivers are the need to expand into new growth areas as well as the fast-changing demand from customers. According to two Chinese scholars (2013), around 20 percent of commercial enterprises in the major developed economies are engaged in activities that provide solutions or outcomes, rather than simply products, to customers. The proportion of services in the manufacturing sector amounted to 58 percent in the US, and 30 percent in the UK. Another study conducted by Andy Neely, head of manufacturing and management in engineering at Cambridge University, showed that the proportion of service-oriented manufacturing enterprises is 51 percent in Finland, 40 percent in The Netherlands and 37 percent in Belgium. However, in China only 2.2 percent of industrial companies sell solutions rather than products.[1]

III Case studies

In contrast with product innovation, solution innovation focuses not on what a product can or should be able to do, but rather on why a customer buys a product. An obvious example is a motor, which customers buy not because they want motors but because they need to drive machinery. With that in mind, instead of focusing on building motors, a manufacturer could equally agree to take over the running of customers' machinery, guaranteeing an agreed level of performance and uptime. Such a model has the advantage of better aligning the interests of the supplier and customer, because the supplier derives income from keeping the product in service, rather than from repairing it when it breaks down.

[1] *Service Science in China, Jiazhen Huo, Zhisheng Hong, p7, 2012*

Solution offerings, which combine products and services, deliver value through efficiency, flexibility, sustainability and security, rather than through steel and fuel, and therefore they necessarily emphasize the interaction between and among things and people. The following three cases offer insights into how solution innovation in the internet era can transform traditional manufacturing and add value to customers' competitiveness.

Case One: Convergence of information and operational technologies (IT and OT) helps asset intensive companies monitor the health of critical assets to achieve greater uptime and lower costs

With its well-established industrial base, Chongqing is home to a large number of asset intensive companies, ranging from machinery to metallurgy to utilities. A common challenge faced by such enterprises is how to consolidate and analyze the data generated by asset systems in a way that leads to actionable information. This requires a broad view of the overall health of assets to support decision making. An additional question is how to best apply the information gained to improve the health and performance of the asset. A global survey of asset intensive organizations has revealed that the integration of IT and OT is a key contributor to meeting the financial and operational goals of such organizations[1].

A typical example of an asset intensive industry is the power sector. Many power plants have aging infrastructure, and its maintenance requires continuous care and strategic upgrades. The maintenance costs in a thermal power plant, for instance, can be as high as 30 percent of the gross cost of power generation[2].

American Electric Power (AEP), one of the largest utilities in the United States, worked with ABB to develop a new Asset Health Center to further enhance the performance and reliability of its aging electric transmission network. The Asset Health Center solution integrates equipment-based OT and enterprise IT contributed by ABB, while leveraging deep operational and diagnostic expertise contributed by AEP. It is designed to automate what can otherwise be a time-consuming process requiring highly skilled individuals to gain visibility into the condition of critical assets, recognize performance issues, and prioritize maintenance and repair activities. This new solution also helped to identify assets requiring replacement as they reach the end of their useful life.

At the heart of the solution is the ability to bring together a wide range of disparate asset information, asset algorithms based on deep subject-matter expertise and smart software solutions into one cohesive system. By leveraging this convergence of OT and IT as well as transforming real-time and historical data into meaningful and timely insights, utilities can ensure greater uptime and uninterrupted service delivery for customers, while lowering their own operations and maintenance costs.[3]

Case Two: Remote control and cloud computing enhances daily maintenance efficiency and maximizes asset value

One of the key applications driving productivity and service gains under IoT is remote monitoring of equipment through

[1] *http://www.abb.com/cawp/seitp202/24e7849a9e5365eb44257fae004b5854.aspx*

[2] *http://www-31.ibm.com/solutions/cn/energy/wp/power_eam.pdf.*

[3] *http://www.abb.com/cawp/seitp202/d54232843602a0d1c1257ab40074d1be.aspx*

data transmitted from sensors to the cloud. Data from Accenture[1] show that the need for manufacturers to pursue a sensor-driven IoT strategy is clear: asset maintenance using IoT can save up to 12 percent over scheduled repairs, reduce overall maintenance costs by up to 30 percent and eliminate breakdowns by up to 70 percent. Furthermore, operational efficiency programs, such as predictive maintenance projects, can reduce the cost of maintaining equipment by up to 25 percent. The return on investment (ROI) opportunities for budget-conscious manufacturers are enhanced by the fact that sensors are becoming smaller, more sophisticated and cheaper. The cost of internet-connected sensors has fallen by more than 50 percent in the past decade.

The remote service center at ABB Xiamen Switchgear Company is a good example of the benefits of cloud computing and sensor-driven IoT. The remote cloud service covers the whole life cycle of ABB switchgear equipped with sensors throughout the country. With 24-hour data monitoring, storage, and analysis, specialists at the remote center can immediately detect an unusual temperature rise in switchgear and define remedial actions efficiently. In this way, equipment failures and unexpected downtime are reduced and plants become more productive.

With only two seats, the service center can issue a monthly average of 1,000 permits-to-work to site engineers, answer 1,500 hotline calls, and make 200 follow-up calls by monitoring all the real-time data on the screen.

Meanwhile, cloud-based services can leverage historical data and provide a maintenance plan tailored to each switchgear, so that the devices can operate healthily throughout their life cycle. When switchgear approaches the end of its life span, the service center can accurately assess its remaining hours of operation based on all historical data, and advise clients whether to refurbish or replace the equipment. In this way, the value of users' asset can be maximized.[2]

Case Three: Software facilitates effective motion-monitoring, forecasting and decision-making for shipping industry

As one of Yangtze's three biggest shipping centers, Chongqing is a port situated along the "Belt and the Road" and Yangtze River Economic Belt, connecting China with the world. To upgrade its shipping industry and craft itself as the shipping hub on the upper reaches of the Yangtze, Chongqing plans to invest 18 billion RMB during the 13th Five-Year period. And by 2020 Chongqing aims to increase its cargo-handling capacity to 220 million tons, 47 percent higher than 2015 (150 million)[3]. Chongqing has long been the home of ABB's largest transformer factory and in 2009, in recognition of the port's rapid development, became a major manufacturing base for ABB turbochargers.

In 2011 the Chinese State Council formally issued *Opinions on Speeding up the Development of Yangtze River and Other Inland Water Transport*[4] with the goal of taking a decade to build a modern inland water transport system that is clear,

[1] *https://www.accenture.com/us-en/insight-sensory-under-load-how-internet-of-things-drives-government-efficiency*

[2] *http://www.cesmedia.cn/CN/news/news1002.shtml*

[3] *http://epaper.21jingji.com/html/2015-11/17/content_25906.htm.*

[4] *http://www.gov.cn/zwgk/2011-01/30/content_1795360.htm*

efficient, safe and green. To echo this national initiative, the Yangtze River Administration of Navigational Affairs proposed in 2012 to speed up the construction of an Intelligent Waterway[1], which intends to use technologies such as smart sensors, Internet of Things, automation and Artificial Intelligence to support the decision-making and safety of cruising for shipping companies.

In this area ABB has also developed pioneering technologies. It recently provided software for 140 vessels of the Maersk Line that uses data about the weather, and a ship's design and movements, to optimize its route. The motion-monitoring, forecasting and decision-support software enables the ship's captain to define on-board loading conditions, and more accurately determine areas of the ocean where the ship's motion is likely to exceed threshold values. Routes can then be optimized automatically to skirt adverse conditions, ensuring cargo arrives safely and on-time at its destination port.

This helps the shipping company to drive vessel efficiency and avoid conditions that could be harmful to the ship, its crew and cargo, or compromise energy efficiency and route schedules.

IV Recommendations and conclusion

It is a fact for Chongqing's manufacturers that the traditional drivers of growth are diminishing as a result of rising labor costs and overcapacity. The Internet of Things (IoT) is leading to new possibilities for advanced manufacturing, and manufacturers are transforming their business model from providing products to providing innovative services, in a global context.

Based on the opportunities and challenges, the Chongqing government could further build up an innovative industrial service ecosystem by:

- **Promoting awareness of IoT-based service among manufacturers**

Many manufacturers are not sure about the value they can derive from the IoT technologies, possibly because of the range of advanced new technologies that are becoming available. According to a survey by the World Economic Forum in 2015, 88 percent of respondent said that they do not fully understand the underlying business models and long-term implication of the IoT for their industries. Chongqing's manufacturers are keen to upgrade their industries but they need guidance on how IoT-based industrial service can benefit all participants along the value chain.

Government-led innovation campaigns and workshops can contribute significantly to promoting the awareness of service innovation and create opportunities for cross industry collaboration to transmit knowledge and know-how, especially when these activities are put in an international setting.

- **Cultivating a favorable service ecosystem**

[1] *http://www.cjhy.gov.cn/hangyundongtai/dianziqikan/hangyunzazhi/201208/t20120816_221801.html*

A healthy ecosystem is critical to the development of businesses and industries. Yet, the ecosystem for service innovation in today's world is characterized by acute volatility. Service has a life cycle just as products do, and this cycle is becoming shorter all the time as the internet continues to inject vitality and volatility into the market, technologies and business models. Governments throughout the world are increasingly keen to find out about policy options that institutionalize service innovation, and most have found consistent policy support to be critical for a healthy and productive ecology for service innovation.

In order to pragmatically apply this principle and reallocate social resources, Chongqing could steadily prioritize incentivizing industrial services that support smart manufacturing with innovative service products, technology intermediation, innovative distribution channels, management consulting, project designing, etc.

Furthermore, discussions of innovation are incomplete without a mention of intellection property rights (IPR). These rights provide the legal foundation for technology diffusion. An effective IPR protection regime governing software-related patents and business method patents is one of the most impactful ways in which the health of the innovation ecosystem can be maintained. Of course, regulators should regularly revisit the IPR regime and make it consistently applicable to fast changing IPR protection needs.

- **Establishing a software industry that supports industrial service**

Industrial software is an indispensable pillar of smart manufacturing. As modern manufacturing is faced with demand for more customized services as well as a more volatile market situation, industrial software plays an increasingly critical role. It supports the flow of information from product design, know-how, planning and testing to logistics, after-sales services and facility maintenance.

The most innovative software developers include big enterprises as well as start-ups. Apart from direct incentives, government procurement programs addressing information technologies can also benefit these software companies.

In 2010, ABB acquired an enterprise software portfolio that is now fully integrated into its Grid Automation business (formerly known as Ventyx). This acquisition has strengthened ABB's capabilities in Energy Trade and Risk Management (ETRM)[1], but above all it has greatly enhanced ABB's competitiveness in the asset management market and enabled direct participation in smart grid projects. Innovations that resulted from the acquisition include the Asset Health Center solution developed for AEP, to optimize the management of critical assets, and this know-how is helping to enhance the smart grid capabilities of transformers such as those ABB manufactures in Chongqing. In these ways, the strategic acquisition has enabled the creation of multiple new services for the power sector.

[1] *http://www.programgo.com/article/88511522562/*

- **Developing a workforce equipped with digital expertise**

Industrial revolutions have always brought about change in the division of labor and created new jobs to replace the old ones. Digitalization will change the nature of many jobs, requiring a labor force with more advanced skills and more experience with software. The evidence from the last 30 years, since the introduction of robots in industry, has shown that countries that embrace advanced manufacturing technology generate more employment than others. For example Japan, Germany and South Korea, which are among the most avid users of industrial robots, have some of the lowest unemployment rates in the world. ABB's vision for the next industrial revolution is of an emerging Internet of Things, Services and People: an ecosystem in which people remain central to manufacturing. Latest developments in robotics underscore the point. Dual-arm collaborative robots, such as ABB's award-winning YuMi, are making it possible for robots to work alongside humans in ways that were previously not possible.

People equipped with digital know-how will be in demand for new jobs in the internet era, from digital medicine to precision agriculture and smart manufacturing. Most needed, however, will be people with the skills to master the new human-machine relationship. People with a collaborative mindset who are also creative problem solvers will work "with" machines to deliver outcomes together with services and products.[1]

Adapting the skills of the workforce is a slow process, for it takes many years to change formal education systems, while the requirements of the digital economy are fast changing. As such, key tasks for the Chongqing authorities are to develop a strategy for attracting talent and innovative policies to manage the mismatch between the pace of technology innovation and skill development.

The Fourth Industrial Revolution is not a buzzword or short-lived trend. It is already bringing tremendous change to countries, industries and individuals. Manufacturers around the world are expanding their value chain in the service sector and fostering new growth driven by the IoT. As a traditional industrial base, Chongqing is well placed to embrace and shape the trend. ABB is looking forward to supporting Chongqing's measures to build unique industrial strengths and position industrial service as a core area for its next level of growth. We are confident that we can make a valuable contribution to this joint endeavor.

[1] *http://www3.weforum.org/docs/WEFUSA_IndustrialInternet_Report2015.pdf*

Developing Service Trade in the Internet+ Era

Shane Tedjarati

President, Global High Growth Regions, Honeywell

China's New Normal, Shifting National Focus

Throughout the years, China's economy has evolved in many ways: from investment-led to consumption and service driven, from natural resources reliant to environmental emphasis. Consumers are more affluent leading to shifts in household consumption structure. In addition to the basic needs such as food and clothing, people are spending more on communications, transportation, health, education and entertainment. A case in point, China's box office (cinema) has witnessed a growth CAGR of 31% over the past decade.

Moreover, China is no longer the "low-cost manufacturing hub". With R&D investment growing from $40B to $220B in the past 10 years, China is increasingly innovative.

The Coming Of Internet+ Era

China started late in internet development, but is catching up at an astonishing speed. By 2015, China internet users reached 670 million (49% penetration), which is more than two times the entire population of the US. China's B2C e-Commerce revenue is two times that of the United States in 2016 despite of the fact that China has almost nothing in 2000.

A few internet companies are quickly reshaping the competitive landscape. Alibaba and JD.com, pure-play e-Commerce companies has already replaced traditional retailers China Resources and Suning to become China's top two retailers in terms of revenue in 2015. Founded in 2012, smart mobility giant Didi processed 1.4 billion orders in 2015 surpassing Uber globally. Mobile payment in China soared from $400 million to more than $200 billion in 5 years and surpassed U.S. in 2015.

Embracing Change

New Opportunities For Traditional Manufacturing

Internet is reshaping manufacturing competitive landscape. A slowing economy, weakening demand as well as rising labor cost have already put a lot of pressure on traditional manufacturing in recent years.

The development of new technology is raising the bar even higher. People are expecting more connected products and

services, optimization of resource allocation, more efficiency and productivity. For example:

- An African gold mine collected data from multiple sensors which showed some unsuspected fluctuations in oxygen levels during leaching, a key process. Fixing this increased yield by 3.7%, worth up to $20 million annually
- One automaker uses data from its online configurator together with purchasing data to identify options that customers are willing to pay a premium for leveraging advanced analytics technology

In the future, areas such as design, purchase, marketing, logistics and business management will add more value than ever before.

In the first half of 2015, the State Council issued “Made In China 2025” initiative. The plan is for China to become a green and innovative “world manufacturing power” by 2025. Internet+ intelligent manufacturing is one of the key to success.

July 2016, Ministry of Industry and Information Technology and National Development and Reform Commission jointly issued the “development of service-oriented manufacturing special action guide" requiring a transition from processing and assembly to “manufacturing + service”, from a simple sale of products to providing “product + service”.

China service sector accounts for 50%+ of GDP and 87% of GDP growth. However, service oriented manufacturing revenue only accounts for less than 10% of total revenue compared to ~30% in developed countries. U.S. manufacturers have the highest proportion of service revenue. More than 50% of the US manufacturers offer services as part of their offerings.

Since services are delivered by enterprises, therefore the advancement of enterprises must be the centerpiece for service transformation. Management concepts such as “customer’s share of wallet”, “own the customer relationship”, “lifecycle management” have given rise to the service centric mindset. Services have been found to help:

- Facilitate sales of products and solution
- Identify customer needs and enhance customer loyalty
- Improve productivity of both the enterprise and it customer

One practical and classic example is Rolls-Royce. Instead of selling aero engines, Rolls-Royce now contracts with many of its customers for "power-by-the-hour". Customer buys the power the aero engine delivers and Rolls-Royce provides all of the support (including maintenance) to ensure that engines can continue to deliver power. Rolls-Royce used to make money on time and materials - basically repairing engines. However, customers don't want unreliable engines that are always in the repair shop. This shift in business means the interests of clients and providers are much more closely aligned. As a result, Rolls-Royces’ aero engine market share grew from 5% in 1970’s to 40% now.

Chongqing has a very solid manufacturing base. Auto and electronics clusters are the key driving forces for Chongqing’s high-speed economic growth. In the Internet+ era, Chongqing should focus on forming a new manufacturing eco system:

- **Develop industry cluster**: leverage internet to connect various enterprises along the value chain; optimizing supply chain management to squeeze out locked-up capital; using data to improve operational efficiency; and thereby

fostering an industry cluster that is conducive to innovation

- **Mindset change**: the shift from "quantity" to "quality" driven economy will require enterprises to engage customers as never before, understanding their needs and problems, and innovating solution on a scalable basis
- **Comprehensive development**: enhance competitiveness in financial services to support the growing complexity of trade. In particular, Chongqing is well positioned to develop overseas trade relationship along the "One Belt One Road"

Leading Change

Facilitate Service Trade Development

As the only municipality in midwestern China, Chongqing is located at the strategic junction of "One Belt One Road" and Yangtze River economic belt. Railways, airports, three first-class ports and free trade zones, port transportation hub and "Chongqing-Xinjiang-Europe" railway laid a good foundation for Chongqing to be an economic hub for midwestern cities.

At the same time, compared to other midwestern cities, Chongqing enjoys a rich talent pool, relatively sound financial system, mature investment environment, friendly policies and fast decision making capability. All these make Chongqing very suitable to develop service trade.

Develop Midwestern Logistics Hub

Modern logistics has grown to be a huge system that includes warehouse, transportation, sensing & sorting, project management, integrated software & hardware, etc. China's logistics market size is estimated to be around $9 billion in 2015, with a CAGR of 20% in the past 10 years. China logistics industry is huge yet remains largely traditional. The weakness mainly lies in customs clearance efficiency, timeliness of delivery and logistics service ability and quality. Of these factors, making processes (such as customs clearance) faster, more efficient and transparent can make Chongqing become a much more attractive destination as a logistics hub.

After many years of consolidation, China logistics industry has formed 4 regional logistics hubs centered along the coastal line:

- **Bohai logistics hub** centered around Beijing, Tianjin, Shenyang, Dalian and Qingdao；
- **Yangtze River Delta logistics hub** centered around Shanghai, Nanjing, Hangzhou and Ningbo
- **Taiwan strait logistic hub** centered around Xiamen and Fuzhou
- **Pearl River Delta logistics hub** centered around Guangzhou and Shenzhen

Central and western China has yet to form its own logistic eco system and have to rely on those coastal hubs.

Chongqing enjoys superior geographic advantage, solid infrastructure and relatively established industrial cluster. These are all good for developing its logistics industry. As a major laptop manufacturer and exporter, a low-cost, fast and efficient logistic system is a must-have for Chongqing. Automotive, e-Commerce, healthcare, cold-chain logistics are key growth

drivers for overall industry growth. These segments are largely in line with Chongqing's industrial outlook.

To build a logistic center that well serves midwestern China and the "One Belt One Road" initiative, we should consider a few things:

- Optimize customs clearance process; develop international multimodal transport by fully leveraging ports, airport, railway and free trade zones in the region
- Invest in modern logistics systems and new technology; boost the application of industrial IoT technologies such as connectivity, data analytics, information sharing, etc.
- Increase the level of warehouse automation for better efficiency and lower costs by using mechanical automation, scanning, intelligent sorting, security monitoring systems and etc.
- Encourage and attract private and foreign investments; welcome industry leaders to set a regional headquarter in Chongqing, eg. SF, JD, Amazon, FedEx and etc.

Become The Technology & Innovation Center Of Midwestern China

Shenzhen has developed itself as an interesting innovation hub. Its extensive electronic manufacturing eco system offers a feast of components on demand, allowing for the rapid tinkering and iterating that fuels innovation. Together with its manufacturing prowess, engineering talent and lightning-fast logistics, the city has become a fertile ground for hardware startups to go from prototype to products. Builders here say a week of work in Shenzhen is equal to a month in the U.S. Its success is evident by numbers:

- Shenzhen's R&D investment accounted for 4%+ of the city's GDP in 2015, close to the world's top two countries: Israel and South Korea
- According to Tencent's index, Shenzhen is the country's "Youngest City"
- 66 valid patents owned by every 10,000 people, ten times of national average
- By the end of 2015, Shenzhen has 1.13 million businesses, which means, every 10 people have a business

Indeed, Shenzhen's model is worth studying. CICC summarized Shenzhen's key success factors nicely:

- Heavy investment in R&D is the prerequisite for industrial upgrade
- Extensive manufacturing base and eco system; relatively developed financial market; easy to commoditize scientific achievements at a low cost
- The spirit of tolerance to diversity attracted a large number of talents
- Insisting on market economy with appropriate level of government intervention; encourage and guide the emerging industry

Chongqing's R&D investment accounted for only 1.4% of GDP in 2014, which is lower than national average of 2.05%, and ranking at #14 nationwide. It is even lower than its regional peers Shaanxi and Sichuan. In 2015, Chongqing has set a more ambitious target to increase R&D investment to 2% of GDP by 2020.

In attracting high-tech companies and thus R&D investment, the city of Chicago provides an enlightening experience:

During the key transition period in the 2nd half of 20th century, Chicago focused on fostering emerging service industries closely related to its manufacturing business. In the meantime, it also committed to the introduction of functions which are higher up along the value chain such as, management, R&D and marketing. It attracted Boeing to relocate its global headquarter from Seattle to Chicago with its global characters and tax incentives. This brought more than 300 senior marketing and project management professionals to the city.

Different from young Shenzhen, Chongqing's technology innovation requires more promotion from the government. To form a new and innovative culture, the government needs to stay focused and attract the right talents, develop a consistent policy and count on strong execution.

Closing

As a midwestern inland city, Chongqing has been very successful thanks to its clear plan and strong execution. Its outstanding economic growth is proof of its success.

The new eco system brought by the advancement of internet technology requires a change of mindset. We need to look at challenges and opportunities from a fresh perspective. Upgrade existing industries, develop new service trade by leveraging emerging technologies.

Chongqing has very strong leadership within its municipal government, and I believe it is well positioned to seize the emerging opportunities in the new digital economy.

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Promoting Enterprise Competitiveness under the Service Trade Development Trend to Accelerate the Transformation of Chongqing by Virtue of IT Reform

Robert Y.L. Mao

Chairman of HPE in China Region

We are in an era of service economy, when the world economy is transforming to service economy in an all-round way, the service industry has become an important content of international division of labor and global value chain and the world economic system is reconstructed. Service innovation has become the main source of value increment and service trade has become the new power to drive world economic development. The technological development and IT reform, especially the continuous development and fusion of the Internet, cloud computing, big data, mobile Internet and e-commerce are pushing forward the global economic integration, and the service trade is booming!

HPE believes we are also in an era of "idea economy". Technology makes ideas easier to realize than ever. Enterprise IT strategy is particularly important; it follows and supplements business development to become a key factor for an enterprise to obtain competitive advantages. Under the trend of service trade, a smart IT strategy can bring very high input-output efficiency to a service-oriented enterprise, allowing the enterprise to turn an idea into a new product or service at low cost and then stand out in the fierce competition!

With about 250,000 employees worldwide and annual revenue at $53 billion, HPE is a multinational IT total solution and service enterprise officially established on November 1, 2015 after several years of transformation of former HP. It focuses on providing enterprise users with the most comprehensive industrial product portfolios from cloud, data center to workplace applications, and serves customers in more than 120 countries all over the world, making IT more efficient, more productive and more secure. After successful transformation, HPE focuses on four fields which are crucial for business transformation and future growth: Transforming to a hybrid infrastructure by helping customers seamlessly manage information across traditional IT and private, managed and public cloud environments; Empowering a data-driven organization engineered to turn information into insight and insight into action; Protecting their digital enterprise to manage risk, monitor operations, protect information and applications and sustain operational integrity; Enabling workplace productivity to create best-in-class experiences for employees, customers and partners through mobility and networking solutions.

A very important aspect for HPE's successful transformation into a multinational IT enterprise providing customers with transformation service is the transformation of its own IT system—flexible and convenient IT infrastructure enables us to quickly respond to market changes and serve customers. Just like other giant multinational enterprises, former HP used to deploy complex cutting-edge IT systems internally to support the successful operation of its large international business. Today's HPE has new cloud infrastructure with only 4 data centers for internal use and only needs 1 hour for allocating

managed computing resources. The secret we can do this is the hybrid cloud infrastructure.

Before 2014: Ingrained traditional IT infrastructure pattern

There was no doubt that, in view of the strength and scale of former HP, only by establishing enormous infrastructure could the internal and external demands of new type of IT be met: 1,500 network routers, 15,000 switches, more than 23,000 physical servers and more than 18,000 virtual servers, 4 EcoPODs, enormous 3PAR, XP and EVA storage space... In the face of such huge IT infrastructure, the IT department of former HP was faced with huge challenges, and it was imperative for change with the passage of time:

First of all, with the rise of mobile office, enterprises and employees all need to access corporate network across the firewall from all over the world in a secure environment, through computers, mobile phones or other smart devices.

Secondly, due to high energy consumption, traditional IT data center is costly but not eco-friendly. After the company's support and operation departments shrink, enterprise employees increasingly need self-service IT so as to save their time for requesting IT service and save the resources of IT department.

Thirdly, from the perspective of the whole market, products need shorter time to market, so we need to change the traditional IT mode, transforming from a cost center to a value center which can continuously promote innovation.

2014—2015: From traditional IT to private cloud

In the face of the ingrained traditional IT infrastructure pattern, in 2014, we began our efforts to shift from traditional IT to enterprise-level private cloud platform to provide self-service market for mature IT applications; there are 475 enterprise-level applications running in the production environment.

In January 2015, after sorting out the existing IT private cloud, we found that the traditional IT infrastructure pattern with ingrained history had witnessed periodical achievements on the road of transformation to private cloud, which can be seen from the following figures:

There were 4 large data centers in Austin and Houston in the United States; in 3Par storage array, there was 2.8+PB data; in Proliant the G7 and G8 blades, there were more than 1,000 ESX Hosts. It took 60 minutes to start and deploy manageable computational nodes; there were more than 40,000 virtual machines; more than 600 applications were being developed, running in Dev/Test workload; more than 650 applications were running constantly in the production environment; there were 6500+ cloud databases...

In 2015, the journey of hybrid cloud computing started

Cloud has fundamentally changed the traditional IT; it provides a new way of service. People are willing to use cloud to accelerate business innovation, reduce enterprise cost and enhance business flexibility. Therefore, when the former IT infrastructure was unable to meet HPE's development needs, a journey of hybrid cloud computing started.

With changing enterprise business development needs, we found that hybrid cloud computing has become a trend, as hybrid infrastructure can greatly release the potential of cloud computing and provide endless possibilities. The successful transformation to hybrid cloud computing will continue to contribute to HPE's glory. When we set foot on the journey, we

had already set development goals.

2015-2016: Overall transformation to hybrid infrastructure

The construction goal of IT cloud inside HPE: making HPE better adopt private cloud and hybrid cloud computing to support the operation of the company, and setting an example for the industry, partners and open source communities. We are making unremitting endeavor toward building an elastic, highly scalable and secure hybrid cloud environment; this cloud environment will promote HPE's development and expansion (HPE-on –HPE-by-HPE), and provide the best cases and models for partners and customers.

Starting from 2016, HPE transformed to hybrid cloud computing in an all-round way and transformed the applications to the real cloud platform by using Helion OpenStack and Helion development platforms; 90% enterprise-level applications will adopt cloud computing or SaaS mode to start the real hybrid cloud computing infrastructure.

According to 451 Research, vertical industries will present a trend of hybrid investment in IT in two years. The reason for choosing hybrid cloud infrastructure is not only that the development of hybrid cloud is in line with the current trend, but it can maximize the enterprise business development potential.

The advantages of hybrid infrastructure: it can make IT more flexible, thus accelerating the business transformation. The new hybrid infrastructure enables us to better integrate and sort out the existing IT resources so that the applications will run on a new form of IT infrastructure. At the same time, hybrid cloud is more open; it enables us to use the latest technology sooner, "refreshes" our products and solutions, improves user's experience and injects new energy to the traditional disturbing IT infrastructure. From the perspective of cost, cloud computing reduces the cost of hardware upgrading and enables our developers to timely gain access to computing resources, which will in turn reduce the development cycle and cost and truly accelerate the development of business.

The hybrid cloud computing infrastructure has witnessed the outstanding achievements of HPE's transformation, brought huge profits for company development and brought a lot of IT benefits:

IT gains:

More efficient: by integrating IT resources again, the number of servers is decreased by 40%, processing capacity is increased by 250% and the response time for internal demands is reduced from 21 days to 4 hours.

More secure: leading security solutions improve security scanning efficiency by 90%, with up to 1.0 billion security events monitored each day, and reduce the disaster recovery time from 45 days to minutes;

More cost-saving: with the capacity of data center decreased by 80% and the global application number falling to 2000, the energy consumption is reduced by 60% every year, and the overall IT spending is reduced by half, thus greatly saving costs for the company.

Business gains:

Increasing business flexibility: the hybrid IT infrastructure can rapidly meet the ever-changing internal and external IT demands under the new form of business;

Improving mobility: allowing partners and employees to access company network securely at any time anywhere;

Accelerating business responsiveness: hybrid cloud infrastructure enables our developers to quickly respond to business needs and reduces the time to market.

Having experienced a successful transformation, HPE more firmly believes that in the era of "service economy" + "idea economy", the IT reform can help an enterprise gain competitive advantages under the trend of service trade. In this interconnected, booming world, cloud computing can promote an enterprise's journey of innovation. The flexible and swift hybrid IT infrastructure can help an enterprise find truly valuable insights in mass data and actively respond to network threats, provide rich mobile experience anywhere on any device and thus help the enterprise remain invincible in the fierce market competition.

It has been 11 years since we settled in Chongqing. Over these years, we are honored to witness the rapid development of Chongqing and grow with the industries in Chongqing together; we have become a part of economy in Chongqing. The Chinese government has recently proposed the national strategies of "One Belt and One Road Initiative" and "Yangtze River Economic Zone", which take speeding up service trade development and cultivating service trade market entity as an important job, and highlight the importance of creating a number of large multinational service enterprises who have prominent main business and strong competitiveness. Chongqing has carried out the above national strategies and implemented five emerging service trade projects so as to accelerate the development of service industry and realize economic transformation. HPE hopes to, by virtue of our transformation experience and by providing the ability for total solution and with our global professional service team, help the enterprises in Chongqing find the right mix of public and private clouds, shift smoothly from traditional IT infrastructure to the cloud, embark on the way to change, improve its competitiveness and innovation capability, and step on the road of internationalization, thus contributing to economic transformation and innovation development of Chongqing.

Deploying the 'Internet-plus' Advantages to Develop Chongqing as a World-class Trade Hub

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CONTENTS

I Introduction

Invariably, China hasarrived at a juncture of change, economic evolution and business innovation, all amid a dynamic medley of continuing development and market liberalisation. Nearly four decades of economic progress in the forms of intense manufacturing and swift exports has generated unprecedented growth for the country's rising enterprises, expansion across its industries both old and new, and prosperity for its people nationwide.

Yet even as growth continues, it has shifted to a slower pace, in part, attributed to slagging economic recovery worldwide and, in another part, tethered to a refreshed model favouring an upgraded and more efficient quality-based growth. This approach on growth now focuses on unleashing the forces of domestic consumption, commercial innovation and industrial productivity. The coming phase of development will look very different: China's economic miracle is becoming the 'China dream', one that is being built on advanced technology, upgraded industries and efficient capital for both trade and investment.

For Chongqing, China's transformativeeconomic growth presents an opportunistic moment to re-configure and refine its own model on forward development. Among the several renewed focuses is the core element of injecting innovation into the municipal economy, through its enterprises and industries.Introduced in December 2015and echoing national policy, Chongqing's action plan laid out clear objectives for developing the software and information and communications technology (ICT) industries over the next few years.

Namely, the national 'Internet-plus' strategy announced in March last year is already making notable inroads in Chongqing, demonstrating the municipal government's commitment and initiatives to upgrade its industries with technology. Industrial output still dominates,occupying over one-third of its total GDP last year – heavy industryhas accounted for as much as three-fourth of its gross value in recent years[1] – and remains its comparative advantage as a national centre for sectors ranging from automobile to iron to steel.

Chongqing has been revamping itself on these and other fronts, setting its sights on upgrading its industrial base, enhancing its logistics assets and developing its vibrant financial market. The advantages for further engineering itself as a top-class trade hub – for both headquarters and transit trade –are firmly rooted in its geographic position, one that places it at the convergence of two prominent economic development initiatives: one is domestic in scope, the Yangtze River Economic Belt Initiative, and the other international in reach, China's Belt and Road Initiative.

The opportunities to grow through Chongqing's economic advantages will open wider to the city's ecology of enterprises, as well as the diversity of established and freshly emerging industries. As ever, it is an honour for HSBC to be able to work alongside the Chongqing Municipal Government and offer our insights as a leading global bank.

This paper offers some of HSBC's key recommendations on how to integrate the Internet-plus strategy into Chongqing's industrial upgrading, ultimately as an effective way to reinforce its development as a top-class regional trade hub:

- Driving policy implementation to steer enterprise change and nurture innovation by applying the advantages of Internet-plus and other technological advances;
- Developing a vibrant market that empowers institutions to make ample financing accessible, sustainable and effective

[1] *Hong Kong Trade Development Council (HKTDC), 6Feb16; heavy industry was 74% share of industrial output in 2014 (full-year 2015 not yet available); industrial output was 35% for 2015, according toChongqing government*

for business and industry growth; and

- Creating incentives and activating initiatives to cultivate public-private partnerships, or also known as PPPs.

The national economic transformation currently underway further fuels Chongqing's momentum as the city continues on its path towards upgrading established industrial strengths while advancing on innovation. Applying the Internet-plus strategy will be further integral to turning the city's comparative advantages into competitive ones, further growing Chongqing's economic influence as a strategic trade hub.

II Internet-plus and why it matters: Opportunity for Chongqing's next phase of growth and upgraded development as a trade hub

China'sInternet-plus strategy aims to generate a driving force for national economic transformation by playing an integral role in industrial upgrading while, in the process, enhancing business strategy and long-term growth. It sets out to integrate digital and innovative technologies – namely, Internet mobility, cloud computing, big data and the Internet of Things – with traditional industries such as manufacturing, energy and logistics.

The primary principles of mobility, intelligence and inter-connectedness all serve to encourage a greater scale of advanced manufacturing, industrial innovation and dynamic entrepreneurship.

In due course, Internet-plus will help transform Chongqing's traditional industries and cultivate a gathering wave of emerging industries.Local sectors that will benefit would range widely, from energy to e-commerce to logistics and transport; local companies and institutions will benefit from raised productivity, leaner industries and improved economic efficiency and scale.

But today is only just the beginning of the digital age, and China's digital journey has been largely focused on consumers and related sectors. China is now home to 710 million[1] Internet users, more than half of its total population and more than double the US population.[2]Of greater economic impact will be just how enterprises apply and activate the Internet as part of its strategy, development, procurement, operations and sales.

The penetration rate of digital application in Chinese enterprises, including SMEs, remains relatively low at 20-25 percent.[3] (That's compared to as high as 63 percent of all enterprises in the US, or 85 percent of its SMEs.) Depending on the extent of industry adoption, the Internet has the potential to add 7-22 percent to China's incremental GDP growth by 2025.[4] By then, it could generate RMB4-14 trillion in annual GDP. That gap of RMB10 trillion will be determined by how efficiently and effectively policy support and businesses can work together to integrate digital applications.

Nationally the digital movement is expected to advance a wide range of sectors. Six industries, in particular, could see stark impact of a digital transformation in varying ways – consumer electronics, automotive, chemicals, financial services, real estate, and healthcare – and these are poised to play well to Chongqing's industrial strengths.Furthermore, why and how Internet-plus matters to Chongqing can be better viewed in three perspectives:

- The city's inherent advantages in highly developed resources, in infrastructure, production andtransport, offer a firm

[1] *China Internet Network Information Center,up to Jun16*

[2] *US population at over 324 million, various online sources, Aug16*

[3] *McKinsey Global Institute, report on 'China's digital transformation: the Internet's impact on productivity and growth', Jul14*

[4] *McKinsey Global Institute report (same as above)*

foundation for industrialupgrading;

- Its strategic opportunity will be to advance further on the progress of building a top-class regional centre for trade and investment; and
- Applying the Internet-plus strategy in effective ways willactivate technology and innovation to become catalysts for Chongqing's long-term economic success.

We see natural interaction among these three key components, with Internet-plus guiding as well as facilitating the advances on industrial upgrading.The pillars of technology and innovation contribute to tangible enhancements in transport and logistics operations.Greater ease and fluidity in the movement of goods will, in turn, achieve greater efficienciesand capacities throughout the supply chain, from production to transport to point of sale.

What's more, the Internet and related digital technologies are no longer confined to an individual sector all its own; they are becoming a means to transforming existing businesses by innovating strategies, products and services.

III Chongqing's pivotal significance: achieving growth along China's Belt and Road

While Internet-plus will go a long way towards enhancing companies' ability to innovate and develop – thereby also strengthening industries' competitiveness –it will be Chongqing's strategic position at the heart of China's trade that will open up wider space for continuing business growth. The city's geographic location at the upper-middle reaches of the Yangtze River has long made it an essential hub, a status well established during China's unprecedented economic rise through manufacturing and exports.

Yet it is Chongqing's stature as a centre for both regional and global trade that has gained greater prominencewith the sharpened focus forged by China's Belt and Road Initiative. This development plan re-paves the 'New Silk Road' that extends to Europe by land and sea spanning more than 60 countries.Collectively, they account for 29 percent of global GDP and comprise nearly two-thirds, or 63 percent, of the world's population.[1]

That expansive geographic coverage translates into massive potential for commercial expansion. China's annual trade with these countries is expected to surpass USD2.5 trillion in the next decade, rising from around USD1 trillion in 2015.[2]Also last year, Chinese enterprises invested in as many as 49 countries along this New Silk Road, with investment there reaching USD14.8 billion, or one-eighth of China's total non-financial ODI.[3]

As the country's heartland for industrial prowess, Chongqing is poised to gain in various ways from the growth generated by the Belt and Road. This development drive withvast international scope will further re-define the citywhile positioning it to excel both as an origin or destination for investment and as an essential transit hub for trade.

We are only beginning to see the economic impact of the Belt and Road Initiative, and the potential benefits to Chongqing's industries and businesses will be immense in the years to come. China's 'going out' initiative has been underway for more than a decade now, and the Belt and Road was first laid outless than three years ago – together, they will be formidable driving forces for Chongqing's growth and development in the years to come.

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[1] *HSBC Global Research; NDRC,'Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road' http://en.ndrc.gov.cn/newsrelease/201503/t20150330_669367.html*

[2] *HSBC Global Research; Xinhua News, 29Mar15, President Xi Jinping speaking at Boao Forum*

[3] *HSBC Global Research, 18Mar16*

Already Chongqing isthe springboard from which home-grown businesses launch their overseas expansion, particularly in the countries west and southwest of China. It also stands at an optimal positionfor boosting its versatility as a regional transit hub, functioning as the gateway to trade and infrastructure investment with the likes of Kazakhstan, Turkmenistan and Russia, and ASEAN markets from Vietnam to Laos to Singapore.[1]

The Chongqing Logistics City (CLC), for one,has made significant strides as an international port zone since it was established in 2007. In the city's western part, the 35-square-kilometre CLC is home to comprehensive logistics facilities, from the Tuanjiecun Railway Station and container terminal, a national leader, to the RMB10 billion Guoyuan Port. This transport and logistics area aims to employ 300,000 people by 2025 and generate RMB80 billion in GDP as a centre for high-end logistics and international trade settlement.[2]

The CLC also boasts the starting point of the Chongqing-Xinjiang-Europe International Railway, extending over 11,000 kilometres, crossing the Xinjiang Uygur Autonomus Region, Kazakhstan, Russia and Poland, among other countries, before reaching Germany. This major railway, with other rail, port, road and air links, place Chongqing at the focal point for a new frontier of westward growth.

Viewed in so many ways, Chongqing embodies the essence of the strategic and economic spirit set out by China's Belt and Road Initiative, which accentuates the city's significance for national and regional economic development. Chongqing's opportunity will be to facilitate outbound infrastructure investments and serve as the transit hub for westbound trade– both poised for further growth as the city's advanced transport infrastructure takes shape. Internet-plus provides the key to upgrading these links and production capabilities to ensure sustainable industrial evolution and trade growth for years to come.

IV Recommendations

Chongqing's achievements in the next phase of growth will be tethered to just how the city, with its diverse economic stakeholders, will be able to engineer a refreshed model of development. By no means will that be easy, nor will that continue to rely only on the inherent industrial and transport strengths. However, amid the challenges ahead also lie the forward opportunities.

From HSBC's perspective, three recommendations revolve around connectivity: cultivating public-private partnerships to both guide and support Chongqing's economic development; leveraging these partnerships to activate Internet-plus across the city's industries; further deploying the financial sector to help establish a strong, open platform that enables ample access to funding.

a) Cultivating public-private partnerships (PPPs) – the experience of Manchester's urban regeneration

Chongqing's further economic success as a regional trade hub will rely on the participation of both public and private sectors, leveraging the respective advantages of policy steering and commercial growth with innovation.In joining these sectors, the model of public-private partnerships, or PPPs, presents tested-and-proven practices for the city to tailor to its

[1] *Financial Times, 'New Silk road will transport laptops and frozen chicken', Jack Farchy, 9May16*

[2] *China Daily, 'Port zone takes shape in logistics city', 7Sep15*

needs.

By no means is the PPP model a novel invention. The framework of bringing together public and private sector resources has been applied at varying levels of government all around the world, from developing economies like Uganda in Sub-Saharan Africa to developed regional economies like Germany's Lower Saxony to emerging Asian economies like Indonesia or Malaysia.[1]The focus of PPPs, or their beneficiary causes, also covers a wide spectrum, comprising anywhere from clean technology to transportation to water and sanitation.

Worth noting and exploring in some detail is the PPP model implemented in the UK's City of Manchester since two decades ago. The city's dramatic industrial decline, capped off by one calamitous event, in the 1990s spurred the city's revival that continues to be realised today, making it one of the most successful cases of urban development, or re-development. Although the trigger point and direction for Manchester may differ, its national position as an industrial power will be familiar to Chongqing. Furthermore, its experience – and process, in particular –in development and regeneration offer Chongqing a number of best practices to examine.

Manchester's glorious industrial heritage since early 19th century – widely considered to be the first industrialised city[2] – began to recede by the mid-20th century. Shifting national policies, changing economic trends and rising global competition in the years after World War II led to the city's steady downturn through to the 1980s.It suffered a 60 percent job loss in manufacturing from 1975 to 1985; a 13 percent decrease in population in the 1990s; and a housing market collapse with nearly 20 percent of properties gone vacant.[3]

Then came what was to be known as the 'Manchester bombing', the terrorist act by the Irish Republican Army that struck the heart of the city, injuring hundreds of people, destroying a slew of buildings and incurring damages exceeding GBP700 million[4].

Reconstruction of the city, along with a revival of its deteriorating economy, required a wholesale effort from all sectors. The Manchester City Council led this effort by establishing the Strategic Regeneration Framework by2000 and forming a long-term vision with a timeframe of 10 to 15 years. Ambitious targets included setting aside large plots of land planned for regeneration, attracting billions of pounds in investment and creating tens of thousands of new jobs and homes in order to double the resident population.

However, it was the Urban Regeneration Companies (URCs) that enabled the city to achieve its ambitions. With the City Council as the leading partner, URCs were partnership initiatives capitalising on the best of public and private sector resources and expertise by engaging regional and national authorities, private businesses and community groups.

The essence of these partnerships were clearly definedfrom the start, enabling objectives to be achieved with efficiency and purpose. URCs operated as private ventures with business targets focused on designated areas of the city and on revenue growth. A fundamental principle was to 'help the city help itself', joining the efforts and common interests of a cross-section of stakeholders to re-develop the city. More than 20 URCs were formed across the UK since 1999, with the similar structure, vision and goal of urban regeneration.

HSBC suggests the Chongqing Government to support local authoritiesin setting up a special purpose vehicle (SPV),

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[1] *The World Bank, Public-Private Partnership in Infrastructure Resource (PPP IRC), 'PPP Units Around the World', 13Jul16 (updated)*

[2] *Hall, Peter (1998). 'The first industrial city: Manchester 1760-1830'. Cities in Civilization. London: Weidenfeld & Nicolson.*

[3] *New East Manchester website, "Sustainable Regeneration in East Manchester" (http://www.neweastmanchester.com/introduction/).*

[4] *BBC News*

similar to the URC-structure, to drive and promote the PPP model. The SPV should serve as a centralized platform to unite public and private sector partnersin thedelivery of public projects. Its focus should be on creating an optimal environment for investment by the partners and,at the same time,delivering sustainable public development.

b) Leveraging PPPs to activate Internet-plus across Chongqing's industries

While Manchester's urban regeneration distinctly differs from Chongqing's industrial upgrading goals, its proven PPP model presentsa framework that can be applied to bolster Chongqing's efforts onrealising Internet-plus. Cultivating partnerships among public and private sector stakeholders would marshal the resources in technology, planning, know-how, infrastructure and financial capital, towards achieving the city's economic goals.

Leveraging on PPPs, Chongqing can collaborate with partners such as the Hong Kong SAR, in applying internet-plus concepts and R&D co-operation, leading to further development in Chongqing's industries. A recent notable case involves foreign investment in advanced manufacturing, by a US-based pharmaceutical company. The agreement sources vital contributions from Chongqing's Banan District government, in land and construction funding, and from the company in equipping the two planned facilities[1]. The collaboration, also involving the company's R&D partner, the Polytechnic University of Hong Kong, establishes Chongqing as an integral hub in a world-class pharmaceutical supply chain and is poised to provide Chongqing, and China at large, with greater access to innovative oncology medicine.

The range of PPPs realised by Chongqing, and recognised nationally and globally, has the opportunity to generate a momentum that can drive upgrading of traditional industrial strengths and infrastructure development. When implemented with the application of Internet-plus advantages, PPPs could effect a new age of innovative development for a wider realm of the city's sectors, including the digitisation of public services.

Chongqing's opportunities will rely on the ability to integrate the emerging digital age leaders with the established pillar enterprises, all while supporting the newly emerging sectors to grow into leading industries. This process of integration and transformation will also serve to attract a more diverse cross-section of companies and institutions to plant their roots in Chongqing, further amplifying its attributes as a pivotal centre for trade.

Unleashing the potential of Internet-plus will enhance Chongqing's advantages by upgrading and fully utilising its intricately versatile transport network. The result will see the city enhancing its influence as a hub that connects domestic regions and cross-border markets through efficient trade, both for transit and re-processing, and as an origination platform for the home-grown companies.

Underlying these existing advantages and future opportunities is the core theme of connectivity. For Chongqing, it will be about plugging into Internet-plus by connecting to technology and innovation as effective means to advancing businesses in their strategies, systems and operations. The focus will also be on connecting to markets both regional and global in order to capitalise on the growth potential linked to the Belt and Road.

c) Financing to empower Chongqing's Internet-plus drive and trade hub expansion

At the foundation of Chongqing's strategic goals in strengthening its trade hub positionis efficientaccess to funding that

[1] *PRNewswire, press release by the US pharmaceutical company, 16Oct15*

supports sustainable business growth. Achieving that entails building a wider financial support base and investment channels that incorporate national market liberalisation reforms while tailoring key aspects to Chongqing's intrinsic market needs.The major local and global financial institutions play a key part in supporting the industrial upgrading and overseas expansion of local companies by helping them connect to other domestic and international markets.

For HSBC's part, global connectivity has long been a core operating principle of the products and services we provide, connecting people and businesses to market opportunities and helping them realise their growth ambitions. In mainland China, our leading banking network among foreign banks positions us strongly to serve the evolving needs of Chongqing's enterprises, many of which are undergoing their own transformation by means of innovation or realising their expansion in markets overseas. Even some are in the process of both.

A recent case study shows a leading Chongqing automotive company seeking fresh funds to advance its R&D with a view to acquiring patents, machinery and lab materials.HSBC supported the company's growth objectives by providing working capital to the company's Singapore subsidiary, in the form of a USD20 million loan facility.[1]HSBC in both Chongqing and Singapore collaborated to extend one of the first foreign loans backed by Chinese domestic security.

This pioneer transaction paved the way for Chongqing businesses seeking novel ways to finance their strategic transformation and global expansion. Helping to broaden the funding channels for the city's companies will also ease their access to funds offshore and lower financing costs. It also set a precedence for the closer cooperation supported by the 'China-Singapore (Chongqing) Demonstration Initiative on Strategic Connectivity', signed by the two countries last November.

The top-level bilateral pact, also known as the 'Chongqing Connectivity Initiative' (CCI), will strengthen collaboration between China's western powerhouse and a premier global financial and shipping centre in Singapore to focus on transport and logistics, aviation, ICT and financial services. Two principal goals for the project will be to lower financing costs and logistics costs.[2] Furthermore, itwill offer a template for Chongqing's 'going out' drive connecting to other markets in Southeast Asia and China's western neighbours.

HSBC suggests the Chongqing Government to leverage on the CCI and promote the extension of more foreign loans pledged with local assets,similar to the case arranged by HSBC as stated above. In addition, the Government can extend the similar kind of connectivity initiative to other financial centers, including Hong Kong and London,so thatlocal Chongqing companies can gain better access to overseas marketas well as arrange funding through their subsidiaries in Hong Kong or London with their local assets as collateral on.The move will further broaden the source of financing for local companies.

V CONCLUSION

Asia is poised to lead the world in trade growth, and China will invariably stand at the forefront. With global trade expected to quadruple to USD68.5 trillion by 2050, Asia's share is set to rise to 46 percent, up from one-third in 2015, according to HSBC forecasts.[3] China's trade will reach USD11.75 trillion by 2050, accounting for a nearly 18 percent share,

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[1] HSBC press release, 'HSBC Singapore provides working capital to Chongqing subsidiary…', 1Jun16. In respect of client confidentiality, we are not at liberty to disclose the client's name.

[2] Channel NewsAsia, 'Singapore and China's third G2G project gets underway in Chongqing', Jeremy Koh, 8Jan16

[3] HSBC report , 'Trade Winds: shaping the future of international business', 23Nov15

further extending its lead as the world's number one trading nation.

For the years and decades ahead, China will continue to thrive not only in its Asia and global trade, but also in its surging outbound investment in both developed and emerging markets. The country's development, as it is already, will be defined by its domestic achievements in economic and financial reforms, as well as its global connections now more tangibly shaped by the Belt and Road Initiative. And Chongqing is at the heart of thatsheer economic force.

It will be Chongqing's opportunity to seize on these winds to advance its own industrial evolution through technological and strategic upgrading, and its drive to its rightful claim as a regional and global hub for trade. As detailed above, HSBC's core recommendations for Chongqing consist of:

- Cultivating public-private partnerships (PPPs) to drive cooperative development for the city's collective growth; the experience of Manchester's urban regeneration offers best practices that can contribute to success in the Chongqing way;
- Deploying the power of PPPs to activate Internet-plus across Chongqing's industries, starting with its enterprises; and
- Building a vibrant and open market to enable the financial sector to empower Chongqing's Internet-plus drive and trade hub expansion.

We are seeing an information revolution in a digital era that is fast exerting its influence on business, trade and investment while also easing the dynamics of enterprise change and economic growth.When combined with ample access to adequate financing, the "Internet-plus" drive, deploying technology and innovation, will serve as an effective catalyst in further strengthening Chongqing as an essential pulse for China's forward economic progress.

Already Chongqing has planted a sound foundation for its Internet-plus development as a way to bolster its leading status as a trade hub in western China.The fact that this year's CMIA meeting bringsthis subject to the fore demonstrates the importance placed on it by and for the city. We at HSBC are honoured to be a part of this conversation, as we will make ourselves available to offer further perspectives to the municipal government.

Chongqing's Opening-up and Trade in Services under the Belt and Road Initiative

Mark Wilson
Chief Executive Officer – Global Acetyls

1 Chongqing-Xinjiang-Europe Railway strengthens Chongqing's location advantage

1.1 Chongqing's geographic advantages have gradually taken shape

Location advantage is normally based on extraordinary natural and geographic conditions, abundant and high-quality endowment in production factors, industry clusters, favorable policies as well as an overall enabling investment environment. Over the years, however, development of Chongqing's secondary industry, as a pillar industry, has been impeded by its geography, as it is an inland mountainous city. Businesses have been held back in terms of their market expansion and development, price competitiveness and integration into the regional, national and even global value chains. All this has undermined Chongqing's traditional influence as the only municipality directly under the central government and industrial base in China's central and western region.

However, planning and construction of the Chongqing-Xinjiang-Europe Railway has opened the rail transport route from the central city of Chongqing to the western autonomous region of Xinjiang, to Russia and all the way to Europe. Chongqing no longer has to turn eastward and take the maritime route to enter Europe. This has not only eased Chongqing's geographic constraints, but has also strengthened its location advantage. The railway has created conditions for Chongqing to play a strategic role under the *Belt and Road Initiative* (Silk Road Economic Belt and 21st Century Maritime Silk Road) and to build a free trade zone in the city.

1.2 Build a successful FTZ based on its location advantage

Looking around the world, FTZs are built around cities that are geographically advantageous. They are normally close to seaports or airports, and some of them function as ports of entry on land or are located in border areas with large trade flows.

The Dulles foreign trade zone of the United States is centered around the Washington Dulles International Airport, which is the main hub for United Airways. It's perfectly located in the center of America and acts as one of the international aviation centers. With exceptional geographic strengths, the Dulles foreign trade zone provides such functions as reshipping and storage of goods.

The Mersin free trade zone is close to the biggest port in Turkey. The city of Mersin sits between Europe and Middle East, as a bridge between the two markets and a gateway for Turkish businesses to enter Central Asia. A complete logistics network has been built around shipping, and supplemented by aviation, railway and road transportation. The free trade zone, providing such services as export processing, en route trade, and bonded storage, has become an important driver of the local economy.

Therefore, to further build, maintain and strengthen the city's location advantage should be a strategic focus for the Chongqing government.

2 The basic logic of Chongqing's service trade development under FTZ arrangements

2.1 Basic rules for service industry and service trade development

Trade in services normally covers the following typical areas: modern logistics, modern finance, e-commerce, science and technology services, IT services, new types of services, restaurants and catering, medical services, old-age nursing and tourism. As we all know, development of service industry, with the exception of tourist and medical services, largely depends on the secondary industry. The second industry, by creating demands for producer and household services, both directly and indirectly drives the growth of service industry.

2.2 Pathway of Chongqing's service trade development under FTZ arrangements

Given that Chongqing has recently been approved to become an inland FTZ, it's important to clarify the reality and strategy for manufacturing industry development of the city, on the basis of FTZ's nature and functions as well as the pathway to develop trade in services.

The pilot free trade zones in China represent, in nature, a new form of foreign trade zones in ordinary sense. The foreign trade zone is a specially regulated area within the borders of a country or region without barriers imposed by customs authorities, where preferential trade policies are adopted. In different countries and regions, and in different phases of history, they are known as free ports, export processing zones, foreign trade zones, bonded warehouses, tax-free zones, etc. Key policies of FTZs include customs bonding and tariffs exemption, supplemented by concessions in income-tax and other preferential policies. Compared with FTZs by international standards, pilot FTZs of China are more about transforming trade models, opening up finance and investment related services and trade in services, transforming government functions and introducing reforms of administrative systems.

Therefore, under the institutional arrangements of FTZs, developing trade in services should give full consideration to the level and scale of the manufacturing industry, which may support or impede trade in services. Potential of producer and household services is determined by investment and employment scale, profitability and pay levels of businesses.

Important means of transportation for Chongqing, located in China's central inland, include rivers, railways and aviation. The city enjoys no low-cost edge in large-volume and low-value goods as the seaports do. Therefore, transporting cargo along

the Chongqing-Xinjiang-Europe Railway puts pressure on the price weight ratio. That means manufacturing industry needs to create higher added value to offset the rail transport and other producer services costs. This has obviously presented challenges to the current export industry of the city.

In this connection, it's hoped that Chongqing will leverage the preferential policies for the FTZ to the benefit of high value-added manufacturing. For example, the enterprises may enjoy lower production costs as a result of bonded processing of parts needed to manufacture high value-added products, and lower capital occupation attributable to the pilot policy of financing the renting of large equipment.

To enhance the competitiveness of local manufacturing, it is also essential to rationalize the pricing of key raw materials. Take natural gas as an example: Chongqing and the surrounding region are blessed with abundant natural gas resource - a primary source of industry raw material. The establishment of a predictable, transparent, open and quantitative pricing mechanism is necessary for ensuring the natural gas advantage to be enjoyed by local manufacturing and transformed into competitive advantage.

Also, only with the right direction and positioning of manufacturing industry that match characters of Chongqing, can the city's drive the growth of producer services, which in turn support manufacturing. From this perspective, producer services, including logistics, finance, e-commerce, science and technology services, IT services, can only enjoy sound and sustainable growth when industry connections are established with Chongqing and other related areas in Sichuan Province. The same logic applies when financial institutions provide services to the real economy and cross-border e-commerce is supported by factory clusters.

2.3 Logistics and financial industries of Chongqing in the process of opening up

Undoubtedly, as the implementation of the *Belt and Road Initiative* and the building of an FTZ unfold, Chongqing's logistics and financial industries face tremendous opportunities and possibilities. In addition, as the third China-Singapore G-to-G project on connectivity was launched in Chongqing, learning from and working with Singapore in logistics and financial areas will become possible and be brought onto the agenda.

Singapore has become an international shipping and trading center for oil and other commodities, an important global offshore financial center and tax haven. BP has successfully operated in Singapore for over 50 years. Today, BP's main business activities in Singapore include the oil, gas, chemicals, carbon and finance trading business for the Eastern Hemisphere, covering the Middle East, Southern & East Africa, Australia, India, South East Asia and China. Singapore is also the regional headquarters for Shipping. Below are some key attributes observed in the success of Singapore's logistics and financial industries.

- Advantageous geographical location (Singapore is an important gateway for Africa, Middle East and Southeast Asia to enter Australia and East Asia) with deep harbor port
- A highly developed logistics network that allows goods to be moved in a quick, safe and cost efficient way.

- Good support infrastructure in place and extensive maritime services provided.
- Have full capabilities to support all types of logistics operations in the region – from the initial stages of stock management, to specialized services like insurance, freight management, consultancy and security control, to the final delivery, enabling short turnaround time.
- A sophisticated telecommunications network, a strong pool of talent and a knowledge based economy with extensive experience and experience in global markets.
- A pro-business environment with a free trade environment
- Good legal and dispute resolution framework.

Chongqing is a major river barge port in upper-Yangtze, and also the potential biggest inland market of China. With the location advantage brought by the Chongqing-Xinjiang-Europe Railway, it has the potential to become an inland logistics center of China if it can further improve its infrastructure and develop the "software" as highlighted above.

Singapore's success in financial industry is attributed to its well-established market and sophisticated services supported by a mature legal framework. Chongqing has made some progress in cross-border trade settlement and financing facilitation, and it would be beneficial if it can further establish offshore finance market and put in place necessary legal infrastructure.

3 Upgrade Chongqing's hardware facilities as well as policy and legal environment

Further opening-up, especially the development of FTZ is undoubtedly the best opportunity to drive Chongqing's service trade. FTZs around the world have all heavily invested in building infrastructure and a favorable environment, and are committed to providing best services. More importantly, supporting laws and regulations lay the groundwork. From this perspective, there is more efforts need to be made by Chongqing.

3.1 Infrastructure, environment and services of FTZs

To make FTZs more attractive, countries have all made significant investment in infrastructure, environment and services. In Incheon free economic zone of the Republic of Korea (ROK), efforts have been made to provide U(Ubiquitous)-City and Eco-City services and functions. The Eco-City perspective, in particular, is about making the city green and environment friendly with low carbon footprint, to minimize energy consumption and inject strong impetus into sustainable development of FTZ. In addition, to support foreign investment, the Incheon free economic zone has set up a one-stop service zone, to provide consultancy on legal, taxation and accounting questions and make assessments on investment and project initiation.

Many other overseas FTZs are known also for their impressive infrastructure and services provided. The Shannon Free Zone of Ireland, with state-of-the-art office space and factory facilities, sufficient water and electricity supplies as well as optical communications and broadband networks connected to major European and American cities, makes things easy for enterprises in the zone. The Aegean free trade zone of Turkey provides steady, low-cost but best-quality services to enterprises, including water, electricity, natural gas, the Internet service, as well as transportation, customs declaration and exhibition services at a reasonable cost. Apart from these basic services, it also provides security and other special services,

and gives tremendous support to high-tech innovation. The event hall within the FTZ, with advanced facilities, is able to accommodate large-scale conferences for high-tech companies to launch new products.

Domestic FTZs also take infrastructure development very seriously. The Shanghai Pilot FTZ boasts a mature transportation network of waterway, railway, hi-speed roads, aviation and urban rail transit. The city enjoys the first-rate harbor infrastructure, and is catching up with world-class international port cities in terms of storage facilities and the collecting-distributing system. It is now exploring the possibility of putting in place a collecting-distributing system with air bridge service in cooperation with Shanghai Pudong International Airport.

3.2 Customs regulation policy adjustment of FTZs

FTZs are closely associated with import and export flows, in which customs authorities play a significant role. To facilitate business, FTZs around the world introduce policies to optimize customs supervision and to make things as easy as possible for enterprises without violating laws.

The McAllen FTZ of the United States has introduced a weekly customs declaration policy, allowing enterprises on the zone to fill in declaration forms only once a week, instead of going through the procedure at every unloading.

The Port of Rotterdam also provides multiple facilitating policies, including a 24-hour customs clearance system except for Sundays, pre-arrival notification, risk analysis and electronic inspection. With these policies, the cargo owners may send customs-designated containers to inspection without holding up the inspection-exempted goods. It increases clearance efficiency and avoids customs holds. The port also replaces inspection with management of account books and inventory data. The customs authorities may replace traditional inspection with verification of accounting statistics of qualified companies. The customs authorities would issue permissions of different categories to companies accordingly, to determine how much convenience they enjoy in terms of import-export procedures.

At the Shanghai Pilot Free Trade Zone, the principle of "open entry at frontier, safe and effective control at secondary line and free flow within the zone" is implemented. The international trade single window system has been launched and tentative steps taken to establish a classification regulation regime for cargo status.

All in all, the customs regulation system is aimed at facilitating business. Chongqing may coordinate with customs authorities to agree on a package that provides real convenience to the business community.

3.3 Supporting legal framework of FTZs

In most cases, legislation is adopted before FTZs are established. In only a small number of cases, FTZs are set up before relevant legislation is passed, and laws are put in place gradually as the FTZs grow.

The United States started with the *Foreign-Trade Zones Act* in 1934, defining the nature and functions of FTZs, and

providing the legal ground and standards for FTZs across the country. Two years later, the very first FTZ was established in the country. The Act has been amended a number of times according to evolving situations, driving the growth of FTZs in the US.

To ensure smooth development of the Manaus free trade zone, the Brazilian government has, since 1976, promulgated 19 acts and decrees, providing protection, incentives and preferential conditions to foreign investment and advanced technologies, and at the same time, lay out strict restrictions to ensure growth of national industries and meet localization targets.

As far as China is concerned, it has amended and implemented relevant provisions of 3 laws, 17 administrative regulations, 3 State Department documents and 3 departmental regulations approved by the State Department. The Shanghai Municipal People's Congress has implemented the *Regulations on China (Shanghai) Pilot Free Trade Zone*, providing comprehensive regulations in the form of local legislation on institutional innovation and specific reform measures of the pilot zone. Therefore, it's recommended that Chongqing to learn from other FTZs and introduce supporting legal framework for the building of a high-standard inland FTZ in the city.

4 Recommendations to Chongqing city

BP is one of the leading foreign investors in the oil & gas sector in China. Our business activities here include exploration and development, petrochemicals manufacturing and marketing, aviation fuel supply, oil products retailing, lubricants, oil and gas supply and trading, LNG terminal and trunk line and the chemicals technology licensing. BP was also one of the first major international companies who came to invest in Chongqing, and our Yaraco JV with Sinopec has been successfully operated for 21 years since established in 1995.

BP is pleased to see the opportunities brought to Chongqing by inland opening, especially the joint development of manufacturing and service industries. With sound manufacturing industry and solid basis of information industry, Chongqing is in a good position to develop trade in services by integrating it with other industries. Based on our experiences of operation in China, including experiences in eastern coastal areas, and from our industry perspective, we would like to make below recommendations for the reference of Chongqing government.

4.1 Utilizing FTZ policies to enhance competitiveness of local export-oriented enterprises.

BP has long provided olefins, aromatics and other raw materials for the coastal export enterprises. Some policies of those costal bounded areas/FTZs allow us to make some commercial arrangement that can benefit downstream purchasers in terms of the flexibility of choosing payment facilities, effective management of working capital, and the increasing of export competitiveness. This brought us a win-win situation. By adopting similar FTZ polices, Chongqing government can help to enhance competitiveness of local export-oriented enterprises.

4.2 Support the development of industry chain

At current stage, Chongqing's industrial productions, business clusters and services development are not yet well integrated. Apart from a few sectors such as automobile and parts manufacturing, industries do not yet form supply value chains and business clusters to maximize productivity.

Take the industry chain of PX-PTA-PET- textiles as an example: the development of each link of the chain was not synchronized in southwest region. When the first PTA production line in the region started up, both feedstock and downstream consumption were highly depended on East China, and its operation had experienced serious difficulties and failed to last until the start-up of the local PX plant. Now Pengzhou PX plant started-up, there is no PTA plant running in the region, not to mention downstream PET. Pengzhou therefore has to ship PX to East China and then eventually satisfy local demand with products from the East. We need to remember South West China is a market with one seventh of China population, and the labor cost is much more competitive than East China. This is just an example to understand the importance of supply value chain. However, it is not an appropriate time to develop such value chain because of overcapacity and weak PTA demand.

Another example is Butyl-acetate, an important solvent for printing inks industry with end-products widely used including on automobiles. Butyl-acetate is made from butanol and acetic acid. Previously there was no competitive butanol supply in the southwest region, thus, local Butyl-acetate products could not compete with those imported from East China, even with abundant acid supply available. This undermined the competitiveness of local printing inks industry and its downstream manufacturing. The situation was improved since the startup of Pengzhou refinery. Now BP's Ester unit in Chongqing can run at its full rate by utilizing local feedstock to satisfy local demand.

From these cases, we can see the importance of developing industry chain and we believe there is a bigger role the government can play in supporting this.

Conclusion

With Chongqing's geographic advantages taken shape, as the only municipality directly under the central government, Chongqing will certainly play a strategic role in China's One Belt and One Road initiative. And the speed up of inland opening-up, especially the establishment of a FTZ in Chongqing, will undoubtedly bring huge opportunities for local manufacturing and service industries. BP is committed to Chongqing and will continue to explore more growth opportunities in this robust city.

Digital Strategy Critical to Enhancing Competitiveness of Trade in Services in Chongqing

Chris Houghton

Senior Vice President, Ericsson Group

As we have experienced today, our society is becoming increasingly digitized as digital infrastructures and interactions are increasingly central to the functioning of our societies, economies and lives.

In the context of trade in services as we discuss today, it is well noted that digital technologies have changed the nature of trade in services in recent decades. For example, services like retail, travel services, banking, and even some health care services that once could be offered only or largely locally can now be accessed remotely thanks to the information and communications technologies (ICT).

The ICT revolution has now not only enabled many services that previously required face-to-face contact between the firm and consumer to be provided remotely, but also allowed platforms and support services to make it easier for firms to access international markets.

ICT-enabled business platforms play an instrumental role in facilitating services trade as these services are able to quickly and cheaply connect suppliers and sellers based on their collection and analysis of user data.

It is reported that the city of Chongqing has witnessed significant development of trade in services with an annual growth rate of more than 25 percent in recent years.

We have noted that Chongqing municipal government intends to drive the remarkable growth of trade in services through fostering competitiveness of enterprises in the service sector.

We view that the key challenge for Chongqing is to ensure that the rapidly-grown service sector and services companies can fully capture the opportunities and value of digitalization.

Digital transformation in acceleration

In today's global digital economy, enterprises have little choice but to invest in information and communication technologies, because we are at an inflection point where we can really take advantage of ICT to dramatically boost productivity.

However, without the proper skills to put these technologies to effective use, enterprises will be at significant risk of wasting their investments and missing key opportunities for growth and competitiveness.

It is our strong belief and also consistent practice that to be competitive, innovation is critical and there are three key aspects for the success: strategy, skills, and tools.

Countries at all levels of development are increasingly aspiring to use the Internet and digital technologies for transformative and sustainable development.

For example, in early 2010 the European Commission presented a Digital Agenda for Europe, which is the EU's strategy to ensure digital technologies, including the Internet, are used to make life better in Europe. It aims to reboot Europe's economy and connect citizens in new ways.

The European Commission holds that digital technologies play the central role in value creation in the economy and bring about radical transformation to all aspects of development, production and related services. Europe's industrial renaissance can only become a reality if digitization of products, processes and business models is mainstreamed across all industrial sectors.

We've noted that the Chinese government unveiled in 2015 an "Internet Plus" action plan, aiming to further deepen the integration of the Internet with economic and social development, making the Internet-led new industrial modes a main driving force of growth.

To implement the national action plan, Chongqing government has also formulated an Implementation Opinions proposing 10 directions and 38 key tasks, policies and measures for the "Internet Plus" action plan in Chongqing.

Our recommendation: Place digital skills development as a key component in Chongqing's Internet Plus action plan

As Chongqing is speeding up its drive for the Internet-led transformation, demand for digitally skilled human resources will definitely grow rapidly. We therefore propose that Chongqing government to place digital skills development as a key component in its Internet Plus action plan and also for long-term digital development in the City.

As we are investing more in ICT and are digitizing a greater number of business processes, products and services, efforts are needed to ensure we have sufficient e-skilled professionals to be innovative and competitive, thus maximizing value creation from ICT.

Having strong e-skills is not simply beneficial to competitiveness -- it is necessary to avoid wasting investments in ICT. This is true for all types of organizations – no matter the size or sector.

It is now well noted that digital technology is transforming almost every aspect of our public, private or work life. Digital skills will be needed for nearly all jobs where digital technology complements existing tasks. It is predicted that in the near future 90% of jobs - in careers such as engineering, accountancy, nursing, medicine, art, architecture, and many more - will require some level of digital skills. At the end of the day every citizen needs to have at least basic digital skills in order to live, work, learn and participate in society.

Strengthening digital skills in schools and higher education is only sufficient up to a certain point. There is also a need to develop skills in the world of work and organizations in general. This applies to more fundamental digital skills, for example to work more intelligently with ICT support, but also top-level skills for ICT development.

The government can also set up mechanism to involve more stakeholders to address the challenges. Here, we would like to share with you what European Union has done in this area.

To implement the Digital Agenda for Europe, the European Commission has set out steps to improve digital skills in Europe.

In March 2013 the European Commission launched the Grand Coalition for Digital Jobs to address the lack of digital skills in Europe. The Grand Coalition is a multi-stakeholder partnership that endeavors to facilitate collaboration among business and education providers, public and private actors to take action attracting young people into ICT education, and to

retrain unemployed people.

In three years, the Grand Coalition for Digital Jobs has become the largest collaborative effort in Europe aimed to offer more ICT trainings co-designed with the industry, implement job placement programs, provide more digitally aligned degrees and curricula at all levels and types of training and education, and motivate young people to study ICT and pursue related careers.

The Grand Coalition has so far attracted around 60 pledges, from over 100 stakeholders, to undertake concrete actions to reduce digital skills gaps in Europe.

It has also raised political awareness and support for these issues, which in 13 countries led to the setup of national coalitions. The Grand Coalition, together with the 13 national coalitions, has led to the training of an estimated over 2 million people since the initiative's launch in 2013.

One of the most important achievements is that it helped to break down silos in the area of digital skills development and make collaboration happen, especially between governments, education and industry.

In May, the European Commission released the 2016 European Digital Progress Report on digital progress in the EU. The analysis shows that Member States are at very different stages in the development of the digital economy.

The majority of people in the EU (76%) now use the internet regularly and only 16% have never gone online, while 45% of people in the EU do not have basic digital skills.

ICT professional skills are also lacking in many countries. Although employment of ICT professionals has grown by over 4% a year over the past decade, ICT graduate numbers have, however, fallen by 40%.

In June, the European Commission announced a new initiative called “Digital Skills and Jobs Coalition”, calling on Member States to develop comprehensive national digital skills strategies by mid-2017 on the basis of targets set by the end of 2016. It also invites Member States to establish national digital skills coalitions, involving governments, businesses, as well as education, training and labour market stakeholders.

In addition, it calls for concrete measures to bring digital skills to all levels of education and training, supporting teachers and educators and promoting active involvement of business and other organizations. At the same time, the Commission calls on Member States and stakeholders, including social partners, to pledge action that supports life-long learning and to identify and share best practices, so that they can be more easily replicated and scaled up.

5G best for digital transformation

In fact, we are entering a reality in which billions of physical objects are embedded with online intelligence and layer upon layer of digital interactivity. These connections, whether between wearable devices, cars and home-automation systems, or among networked urban infrastructure and sensor-equipped industrial machinery, will serve as enablers for more dynamic products enhanced with a wealth of new services that improve product performance and achieve new levels of network efficiency.

There is great momentum today in the move towards the digital or Internet-led transformation of industries; and this momentum will continue to increase in the near future.

The Internet of Things (IoT) will be a rapidly growing area. By 2021, we forecast there will be 28 billion connected devices worldwide, of which 16 billion will be IoT connected devices.

From our telecom perspective, we see the increasing demands of IoT applications sets the scene for accelerating

technology developments, in particular the upcoming 5G, as the world is going to embrace 5G as the next generation of wireless access in global connectivity.

We believe that 5G is the next chapter of telecom networks designed to meet ever-more advanced and complex sets of performance requirements. And it represents a new way of thinking in the approach to generational changes in mobile technology.

This will enable us to collaborate, innovate, sustain, learn, care and participate in ways we never thought possible just a few years ago and leaves much more yet to discover.

We've noted that Chongqing government intends to further expand the functions of the open platform for the "three three-in-one" (sea, land and air communication hubs, class-I ports, and bonded zones), so as to improve the role of international logistics thoroughfares such as Chongqing-Xinjiang-Europe railway in facilitating and driving the development in the surrounding areas, to improve the construction of logistics facilities inside the city, and also to form an opening-up pattern that facilitates the smooth linking inside and outside the city.

The transport and logistics industry is undergoing a tremendous evolution and achieving a great deal of benefits with the deployment of intelligent transport systems (ITS), which are enhancing the efficiency, safety and green credentials of the transport sector across the world. Mobile communications will simplify and accelerate the ITS deployment.

Our recommendation: NB-IoT: a sustainable technology for connecting billions of devices

We view that as the expansion of the open platform for the "three three-in-one" will involve a multitude of devices, applications and services, the new narrowband radio technology NB-IoT, which was standardized recently, will help the expanded platform function more effectively and efficiently.

The new technology of NB-IoT, which is specially designed to address the requirements of the Internet-of-Things, will provide cost-effective connectivity to billions of IoT devices, supporting low power consumption, the use of low-cost devices, and provision of excellent coverage – all rolled out as software on top of existing LTE infrastructure.

The NB IoT technology will be broadly adopted in areas like smart meters, smart wearables, smart home, municipal IoT, smart building, logistics tracking, wide area IoT, industrial IoT to address the increasing demands of IoT applications.

We've also noted that Chongqing government is determined to increase its efforts to strictly protect environment and implement energy-saving management through conducting research and formulating and strictly implementing ecological environmental protection road maps concerning the prevention and control of water pollution, atmospheric pollution, and disposal of solid wastes.

Connected water solution

We view that one of our projects on connected water solution with the Internet of Things (IoT) devices will be a good reference to adopt NB-IoT for smart management of ecological environmental protection in Chongqing.

In early 2016, Ericsson conducted field trials with AT&T for connected water solutions in Atlanta, to remotely monitor the quality of the city's water at key watershed locations.

The trials are an example of the Internet of Things, where anything that benefits from being connected, will be connected. The first prototype has been placed into the City of Atlanta watershed in Proctor Creek. Sensors will play an essential role in

improving processes and reducing cost in water quality management.

In conclusion, we would like to reiterate that with our leading technologies and strong expertise and also our growing presence in Chongqing, Ericsson will fully support Chongqing government in its drive for the implementation of the "Internet Plus" action plan.

We are well prepared to work in partnership to develop localized IoT solutions and services for our customers, including not only primarily telecom operators but also transportation, logistics, government departments and others.

We will also be more than happy to share our expertise and facilities in the countries along the Belt and Road, where we support the telecom services from our Global Services Centre in China, for smooth operation of cross-border logistics delivery and transportation. We are looking forward to further and more cooperation in Chongqing.

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Historic Changes in the Automotive Industry and the Opportunity for Chongqing

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EXECUTIVE SUMMARY

Chongqing is facing a historic opportunity. The way the world is thinking about the automobile and personal mobility is changing very quickly and creating a wave of new business models and services. This revolution in mobility will generate tremendous economic opportunities and address some of the pressing mobility challenges including air quality and urban congestion.

The Made-In-Chongqing strategy has led to the development of one of the world's largest and most successful automotive hubs. By leveraging the dominant foundation in automotive manufacturing combined with the scale that comes with being one of the world's megacities, Chongqing is uniquely positioned to expand its vision for the auto sector and emerge as a leader in the new mobility economy.

This paper will provide the Chongqing Mayor's International Advisory Council four strategic recommendations that are intended to help Chongqing capitalize on the revolution underway in the automotive industry:

1. Commit to be a Leading Megacity City in The Development of Smart Mobility

The distinction of having the largest auto sector of any of the world's megacities uniquely qualifies Chongqing to play a leading role in the development of smart mobility

2. Lead in the Development of New Regulations

The emerging business models will require new approaches to regulation that cannot even be imagined presently. Chongqing should be prepared to evolve its regulatory frameworks and lead in those conversations nationally to enable new technologies and business models

3. Make Strategic Investments and Partnerships to Accelerate Emerging Business Models

Government investments in strategic infrastructure and partnerships will put in place key aspects of the new mobility ecosystem that will accelerate the emerging business models being developed in Chongqing

4. Anchor Chongqing's Current Automotive Base

Ensure the current automotive industry is anchored and continues to expand and modernize so that it remains an "anchor" to the economy and continues to fund investment for the next wave of innovation

Ford is proud to be a partner with Chongqing and contribute to one of the most exciting automotive hubs in the world. We hope this paper will provide an insight about how Ford is preparing to capitalize on the wave of innovation in personal mobility and also provide some guidance to contribute to the next phase of Chongqing's automotive industry.

INTRODUCTION

There is a revolution in mobility underway that will change the way we move. Breakthroughs in technology are converging with powerful market trends that are completely redefining the automobile industry.

Technologies such as smartphone apps and smart systems, have allowed new ways for to people and technology to connect that are leading to new business models and new services. Ride haling and autonomous vehicles that were obscure concepts five years ago are now common topics in the discussion of mobility.

One important market trend that is driving so much innovation in the automotive sector is the megacity. Never before have the challenges of urban gridlock been more pressing. A world with too many cars stuck in a "global gridlock" of endless traffic jams, with serious consequences for our environment, health, economic progress and quality of life is not a sustainable future.

This paper will outline the significant opportunities in this mobility revolution for both automotive companies like Ford and cities like Chongqing. In particular how the industry is quickly transitioning from a manufacturing sector to a manufacturing and services sector and outline how Ford is changing to meet the new opportunities.

Finally the paper will provide four recommendations on how Chongqing could expand its current Made in Chongqing industrial policy to include a new, bolder role as a leading megacity in the development of smart mobility solutions.

Chongqing is in a unique position - not only does Chongqing face the challenges of a modern growing megacity but it also has the largest auto sector of any megacity. No other city can claim to have so much at stake in the mobility revolution.

SECTION 1: TRANSFORMATION OF THE AUTOMOTIVE INDUSTRY

There is more transformation underway in the automotive sector today that than we have ever seen in the entire history of the industry. This transformation is being driven by breakthroughs in technology and powerful market This transformation is leading to fundamentally new ways to think about the industry, the automobile and generally speaking how people move.

The impact of the changes in the industry will not be known for many years but what is clear is need for industry stakeholders to be prepared to rethink every aspect of their involvement with the industry from manufacturers, to retailers, to consumers, and including the jurisdictions who have built economies around the auto assembly.

Technology & Market Trends - Disrupting Forces

Technology is developing at a staggering pace and creating disruptive changes in the auto industry. New options for customers to connect with each other, and connect with businesses they deal with in ways that were not even imagined just a few years ago.

Increasingly the topic of technology is moving to a discussion of the "evolving mobility ecosystem" in which transportation technology and social trends are creating new business models. The changes include rapid advances in the connected car, the emergence of autonomous drive vehicles, advances in materials and changes in mobility preferences.

Some of these changes will be disruptive in nature and whenever an industry goes through a significant transformation there will be winner and losers.

Coupled with technology, strong market trends have emerged that are also disrupting the industry

1. growth of mega-cities,
2. shifts in consumer mindsets, and
3. air quality

Mega-Cities

The impact of mega-cities is undeniable. There will be more and more congestion around the world as more people move into cities. Today, there are 28 megacities or metropolitan areas with total populations of more than 10 million people worldwide. Fast-forward to 2030, and we expect to see at least 41 megacities worldwide.

Some forecasts project as many as 9 billion people will live in urban areas within the next 25 years, more than the global population now. Automakers and policy makers are under pressure to advance solutions that ease gridlock.

Shifts In Consumer Mindsets

Shifting consumers' preferences is another trend that is driving so much change in mobility. Millennials for example are doing everything different than older generations. Their whole idea of mobility, particularly in urban areas, is centered on needing access versus ownership. And they use technology to stay connected and consume products and services in more ways than we have ever seen before.

Air Quality

Megacities are by their nature congested and create conditions for air quality issues to develop. Improved mobility solutions provide the opportunity operate the existing vehicles more efficiently and in some scenarios such as ride sharing actually reduce the number of vehicles on the road while increasing the number of rides that vehicle performs each day.

Transportation As A Service

One theme in all mobility solutions is the emergence of "transportation as a service". There are urban transit solutions that operate as a service but this concept goes much further. It describes the shift from personally owned transportation to mobility services. Increasingly this service is on demand, and "point to point".

This concept can also be applied to movement of goods dramatically transforming how business transportation needs ae met.

The Scale of the Transformation

To understand the real scale of the revolution in mobility is to look at the estimates of the size of the emerging economic forces and why it is vital for auto companies and related stakeholders to study this very carefully.

For traditional automakers the global industry generates about $2.3 trillion in revenue each year. And an automaker's revenue would be approximately their market share percentage of the $2.3 trillion. At the same time, transportation services – which include mass transit, taxis and ride sharing – totals about $5.4 trillion in revenue - an amount that is expected to grow steadily during the next 15 years. The $5.4 trillion is the expanded economic opportunity that opens up to automakers when you transition from an auto company to **an auto and a mobility company.**

That is a massive opportunity - and it's the reason Ford is expanding the business model and customer offerings.

Autonomous vehicles is a good example of the economic growth being created in this mobility revolution. Boston Consulting forecast that the autonomous car market will hit $42 billion by 2025 and autonomous vehicles could reach 13% of all vehicles on the road by 2025.Not all of the vehicles will be fully autonomous but will contain advance driver-assist functions.

With expanded opportunities in transportation services and the new opportunities in autonomous vehicles it is clear these two examples alone are fundamentally disrupting the traditional business model of assembling and selling automobiles.

SUMMARY

- Industry stakeholders must to be prepared to rethink every aspect of their involvement with the industry
- The economic scale of the transformation will cause massive disruptions

SECTION 2: FORD SMART MOBILITY STRATEGY

Recognizing the fundamental shift in our industry, we are taking steps to become both **an auto company and a mobility company.**

Last year we launched Ford Smart Mobility, which is our plan to be a leader in connectivity and mobility, and ultimately autonomous self-driving vehicles.

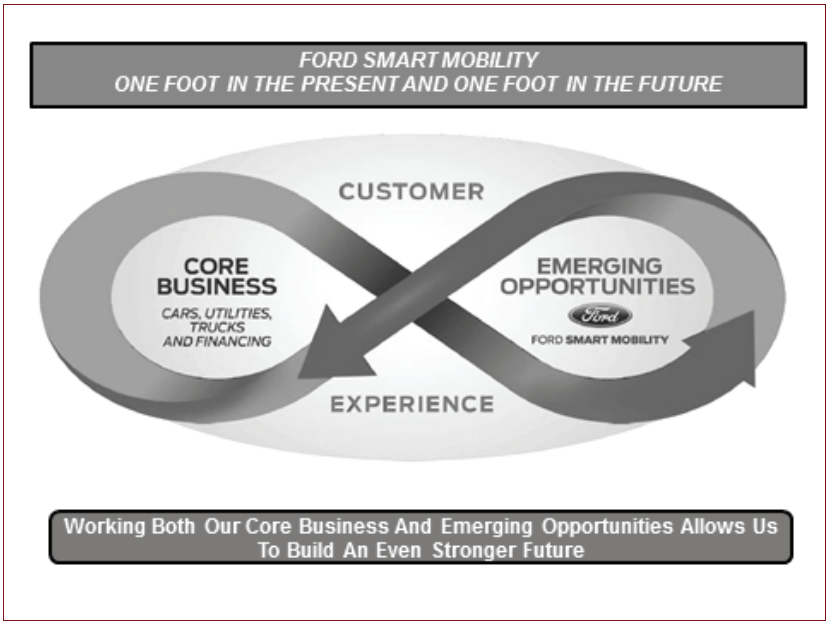
We're designing this first generation of autonomous vehicles specifically to be used for ride hailing and ride sharing – another seismic shift in the transportation landscape. The nature of ownership is changing. More and more people rely on shared forms of transportation.

And that means cars will be used more efficiently – decreasing pollution, saving people time hunting for parking and helping reduce traffic congestion all over the world.

One Foot in the Present - One in the Future

One very important aspect of our smart mobility strategy is that it is an expansion of our current business model. We continuing to develop our core business and we are also taking decisions to move into new markets and business models.

At Ford we refer to this principle of our business strategy as having "one foot in the present and one in the future" And you will see from the image below that both the present and future build a stronger overall business.



Autonomous Vehicles

Autonomous vehicles are a particularly good example to demonstrate the new Ford Smart Mobility Strategy.

At Ford, we see that the next decade will be defined by automation of the automobile. In fact, we see autonomous vehicles as having as significant an impact on society as Ford's moving assembly line did a hundred years ago.

Autonomous vehicles is a very good example of Ford's expanding business model that will both add to our core business and move into new emerging automotive markets.

What's important to understand is that this is not just about building an autonomous vehicle.

More than a hundred years ago, we were founded with a clear mission: to make people's lives better by making transportation accessible, using ingenuity and advancing human progress.

Cars used to just be for rich people. But the innovations at Ford brought the automobile to millions of people.

At the time, that was a radical idea. Most people in the U.S. didn't travel more than 20 miles from their homes. When car ownership became a reality for millions, people became more connected, explored more and found greater opportunities to live, work where they wanted.

In a way, it was a revolution in the connectivity of average people – the likes of which we haven't seen again until recently.

This principle of bringing life-changing technologies to millions of people is at the core of what we do. So, when we step back and look at how we can make the most difference in people's lives during the next 100 years, we see the autonomous car changing the way the world moves. And that's because autonomous cars address a host of safety, social and environmental challenges.

In August this summer Ford made a major announcement that it plans to have a high volume SAE level 4 fully autonomous vehicle in commercial operation by 2021 in a ride-hailing or ride-sharing service. This is one of our most exciting announcements in mobility solutions.

Autonomous vehicles will be good for Ford's business. They will help gain a share of the growing "transportation as a service" market. New revenue will be generated for the core business – by producing the autonomous vehicles themselves – and new revenue for the emerging business, by using them in ride-sharing and ride-hailing services

SUMMARY

- Analysts were talking about how the auto industry needs to change to avoid being disrupted by tech companies. Ford decided to "disrupt" itself by expanding the business model.
- Pivoting to new products and services does not mean turning away from the core business that generated so much success in the past and will help fund future investments.

SECTION 3: THE OPPORTUNITY FOR CHONGQING

Chongqing has built a renowned manufacturing hub anchored by the automotive sector and has the distinction of remaining one of the fastest growing cities.

We know the success in Chongqing is the result of years of hard work and a focus on the Made in Chongqing strategy. And we believe there are some important new opportunities for Chongqing to leverage in this new mobility revolution.

The key opportunity is for Chongqing to commit to being a leading megacity in the development of smart mobility. By leveraging the dominant foundation in automotive manufacturing combined with the scale that comes with being one of the world's megacities, Chongqing is uniquely positioned to be a leader in mobility.

What we are talking about are strategies to accelerate and expand the benefits from leading in the mobility revolution.

Chongqing already possesses the talent, and resources in the economic development team to accelerate and expand in the area of mobility. What could make a significant difference is for a bold new goal in the Made in Chongqing strategy that would coalesce all of industrial planning resources behind a new vision – **a leading city in mobility.**

And leadership is so important. The auto industry itself in Chongqing would not be nearly the success that is today without the vision of early leaders to make auto manufacturing an anchor industry of the economy.

During the recent Global Automotive Forum in Chongqing in June, much discussion was centered around the theme: Pivoting to a New Round of Development – China Opportunities: The 13th Five-Year Plan and Made-In-China 2025. And one recurring concern was raised…China is lagging in investment in intelligent vehicle technologies.

It is a fact confirmed by Roland Berger in the January 2016 Quarterly Automated Vehicles Index that the US and Germany still lead in the development of partially and highly automated vehicle functions. But this is where leadership can play such a pivotal role…it is not the current level of investment per se that is important, but what is the longer term goal to win.

The same Roland Berger's report had a very important update on consumer preferences. While the US and Germany continues to lead intelligent technology investment - Chinese consumers are among the highest in terms of expressing interest to use autonomous vehicles.

"… some 60 percent of study participants interviewed by Roland Berger in Germany and the US express an interest in automated driving, with the figure in China as high as 96 percent. 26 percent of German car owners, 28 percent of Americans and 51 percent of Chinese could even see themselves using self-driving robot taxis in the future instead of buying their own new car." Roland Berger Jan 2016 Quarterly Automated Vehicles Index

The point is that Chinese consumer sentiments towards autonomous vehicles are ahead of those in other leading

automotive markets and this is very promising when considering the opportunities for mobility projects in Chongqing.

Chongqing is already doing so many things so well and we think there is a golden opportunity for Chongqing to make a strong declaration that it will lead in mobility.

SECTION 4: STRATEGIC RECOMMENDATIONS FOR CHONGQING

1. Commit to be a Leading Megacity City in The Development of Smart Mobility

The distinction of having the largest auto sector of any of the world's megacities uniquely qualifies Chongqing to play a leading role in mobility.

A bold declaration of Chongqing's intent to lead in mobility is one of the key drivers to accelerate and expand the mobility opportunities for Chongqing.

Chongqing already possesses the talent and resources to expand the Made in Chongqing strategy

A bold new objective committing Chongqing to lead in mobility would have two very powerful results.

- ✓ First, it would coalesce local resources behind strategic projects. There are many mobility initiatives underway in Chongqing but an overarching commitment would provide additional support.

- ✓ Second, and even more importantly, a strong declaration that Chongqing will lead in mobility would send a very strong signal to the world. This would be tremendously helpful to position Chongqing as leader in mobility and help to attract investment and partnerships.

2. Lead in the Development of New Regulations

The emerging business models will require new approaches to regulation that cannot even be imagined presently. Chongqing should be prepared to evolve its regulatory frameworks to enable new technologies and business models and to be a leader in the national discussion of these issues.

Autonomous vehicles regulation is complex but there are solutions that can and will be developed. This is an area that Chongqing can lead in.

We watched with interest the successful 1,200 mile road trip across China in a self-driving car by our partners at Changan Auto. This is an example of the emerging expertise that is being developed in Chongqing and could be supported by an active approach to developing new regulations. .

3. Make Strategic Investments and Partnerships to Accelerate New Business Models

Government investments will be required to build strategic smart infrastructure

The infrastructure is the foundation to support emerging business models being developed in Chongqing.

Partnerships are an excellent way to accelerate the development of new technologies and services by forming partnerships with third party organization who will share the cost and deliver the expertise.

4. Anchor Chongqing's Current Automotive Base

Ensure the current automotive industry is anchored and continues to expand and modernize. It is important that the current economic base remains in place and flourishes.

It should remain an "anchor" to the economy and continue to fund investment for the next wave of innovation

The strategy should be to maintain the current economic base while pivoting to the future. A vibrant manufacturing base is required to help fund the investments in the future.

At Ford we refer to this as: One foot in the present and one in the future.

CONCLUSION

We are witnessing the transformation of the automotive industry in ways that are hard to imagine.

We firmly believe that there are benefits to Chongqing taking an expanded role to leader in the mobility revolution. And to do this we made four strategic recommendations.

1. **Commit to be a Leading Megacity City in The Development of Smart Mobility**
2. **Lead in the Development of New Regulations**
3. **Make Strategic Investments and Partnerships to Accelerate Emerging Business Models**
4. **Anchor Chongqing's Current Automotive Base**

At Ford we are proud of our partnership with Chongqing and we are clear there is much success that lies ahead working together.

Thank you for the opportunity to present our thoughts about mobility to the 2016 Chongqing Mayor's International Advisory Council Annual Meeting.

The Opportunities and Challenges Offered by the Internet Plus Strategy for Trade in Services in Chongqing and its Opportunity for the Transformation of the Industrial Sector

Bi Yong Chungunco

Special Advisor to the Group CEO and the Head of Divestments of LafargeHolcim Group LafargeHolcim

1 Introduction & context

This year's CMIA meeting theme covers the development of trade in services in the framework of the "'Made in China 2025" plan and the "Internet Plus" strategy. We were asked to focus on Internet Plus and its effect on cross-boundary trade services.

1.1 China's Internet Plus strategy

China's Premier Li Keqiang first presented the 'Internet Plus' strategy in March 2015: *"We will develop the 'Internet Plus' action plan to integrate the mobile Internet, cloud computing, big data, and the Internet of Things with modern manufacturing, to encourage the healthy development of e-commerce, industrial networks, and Internet banking, and to guide Internet-based companies to increase their presence in the international market."*

The 'Internet Plus' action plan was announced in July 2015. Its aim is to further develop Internet use in the economy and to push forward its integration into the manufacturing sector. It is about transforming the Chinese economic, establishing new industrial models, towards an advanced digitalization in every sector.

Along with 'Made in China 2025', 'One Belt, One Road', the 'Internet Plus' strategy is expected to trigger economic growth. According the government's action plan, these new Internet-based industrial models should become the "main driving force of growth by 2018".

1.2 What do we mean by 'services' and 'trade in services'?

Services are actions or an action that someone does for you. By opposition to goods, a service is intangible and does not result in fixed property. It is consumed at the point of sale. Examples of services are numerous and concern many fields: health, transportation, tourism, education, financial services, construction, communication services, etc. Services often have underlying goods such as postal services who deliver goods, or construction companies who construct houses and buildings

for their (future) owner.

Trade in services records the value of services exchanged between the producer and the consumer, which are based in different countries. The WTO's General Agreement in Trade and Services (GATS), which entered in force in 1995, defines 4 modes of trade in services:

- **Cross-border supply** covers services flows from one territory to another foreign territory (e.g. banking or architectural services transmitted via telecommunications or mail);
- **Consumption abroad** refers to situations where a service consumer (e.g. tourist or patient) goes to a foreign territory to obtain a service;
- **Commercial presence** implies that a service supplier establishes a territorial presence abroad, including through ownership or lease of premises, to provide a service (e.g. domestic subsidiaries of foreign insurance companies or hotel chains);
- **Presence of natural persons** consists of persons going abroad to supply a service (e.g. accountants, doctors or teachers).

1.3 LafargeHolcim

LafargeHolcim is the world leader in the building materials industry, with a focus on cement, aggregates and concrete. The Group has 100,000 employees in 90 countries. It has a combined net sales of CHF 29.5 billion (2015). LafargeHolcim is the industry benchmark in R&D and serves from the individual homebuilder to the largest and most complex project with the widest range of value-adding products, innovative services and comprehensive building solutions. Our industry is mainly local, with limited cross-border exchanges.

Given our sector of expertise, we have decided to focus on how digital tools are transforming the industry and creating new services for clients, through our company's example. We will also focus on the opportunities offered by the Internet Plus strategy and its challenges, with regards to developing trade services.

2 'Internet Plus' offers an opportunity for transformation of the industrial sector of Chongqing – Examples by LafargeHolcim

The industrial sector is transforming itself by offering more and more services linked to its products. This is part of LafargeHolcim's strategy. For instance, we have developed a road integrated offer which includes design advice in the conception phase as well as technical solutions and material supply, with the idea that the design phase is key to optimize the use of materials in the project. The development of digital technologies offers an opportunity to further develop services for our clients.

2.1 Digital platforms and apps: developing new retail services for our clients

One major opportunity brought by new technologies, internet usages and mobile, is in the relationship with our

customers. It enables us to have a closer relation with our end customers. We are sharing here a few examples:

- The application ACC **DreamHome**, which was launched a few weeks ago in India, enables to put in relation influencers (architects, designers), distribution channels (dealers, retailers) and end customers. It was designed as a "One stop solution" to enable clients to get all the answers to their construction-related queries. Clients can select the best suited product for their project, find their nearest distribution point and ask all their questions in terms of construction, material usages, etc. to experts.
- In the framework of our affordable housing program, we have worked on an **Affordable Housing application** to support our clients in finding quickly the solutions they need to build or renovate their homes. The application enables to make quick plans, list the material needs and the cost. Also, as part of the program consists in financing solutions through partnering micro-finance institutions, the app offers the possibility to prepare the file that needs to be submitted.
- We are currently working on a **geo-localized** application that will reference all available trucks around to find quickly the person available immediately to support your construction work.
- We are also working on a **digital platform** that will combine the services we can offer our clients in the various phases of their projects. On this platform, they will find tools and inspiration for the design and conception of their project; they will be able to identify building professionnals in their area, to contact them and submit their project; they will have the possibility to evaluate their building material needs, the cost and to order accordingly.
- In line with the trend of Internet, Huaxin Cement, an affiliate company of LafargeHolcim in China, has gradually opened a mobile APP via online website (e.huaxincem.com) and its official purchase platform, which you can log on via PC, mobile phone and mobile APP. Without having to walk out of your home, customers can obtain the information about various products under this e-commerce platform instantly by only clicking Online Order, Online Payment and Transaction Review with mouse. The handling efficiency has been improved by 60%. In addition, by establishing direct contact between the e-commerce platform and end users, reducing the transaction links in the middle, lowering the channel costs, it has benefited end users substantially, which is a bold innovation and breakthrough for traditional enterprises in the era of the Internet. So far, Huaxin has opened e-commerce platform outlets in Hubei, Hunan, Chongqing, Sichuan and Yunnan, which account for 70% of the total sales volume of the company.

This various examples show that if building materials remain the underlying goods of the commercial exchange with clients through the online platforms and applications, digital channels offer the opportunity to go one step further and offer new services for our clients, generating additional business.

2.2 Building Information Modeling: a transformation of the construction sector offered by digital representation

Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. It is a shared knowledge resource containing information about a facility and forming a reliable base for decision-making during its whole life-cycle (from its conception to its demolition). It offers a solution for more effective and efficient constructions.

This digital platform allows construction designers and decision-makers to:

- **View a 3D representation** of their building or infrastructure

- **Simulate different design options** to find the optimal solution compliant with the project requirements and local regulation (cost savings, energy savings, lower emissions, faster delivery, waste reduction, complex designs, etc).
- **Evaluate thermal or structural performance** and dimension volumes of materials for each option, thanks to real-time calculation.
- **Share data with all players involved** in a construction project in order to optimize schedules, avoid errors or reduce waste.

BIM triggers a business transformation, as it offers an approach to an industrialization of construction and changes the way we serve our clients.

2.3 RFID chip: using new technologies to monitor buildings

Through a solution based on radio frequency identification (RFID), LafargeHolcim has developed an RFID chip which is incorporated in concrete and that enables to gather easily and securely information on the identity of the material.

This tool enables scalable control and guarantee of the structural work on site and offers an innovative service which strengthens the reliability and quality approach of the actors of the sector, from construction to deconstruction of buildings.

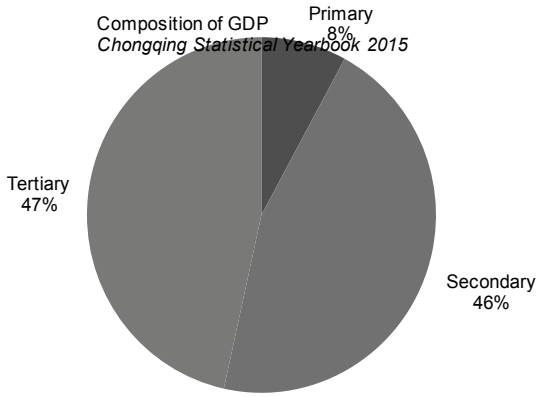
In the context of the implementation of the 'Internet Plus' strategy in Chongqing, these examples show us two type of opportunities for the city:

- Internet Plus will be **a lever of transformation of the industrial sector** – which a key part of the city's current economic activity – by creating new services and opening for exchanges abroad through digital channels
- The development of new technologies triggered by the Internet Plus strategy is an opportunity for **the city's future construction projects**, as new technologies offer solutions to optimize building conception, construction and monitoring, supporting the city's development in a sustainable manner.

3 'Internet Plus' represents an opportunity for the sustainable development of Chongqing

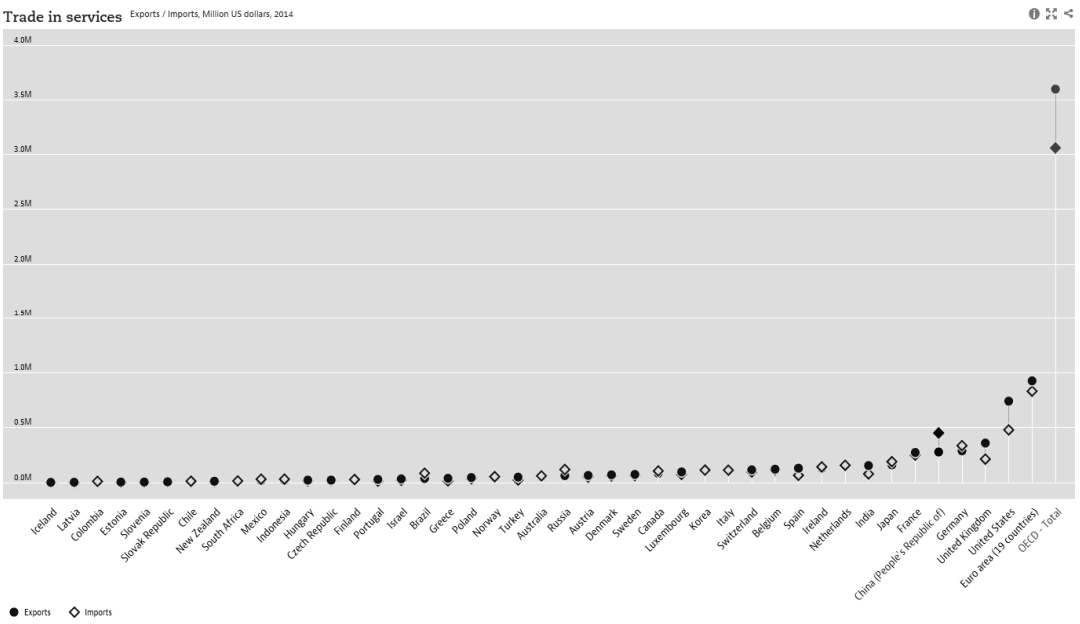
As seen before, in addition to the positive effects for the environment advanced digitalization in Chongqing can bring to urban planning and construction (for instance, by using thermal analysis modelization of buildings to optimize their conception), "Internet Plus" represents a growth opportunity for the city with positive social implications for the rural areas.

3.1 Economy: 'Internet Plus' to support the city's growth through the development of services



As data from *China Knowledge* show, Chongqing's GDP is composed by half by the secondary economic activity (industry). In advanced economies, services represent in average two thirds of the GDP composition. The 'Internet Plus' strategy will support the development of services' share in the GDP composition with through the creation of new services.

Unsurprisingly, given the previous data, the Chongqing balance of import and export trade services is in deficit, with import volumes ($ 4.9 billion) higher than export volumes ($ 3.6 billion) - according to data by the *Chongqing Municipal Foreign Economic and Trade Commission* over the period of January to August 2014. We can see that trade in services is in surplus in OECD countries.

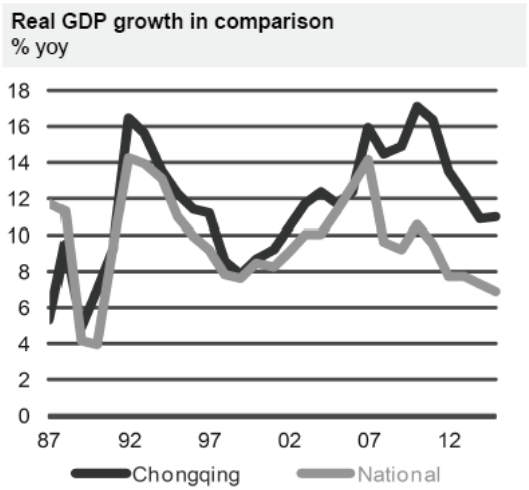


Source: OECD

The economic development triggered by the 'Internet Plus' strategy will support a shift towards a services economy. It doesn't mean that it will be to the detriment of the industry. We see it as a further support to the growth dynamic of the city.

Chongqing has indeed experienced strong growth over the last years – stronger than China. However, we see that the

pace has been slowing down over the last 5 years. The 'Internet Plus' represents a clear lever for further growth dynamic.



Source: Deutsche Bank

3.2 Social transformation: 'Internet Plus' to play a role in the development of rural areas of Chongqing

The large municipality of Chongqing is urbanized at 50%. Around the classic urban core of the city – which is urban at 61% and accounts for 60% of the population – the northeast and southeast wings form a rural periphery with urbanization rates established around 30%.

In this context, the 'Internet Plus' strategy will have positive effects on Chongqing's rural areas. First, it will stimulate agriculture productivity, which accounts for 7% of Chongqing's GDP. Through digitalization, farmers and agribusiness will access technologies and market information enabling them to develop new products, orient production towards consumer demand, increase trade, improve technological skills, and ultimately incomes. It will open new markets for them.

Second, digitalization gives an easy access to markets that are traditionally more difficult to access for rural areas. For instance, e-commerce gives access to goods that are not in store close to your home, information accessed through internet gives you more opportunities to plan trips and travels (incl. abroad), etc. In the end, both issues – facilitated by the 'Internet Plus' strategy – will *in fine* support growth development of Chongqing.

4 Challenges for the development of trade in services in Chongqing

4.1 Internet infrastructure: developing internet access for all

As data from January 2015 published by the *Statistical Report on Internet development in China* show below, the province of Chongqing is lagging behind in terms of internet access. Chongqing has a penetration rate of just below 50%. Chongqing is ranked 17th, far behind the country's major economic poles such as Beijing, Shanghai, Guangdong, etc.

Province	Penetration rate	Ranking
Beijing	75.3%	1
Shanghai	71.1%	2
Guangdong	68.5%	3
Fujian	65.5%	4
Zhejiang	62.9%	5
Tianjin	61.4%	6
Liaoning	58.8%	7
Jiangsu	53.8%	8
Shanxi	50.6%	9
Xinjiang	50.3%	10
Qinghai	50%	11
Hebei	49.1%	12
Shandong	47.6%	13
Hainan	47%	14
Shaanxi	46.4%	15
Inner Mongolia	45.7%	16
Chongqing	45.7%	17
Hubei	45.3%	18
Jilin	45.2%	19
Ningxia	45.1%	20

This a particularly important aspect of the implementation of the Internet Plus strategy, as access to Internet equals access to (virtual) markets such as e-commerce platforms, opening up new trade services opportunities and creating a larger market.

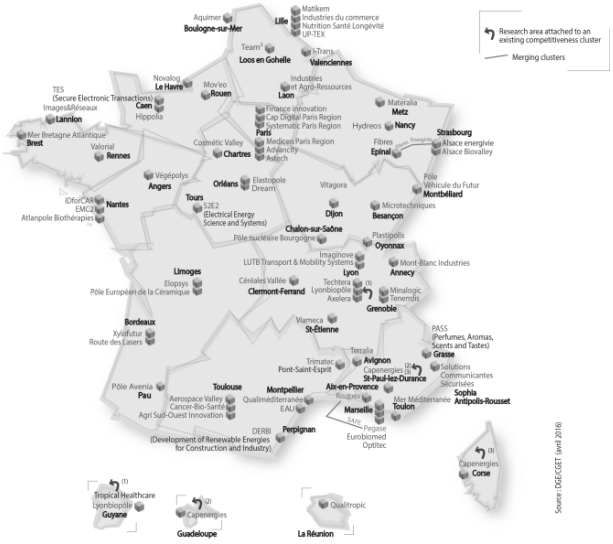
The municipality should support actions to bring internet access to all. The installation of wireless connections in hot spots of the city (such as the one deployed in the framework of the partnership between Chongqing Telecom and Ruckus Wireless) goes in the right direction but connecting all homes - including in rural areas - should also be a focus.

4.2 Digital eco-system: developing a favorable framework

As we have seen before, the development of internet and digital applications offers numerous opportunities in terms of innovation. Chongqing aims at offering a favorable framework to trigger these innovations.

We are sharing here the example of the French authorities' competitiveness clusters – "pôles de compétitivité" – which are key in the country's innovation process. These competitiveness clusters are organized around a specific theme and a specific region. They bring together large and small firms, research bodies and educational establishments, all working together around a shared theme. The goal of those clusters is to build on synergies and collaborative innovation projects in order to give partner firms the chance to become first in their markets, both in France and abroad.

These Clusters aim at making the French economy more competitive. They develop growth and jobs in key markets by stepping up companies' innovation efforts and supporting mainly industrial activities with a large technological component and by improving the attractiveness of France through greater international visibility. Clusters reinforce the economic benefits of R&D projects. The clusters become the ‘factories’ for tomorrow's products. The country has developed several of those, on a wide range of themes.



French Competitiveness clusters

This type of governmental initiative supports the concept of Open Innovation – which is key to accelerate innovation processes. As defined by Henry Chesbrough, from the University of California, Open Innovation is “*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Open Innovation combines internal and external ideas into architectures and systems whose requirements are defined by a business model”*.

LafargeHolcim’s R&D center has for instance established partnerships with start-ups, incubators, competitiveness clusters, small structures, etc. to have access to advanced technologies the Group didn’t have internally and that could apply to our sector. If we take the example of 3D printing, LafargeHolcim is partnered with XteeE, a start-up specialized in the field, and brings the Group its expertise to work hand-in-hand on using 3D printing for the construction sector.

To support the transformation of the industrial sector in Chongqing, the municipality could create a dynamic around a pattern similar to France’s competitiveness pole, by bringing together all the actors of innovation - start-ups, big companies, universities, research bodies - around a specific field. We suggest that the field chosen links the development of Internet and its opportunities for the industry – which is the current core activity of Chongqing.

4.3 Tourism: attracting more foreign tourists

One of the key aspects of services and trade in services is tourism. If Chongqing attracts more foreign tourism, this will positively affect the trade services balance.

An efficient way to attract foreign tourists is by promoting the Chongqing city brand abroad. In addition to our proposals shared last year in this regard (which included: gaining more international exposure through international events held in the city and sponsored by the city ; creating a more functional and attractive English website ; leveraging on the CMIA alumni resources), we would like to share the recent example of Paris. French public authorities have launched various promotional campaigns, following the November 2015 terrorist attacks to rebalance the city's image. The tourism sector suffered from the lack of attraction created by those events.

The "Destination Paris" campaign is being deployed across 16 strategic markets accounting for 83% of international visits to France. It is designed to reassure concerned foreign tourists and is focused on the Internet and social networks.

Another campaign "#ParisWeLoveYou" was designed to bolster the appeal of Paris to Parisians themselves as well as to the rest of France and international tourists. A dedicated website –ParisWeLoveYou.com – invites people to share photos, along with the hashtag #ParisWeLoveYou, that illustrate their own feelings for Paris, with the aim to create a collective momentum to promote the city.

As these two campaigns illustrate, in the context of the implementation of the 'Internet Plus' strategy in Chongqing, digital tools offer an opportunity to use digital channels and reach the largest audiences including abroad.

5 Conclusions & synthesis of recommendations:

The implementation of the 'Internet Plus' strategy in Chongqing offers many opportunities for the city's development. The municipality aims at accompanying accompanies this development and leveraging on the opportunity it triggers. See below a synthesis of our recommendations in this regard:

- Take advantage of the digital tools to support the development of sustainable construction in the city
- Ensure infrastructure enable a wide internet access, for the largest population
- Develop a favorable innovation eco-system, by bringing together all actors, thus supporting the concept of Open Innovation

Create more attraction for foreign tourism in Chongqing, by promoting the city brand

Maersk Perspective on the Belt and Road Initiative and Yuxinou

Tim Smith

Chairman of Maersk China Ltd.
Chief Representative North Asia for Maersk Group

Honorable mayor Huang Qifan, Distinguished guests, ladies and gentlemen:

First of all, I wish thank Mayor Huang and the Chongqing Municipal government for the invitation to participate in this important event. I am delighted to have the opportunity to share with you our perspectives on the topic of connectivity in the context of the Belt and Road initiative and the specific circumstances of Chongqing, in particular the Yuxinou rail link to Europe.

I wish to start out by making clear that we, as a globally leading transportation provider, are very excited about the potential and vision of the Belt and Road initiative. The goal of creating trade worth $2.5trn over the next 10 years between the countries in scope of the Belt and Road Initiative is truly staggering and indeed very welcome in the present global situation with a faltering world economy, low trade growth, deflation and over-capacity.

We also believe that the Belt and Road Initiative correctly identifies **improving transport connectivity** as a main enabler for trade growth and trade driven prosperity. Our own research at Maersk shows that historically, in China, a 10% increase in connectivity is associated with a 3% decrease in trade costs. Calculations indicate that over a period of time, a 10% increase in transport connectivity has resulted in as much as a 6% and 9% increase in the volume of Chinese imports and exports respectively. In terms of maritime transport, which is what I know best, China's connectivity has increased by 67% over the past decade so this really adds up.

In this respect China presents paradox. While a huge amount has been achieved in making China the world's best connected country in maritime terms and China's coastal cities today have some of the world's most advanced and efficient supply chains, China is at the same time struggling with significant transport and logistics inefficiencies in the interior provinces. In our view, the Belt and Road initiative correctly identifies the need to improve inland connectivity on the overland routes to Central Asia and Europe.

Whilst the Yuxinou rail link to Europe has made significant progress in recent years, there are still tremendous opportunities to improve connectivity and drive future growth.

In this respect we have three recommendations:

1. Within the scope of current Yuxinou operations, connectivity can be further increased by improving the soft infrastructure, such as systems, marketing and the regulatory environment.

2. Looking further ahead, for the next stage of development and growth, we suggest Chonqing and Yuxinou should collaborate with other rail operators in China and Europe, to build a broader network of regular, fast, high-density services connecting a wider range of origins and destinations

3. Connectivity and growth can be further facilitated by building a 'transhipment hub' for the rail routes at China's border with Kazakhstan

I will briefly outline each of these ideas in the following slides.

My first suggestion is to maximise the potential of existing Yuxinou services by focussing on the 'soft' infrastructure to support the physical operations.

It is impressive that cargo volumes on Yuxinou have increased by 50% in the past two years, and more volume has helped improve frequency and bring down the cost of using the rail. However, there are still barriers to efficiency that can act as a brake on growth in use of the rail service.

Customs clearance is an area in which significant improvements can be made which will affect efficiency and by extension connectivity. Efficient customs clearance is critically important to the speed and cost of trade. For example, many restrictions remain that limit the type and number of different commodities that can be loaded in one container. These restrictions are not necessarily in China but may originate in the countries that Yuxinou passes through en route to destination.

In this context it should be considered to reach out to governments and institutions in the countries relevant to Yuxinou. For example, the European Union is highly prioritizing the development of asingle window system. Such a 'single window' system aims to expedite and simplify information flows between trade and government allowing traders to lodge information with a single body to fulfil all import and export related regulatory requirements. The implementation of such a system would deliver immediate benefits to all participants in terms of simplification, removal of trade barriers and increase the speed at which goods can move. Chongqing could play a positive role in supporting such a 'single window' along the Yuxinou. I am convinced the European Union would be very interested in working with China and Chongqing on this.

But great infrastructure and an efficient customs environment does not by itself guarantee success. Yuxinou suffers from the fact that today it is not very well known in Europe. More work needs to be done to promote Yuxinou together with overseas partners and by Yuxinou itself. Given there is still an imbalance of trade (with approximately 3 westbound shipments for every 1 shipment eastbound) a concerted and sustained effort to promote Yuxinou (and the other Chinese railways) to exporters in Europe would really make sense. Many of them probably do not realise how fast, frequent and cost effective the railway is becoming these days. Helping them to realise that the train is becoming a viable alternative to air and sea routes is important to change established behaviour, and enable them to use the rail as a regular part of their supply chains.

Chongqing and Yuxinou have done very well to develop rail links to Europe and Central Asia in recent years, and a good volume base and standard of operation has been achieved. However, looking forward, the next phase of development requires thinking beyond the scope of the existing Yuxinou service, to build a wider network of services to really tap into the potential of railways to drive trade growth and economic development.

Today the Yuxinou rail service from Chongqing operates partly in competition with a number of similar rail links from other parts of China to Europe, for example from Chengdu, Zhengzhou, Xi'an, Lianyungang, Wuhan, and Guangzhou etc. As a consequence of the competition, service levels have improved and prices have come down. This is positive. It has, however, also created a need for coordination and cargo consolation both in China and in Europe, in order to improve utilization, reduce costs and optimize the coverage of the China-Euro rail link.

We believe the time is right to look beyond the local interest of each city or province's local rail service, and instead focus efforts on coordination and consolidation to make the whole network more effective and to build scale.

Connectivity would be given an immediate boost if the number of destinations linked to Yuxinou was to be expanded in Europe and in the countries along the route. A higher level of integration with EU distribution networks and a higher number of destinations served would expand the market of Yuxinou and enhance connectivity. There could be opportunities to add stops along the route, not least in view of the Belt & road initiative and the increased economic activity this may bring to these countries. Also, the cargo catchment area in China of Yuxinou could be expanded by working with cargo owners and transport service providers in neighbouring provinces and municipalities towards making Yuxinou an attractive route to Europe from these locations. None of this requires investment in expensive infrastructure but will require cooperation with partners and governments in Europe and elsewhere.

My third suggestion is to use Belt and Road funds to build an effective 'transhipment hub' on the Chinese side of the Kazakhstan border.

Whilst more volume has enabled more frequency, Yuxinou is still not able to offer daily departures. In addition, looking at the various long-haul rail services from China to Europe, it is clear that today we have a network characterised by several 'long-and-thin' routes running in parallel. Such a network will always struggle to be efficient and cost effective.

Borrowing a successful concept from the ocean container and airline industries, if China were to build an efficient transshipment hub at the China-Kazakhstan border, the potential exists to transform these 'long-and-thin' end-to-end services between China and Europe, and replace them with multiple, larger volume, shorter and more frequent 'feeder' services. This is exactly what several successful Middle Eastern airlines have done establishing major hub airports in Dubai, Abu Dhabi and Doha mid-way on the main routes from Asia to Europe.

Carriers like Emirates and Qatar Airways schedule flights from across Asia to arrive at their hubs in the Gulf, to connect with ongoing flights to destinations throughout Europe, Africa and the Middle East. The 'hubbing' concept allows the airlines to source more passengers from across a number of origins, sufficient to make it economic to run services to small and

medium-sized cities which otherwise could not be profitable.

Exactly the same concept could be applied to the rail network, with a new transshipment hub on the Chinese border allowing cargo to be sourced from multiple origins, to make up train loads for destinations further west. Such a set up will allow more frequent departures, faster transit times and increased utilization of trains. In doing so, volumes will increase, and costs can be further reduced, establishing a 'virtuous circle' to drive further expansion.

Locating such a transshipment hub at the Kazakh border would make sense because containers need to switch to trains of a different gauge there anyway.

Existence of a large hub capable of tapping into a wider range of cargo origins could also provide a platform for the launch of new services, e.g. to Iran.

I hope that these suggestions may be of some interest, even if some of them will require quite a significant change in thinking to address.

Last but not least, I want to take the opportunity to congratulate Mayor Huang and Chongqing on the recent approval for Chongqing to become a Free Trade Zone pilot area. This will definitely add further to Chongqing's attractiveness as a hub for trade.

Thank you!

“Chongqing Service” Enhances “Made in Chongqing”

Nina Yang

Chief Operating Officer, Singbridge

1 Opening

China’s manufacturing sector will continue its march up the value chain in search of a larger share of overall value, in the process replacing the labor-intensive of the past with the technology- and services-intensive that China aspires for its future. This transformation has been under way for some years, and accelerated under the present administration. Led by President Xi Jinping and Premier Li Keqiang, the country is espousing two important and complementary strategies – “Made in China 2025” and “Internet+” -- to transition the economy across the so-called “middle income trap”. This is an exciting period filled with opportunities for Chongqing which already has a formidable industrial base, not least in electronics and automotive. Coupled with the opportunities associated with China’s One Belt One Road (OBOR) strategy, Chongqing’s excellent transport infrastructure and land-rail-sea-air connectivity are valuable enhancements to the city’s overall competitive advantage.

Advanced countries that have successfully navigated this transformation can offer interesting experiences for Chongqing to adapt and adopt. One way in which this has taken place – and continues to happen – in advanced economies is through intense manufacturing-services integration. To be sure, both governments and service businesses must adapt to the needs of this integration. This interplay between government and businesses can be clearly discerned in the “Made in China 2025” blueprint, which focusses on technological innovations, re-modelling of business processes and models using the Internet, and the extensive use of technology in manufacturing (e.g. additive manufacturing, digital design and robotic automation). None of this is straight forward, but China has got the design right.

Ascendas-Singbridge’s core business is in urban transformation, not manufacturing or its related services. We do however have some 2,600 customers worldwide, many of whom are in technology-heavy manufacturing and related services. We are deeply honored to be given a chance to share our views on the exciting economic transformation of Chongqing’s services and manufacturing sectors. We offer a general overview of the trend of “servicification” in the manufacturing sector, and introduce the importance of market access and intellectual property rights in the process. We will then also showcase three Singapore case studies to highlight what the government can do to accelerate the transition.

2 Ensuring an open market

Manufacturing is increasingly entering what governments and businesses call the “fourth industrial revolution” that is characterized by manufacturing-services integration (or the “servicification” of manufacturing). Such integration in turn is

made possible, indeed accelerated by the advent of Internet technologies, advanced data analytics, state of the art digital infrastructure, and enabling industrial policies (especially in advanced economies). For sure, manufacturing will become much more knowledge intensive, and require capabilities across multiple domains. This is taking place not within borders but globally. International trade and manufacturing are increasingly structured around 'global value chains' (GVCs). A GVC involves all the activities that companies engage in, globally, to bring its products to market, from conception to final use. However, globalization, reduced logistics costs, trade policies, and specialization of countries, and a global network of buyers and suppliers have led to further fragmentation of GVCs based on countries' comparative advantages.

Services figure prominently in GVCs, and crosses borders. However, services delivery – unlike goods – require proximity between buyer and seller. This is true to a large extent whether it involves "services as a manufacturing input" (e.g. R&D, product design etc.) or "services as part of the output goods" (e.g. repairs and upgrades). We can therefore two natural outcomes to this macro development.

a) the case for gradual liberalization of the services sector, especially to encourage and allow services FDI, which in turn will improve the productivity and overall competitiveness of the manufacturing sector. This is especially true for emerging economies with a strong but relatively low-knowledge-content manufacturing base. In pursuing the Made in China 2025 and Internet+ strategies, China recognizes this need to liberalize to a larger extent its services sector.

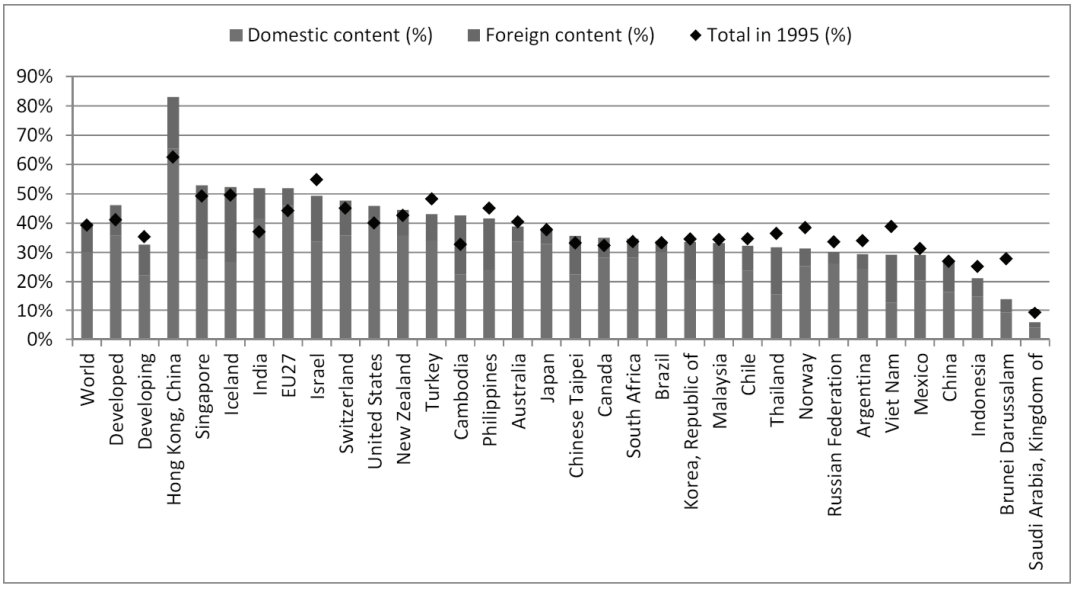
b) the case for intellectual property rights (IPR) protection for foreign technology owners and level playing field for foreign services providers. China recognizes this need and has taken concrete steps to enhance IPR protection, and energize the IPR services sector. Since December 2014, IPR cases are heard in three specialized courts in Beijing, Shanghai and Guangzhou, adjudicated by subject matter expert magistrates. JV law firms have also been allowed in the Guangdong free trade zone. In Shenzhen, commercial arbitration can be conducted in foreign languages, arbitrated by foreign arbitrators, and following international norms. The benefit is mutual. China's creative talents will also be motivated to create and commercialize their intellectual assets. In July 2016, the Sino-Singapore Guangzhou Knowledge City was designated the nation's first and only comprehensive IPR reform pilot. We are only seeing the process at its beginning. Intellectual assets will increasingly be attracted by China's improved enforcement and huge domestic market for new technologies and products they engender.

China's total manufacturing output outgrew that of the United States since 2012. China overtook the United States as the largest trading country since 2013. Much of its imports and exports however are in manufactured goods, and at the lower to middle rung of the value chain. In the years after China's opening up, China adopted an open-door policy to attract FDI, and technologies. Since entry into WTO in 2001, multinationals began to move their production activities to China, bringing the country into the global manufacturing value chain. This was soon followed by technical centers and R&D facilities. Today, China's manufacturing sector has reached excellent (indeed even top) technical capabilities in many product categories, developed sophisticated supply networks and links with foreign markets. In the next leg of this development, China can focus on deepening the sophistication of technology among its "domestic" enterprises, especially in its private sector.

However, in this next stage of transition up the value chain, it will be useful to note the importance of creating

cross-pollination / knowledge spillovers up and down the entire value chain. The future of advanced manufacturing will increasingly demand an enabling ecosystem, including a robust legal and institutional framework, cross-domain labor skills, innovation-friendly policies and efficient infrastructure. The government has a primary role to play to kick start and maintain the pace of this transition. To maximize the knowledge spillovers – between foreign and local, and also between manufacturers and services providers – meaningful market access / opening and credible IPR protection are necessary but not sufficient. Governments should also consider ways and means to strengthen the absorptive capacity of local players (universities, SMEs, R&D institutes etc.) Towards this end, governments can effectuate a more level playing field for domestic firms, improve access to capital, technology and skills, as well as enable foreign firms to build links with Chinese counterparts.

China has made growing its services sector a strategically important objective. A large piece of the services sector is related to its huge manufacturing sector, both as inputs to manufacturing (intermediate services) and as outputs of production, to capture a larger share of the value add. A look at the chart below from the WTO Economic Research and Statistics Division (Lanz and Maurer, Feb 2015) shows that the services content of exports is significantly higher for developed countries (46%) than for developing ones (33%). As China moves up the value chain, we should see the services content of its exports also move towards levels seen in the developed countries, near to if not exceeding 50%. Given the size of China's exports, the absolute room for growth is tremendous, and represents a large opportunity for China and the world in China's new phase of economic development. Individual cities and regions in China can stake out their piece of this services growth trajectory. In Chongqing for instance, with its already strong manufacturing base in automotive and notebooks, it is natural to foresee these sectors transitioning up with enhanced services inputs spanning product design to technology integration as well as branding and marketing. This process will see an increase in services FDI (predicated on market access and favorable market conditions), as well as a progressive knowledge transfer to local Chinese counterparts. The Chongqing government can play an enabling role in both aspects.



Source: OECD-WTO TiVA Database.

Figure -- Services value added content of total exports, 1995 and 2008

In the following section, we will share three Singapore case studies, in the offshore marine, aerospace engineering, to appreciate how the country plays an active role in integrating manufacturing and services. We will also take a look at Singapore's efforts at growing its creative sector.

3 Sharing Singapore's experiences

Every country, indeed every city/region, has a different set of opportunities and constraints at their current stage of development. In this section, we present three case studies using Singapore's experiences in distinct sectors. Ascendas-Singbridge hopes that the Chongqing government finds them to be useful in plotting the economic trajectory for the next phase of China's development.

Case 1: Offshore & Marine Engineering

(A) Overview of Singapore's offshore & marine engineering sector

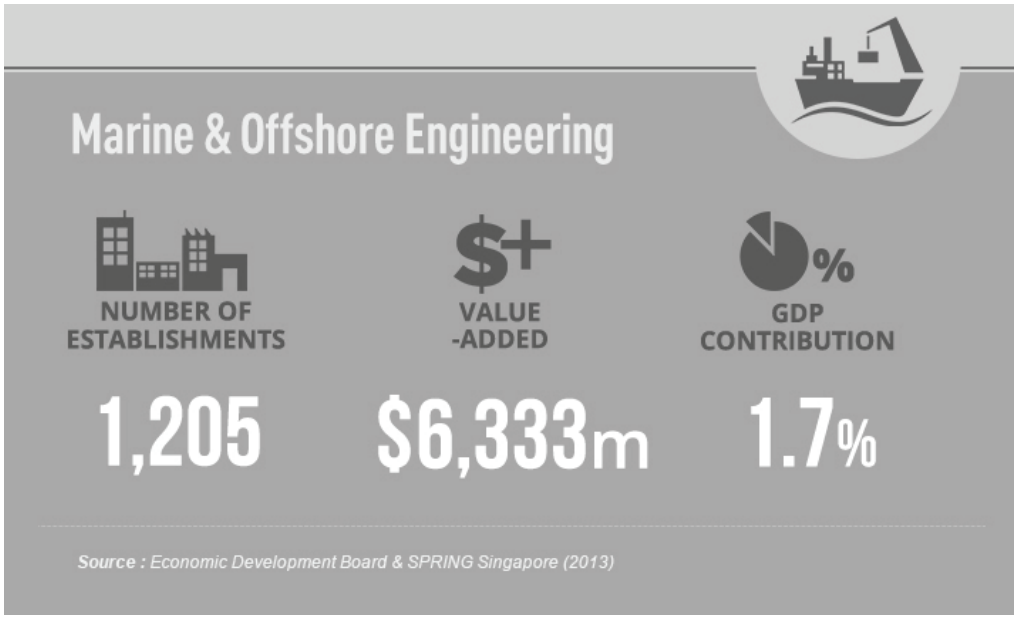


Figure -- Singapore offshore & marine engineering sector topline numbers (2013)

Since its humble beginnings in the ship building industry, Singapore's marine and offshore engineering has first penetrated the ship repair and conversion sector which remained the backbone of the industry for decades. Singapore has 70 per cent of the world market for jack-up rigs and 70 per cent of the global market for the conversion of Floating Production Storage Offloading units.

Since 2008, the rig building and offshore sector has been the largest contributor to the industry. In 2014, Singapore's marine and offshore engineering industry achieved a total turnover of SGD 17.23B, a new milestone and a new record for the industry.

The industry's key sectors are as follows:

Sector	Turnover (SGD B)	Percentage of total industry (%)
Rig building and offshore	11.2	65.0
Ship repair and conversion	5.51	32.0
Ship building	0.52	3.0

This was achieved on the back of successful completion and delivery of a number of offshore projects secured in earlier years as well as higher revenue recognition from completed rig building and offshore conversion projects. However, the industry has since seen tougher times with the decline of oil prices from its recent peak of USD 110 a barrel and the subsequent knock on effects of cutbacks in exploration and production budgets.

Overall, Singapore's marine and offshore industry remains resilient and these have been driven by its carefully nurtured competitive advantages in the following areas:

1. World class product design and development;
2. Disciplined, skilled and competent workforce;
3. Multiple R&D links between academia and industry
4. Development of marine related service companies; and
5. Excellent logistics infrastructure

(B) World Class Product Design and Development

Despite 2014 being a difficult year for the industry, the industry secured contracts for new rig building and ship conversion projects totalling some SGD 9.7b. Many of the new rig orders awarded were for the proven high-performance proprietary jack-up rig designs such as KFELS B Class and Pacific 400 Class owned by Singapore shipyards.

The increasing weightage of LNG within the global energy mix has also driven demand for natural gas and potential lies in natural gas liquefaction systems, LNG vessels and FLNGV.

The repair and maintenance of LNG carriers is a highly specialised market segment and Singapore has honed its capabilities to provide repair, refurbishment and upgrading services to LNG carriers. Sembawang Shipyard is recognised as the leading shipyard for LNG repairs, refits and life extension works in the world.

Keppel Shipyard, on the other hand, is taking the lead within the FLNGV sector in performing the world's first-of-its-type conversion of an existing MOSS LNG carrier into a FLNGV.

(C) Disciplined, Skilled and Competent Workforce

The industry employed a total of 106,600 workers in 2014 and this workforce is led by passionate and committed industry leaders at various levels of hierarchy. Major shipyards and marine companies have invested in training infrastructure and resources in-house to ensure that workers are trained and re-skilled continuously to keep up with changing requirements

to execute work safely. Together with the Association of Singapore Marine Industries (ASMI), competency standards were set and training curriculum for marine workers and supervisors has been established.

Further, academic courses on marine and offshore technology and scholarships have been introduced at the technical, diploma and degree levels to ensure a continuous pipeline of trained manpower to support the specialised manpower needs of the industry.

Taken together, these measures have helped to ensure a sustainable pipeline of competent talents and leaders to sustain the industry's innovative design, safe execution and timely delivery of projects.

(D) Multiple R&D links between academia and industry

Technology is a key driver for the marine engineering sector. To stay at the leading edge of the industry, Singapore actively promotes R&D collaboration between its educational institutions and the private sector. Key initiatives to develop marine and offshore technology include the Centre for Offshore Research & Engineering and Centre of Innovation – Marine & Offshore Technology. Additionally, both the Marine Centre of Innovation@Singapore Polytechnic and Maritime Research Centre@Nanyang Technological University work closely with local yards, such as Keppel, SembCorp, and ST Marine, to develop new capabilities.

(E) Development of Marine Related Service Companies

Marine-related service companies such as those providing classification services, maritime law and insurance services, and offshore support services has also been carefully nurtured in Singapore.

As a result of its efforts in this area, Singapore has achieved a number of critical milestones including:

1. Singapore was home to over 130 international shipping groups and a total of 5,000 maritime establishments as of September 2015;
2. Singapore is one of the top 10 ship registries in the world with total tonnage of ships under the Singapore flag reaching 82.2m gross tonnes in 2014;
3. Hull and Machinery insurers and Protection and Indemnity Clubs have established offices in Singapore;
4. Singapore was the world's top bunkering port in 2014 with a total of 42.4m tonnes of bunkers sold at the Port of Singapore in 2014;
5. A wide array of alternative financing options with the first shipping trust launched in Singapore in 2006; and
6. A discrete division for maritime disputes, the Singapore Chamber of Maritime Arbitration, within the Singapore International Arbitration Centre.

Further, in 2012, the Baltic and International Maritime Council ("BIMCO") included Singapore as one of the three official seats of arbitration in its standard dispute resolution clause. In 2015, the NUS Centre for Maritime Law (CML) was launched to boost maritime law research and thought leadership.

(F) Excellent Logistics Infrastructure

Singapore's world-class sea ports and air freight facilities, superior warehousing and delivery channels, and unparalleled connectivity regionally and globally make it an optimal base for global sourcing and complex manufacturing. Efficient supply chain management is especially critical for rig building, where the equipment can come from various parts of the world, including Japan, the US and Europe.

Case 2: The Emergence and Growth of Singapore's Aerospace Industry

(A) Overview of Singapore's Aerospace industry

Singapore's aerospace industry started developing only by the end of 1970s, when the country's manufacturing sector has already strengthened its economy. This was in line with the country's overall economic transformation from labour-intensive to capital-intensive, high-value-added manufacturing industries in the 1980s. Faced with increasing regional competition and its own lack of natural resources and hinterland, this transition was necessary for Singapore to remain competitive.

Since then, Singapore's aerospace industry has grown significantly over the past two decades at a compound annual growth rate of 8.6%. The industry contributed an output of S$8.3 billion, and had a value-add of S$3.0 billion in 2014. The industry also employs close to 30,000 workers.[1]

Singapore's remarkable growth in its aerospace industry can be attributed to the government's two prong approach of development – manufacturing with a strong focus on supporting services.

Today, Singapore has the largest number of aerospace Original Equipment Manufacturers (OEMs) in the region, including the presence of multi-national companies, such as Airbus, Boeing, GE Pratt & Whitney and Rolls Royce. Rolls-Royce's global production centre in Singapore has been producing Trent 900 and Trent 1000 engines used on Airbus A380s and Boeing 787s for more than a year. The centre plans to assemble and test 250 engines by 2016. In February 2016, North American manufacturer Pratt & Whitney opened a manufacturing plant to produce geared turbofan blades and turbine disks for its new generation engines. Singapore is one of only two sites in the world that manufactures the company's sophisticated component.

Major aerospace industry players chose Singapore as their base for manufacturing, due to Singapore's strong focus on complementary services that help create a comprehensive ecosystem that is conducive for the nurturing, sustaining and

[1] *http://stats.mom.gov.sg/Pages/Employment-Distribution-and-Employment-Level-by-Industry.aspx*

growing of the aerospace industry. This further propelled the country's position as the aerospace hub in Asia Pacific.

(B) A nurturing ecosystem – Building a conducive aerospace community

The Singapore government is constantly developing a steady pipeline of highly skilled talent for the aerospace industry by deepening synergies between the pre-employment education and industry needs. Local postgraduate R&D talents are trained in areas such as avionics, ground-to-air communication and equipment health monitoring through Economic Development Board's (EDB) Industrial Postgraduate Programme with Airbus, Rolls-Royce, ST Aerospace and Thales. Polytechnics in Singapore have also reported increases of 30 to 40 internship positions each year through link-ups with aerospace companies. In 2011, Rolls-Royce partnered with the National Trade Union congress' e2i (Employment and Employability Institute) and the Singapore Workforce Development Agency (WDA) to equip 300 local technicians with skills required by the aerospace industry.

Apart from building a pool of aerospace talent, the Singapore government also created spaces for the aerospace community to thrive in – the Singapore Changi Airport and the Seletar Aerospace Park.

Considered the premier aviation hub in South East Asia, Changi Airport is served by over 100 airlines with routes to 300 cities in 70 countries and territories. It is the seventh busiest airport by international passenger traffic in the world and the second busiest in Asia in 2015. This traffic helps drive the maintenance business and also makes Singapore a convenient location to pursue regional opportunities.[1] The airport is currently constructing its fourth terminal, set to be ready in 2017. Terminal 5, which will follow in 10 years' time, will be one of the largest terminals in the world.

The ever expanding Changi Airport complements the 300 hectare Seletar Aerospace Park, another government initiative to cluster aerospace-related operations and businesses to harvest benefits from economics of scale and synergies from being in an integrated aerospace community. The Seletar Aerospace Park started developing in 2008 and is currently home to about 30 aerospace companies in Singapore and major players such as Pratt & Whitney and Rolls Royce.

The availability of aerospace talent, combined with a conducive environment for aerospace communities to grow will help boost demand for aerospace manufacturing and related activities to congregate in Singapore.

(C) A sustainable ecosystem – "Nose-to-tail" capabilities across the entire aerospace value chain

Singapore is currently the top maintenance, repair and overhaul (MRO) hub in Asia, and accounts for 20% of Asia Pacific's total MRO contracts, contributing to over 10% of global input. Over 100 companies are providing MRO capabilities for airframes, engines, components, avionics as well as aircraft modifications and conversions. This comprehensive "nose-to-tail" suite of capabilities has established Singapore as a preferred one-stop solution provider for MRO needs.

[1] *http://trade.gov/topmarkets/pdf/Aircraft_Parts_Singapore.pdf*

Home-grown global leaders ST Aerospace and SIA Engineering Company (SIAEC) are among the world's top five airframe MRO companies.

The aerospace value chain is not made up of just big international and local players, small and medium enterprises (SMEs) play an important role as well. SMEs provide services such as the machining of precision parts, manufacturing of tooling as well as parts supply. Under the Partnerships for Capabilities Transformation (PACT) programme, an initiative started by EDB and SPRING to identify projects that upgrade the capabilities of SME suppliers to meet the needs of large organizations. Only with a strong SME supplier network and ecosystem can OEMs then achieve manufacturing, production and MRO efficiencies to serve the regional market. [1]

(D) A growing ecosystem – Concerted whole-of-government approach providing financing, research and development (R&D) support

Key agencies such as Civil Aviation Authority of Singapore (CAAS), Agency for Science, Technology and Research (A*STAR), EDB, SPRING Singapore and WDA play a critical role in supporting the aerospace manufacturing and services sector. In April 2010, the Aviation Development Fund (ADF) was set up to help accelerate further development and growth in the Singapore aerospace industry. Funding of up to S$100 million is disbursed in three programmes under the ADF, namely the Aviation Partnership Programme, Aviation Manpower Programme and the Aviation Innovation Programme.

Favourable government policies, such as tax incentives and labour policies to attract foreign talent, opportunities for companies to move up the value chain and working in areas such as R&D, design, manufacturing and more advanced MRO work, will also help to encourage the growth of the aerospace industry.

The Singapore Government also leverages on R&D and innovation to push the frontiers of technology and develop capabilities that will help Singapore-based companies address industry needs arising from global trends. In January 2016, the government announced an investment of S$3.3 billion in advanced manufacturing and engineering public R&D capabilities over the next five years under the National Research, Innovation and Enterprise 2020 Plan.

Together with a slew of other R&D initiatives, such as the A*STAR Aerospace Programme that conducts pre-competitive research work with strong aerospace industry participation[2], the government takes a concerted approach to provide financing and R&D services for industry players along the aerospace value chain. These initiatives will boost expansion of the aerospace industry in Singapore, and strengthen the country's position as the ideal location for aerospace manufacturing and related activities.

1

https://www.gov.sg/~/sgpcmedia/media_releases/mti/speech/S-20160215-1/attachment/Aerospace%20Technology%20Leadership%20Forum%202016%20Speech%20For%20Min%20I_%20FINAL.pdf

2 https://www.a-star.edu.sg/Portals/31/Publication/Aerospace%20Industry%20Factsheet%20Feb%202012.pdf

Case 3: Growing Singapore's creative sector

Singapore defines its creative cluster in a broad manner, as those industries which have their origin in individual creativity, skill and talent and which have potential to create jobs and wealth, by generating and exploiting intellectual property. We categorize our creative industries into "arts and culture", "design" and "media". While it is difficult to fully quantify the creative sector, by 2013, Singapore's design sector employs 30,000 people, and generated some S$2.13B of GDP. Advertising employs an additional 10,000 people, and by some accounts, has won about 65 per cent of regional advertising accounts in the Asia-Pacific region in the last 3 years. Singapore has just been designated a Unesco "Creative City of Design" and is the 9th most creative country in the world according to Martin Prosperity Institute's Global Creativity Index.

Singapore has come a distance since the Creative Industries Development Plan by the country's Economic Restructuring Committee in September 2002. That Plan called for the launch of three national initiatives – (i) Renaissance City 2.0; (ii) Design Singapore; (iii) Media 21.

(A) Renaissance City 2.0

The target is to re-make Singapore into a "highly innovative and multi-talented global city for Arts and Culture", by developing software that leverages the full potential of our arts infrastructure. This includes:

- Government as catalyst, to stimulate sophisticated demand, like promoting public art, support for the use of design in public amenities, services and spaces.
- Creative towns, where arts, business and technology are integrated into community planning and revitalization projects.
- Museum of Modern and Contemporary Art, to attract international and modern artworks and design, thereby generating economic spinoffs and tourism dollars.
- Promoting arts and culture entrepreneurship, through national agencies like the National Arts Council, National Library Board, and National Heritage Board.

(B) Design Singapore

The goal is to build Singapore into a "Global Cultural and Business Hub for the design of products, content and services, where design consciousness and creativity permeates all aspects of work, home and recreation". A multi-agency task force recommended:

- Integrating design in enterprise. Develop design expertise in Singapore SMEs to allow them to make design part of their strategic differentiator.

- Establishing a national design agency, to champion the design cluster. This agency is staffed by government and private sector.
- Nurturing a vibrant design community, by raising the profile of designers, rolling out professional development/upgrading courses, and even the anchoring of major international design awards in Singapore.

(C) Media 21

Here, the target was to build "a Global Media City with a thriving media ecosystem rooted in Singapore with strong international extensions". Under this initiative, the Media Development Authority was formed, to grow the media industry aggressively.

- Mediapolis @One North, to cluster high value-added media production and R&D activities in a synergistic environment that encourages multi-disciplinary cross-pollination.
- Singapore as media exchange, with specific proposals like:
  - Tax incentives for investments in media copyright
  - Co-establish a Media Loan Fund with private sector
  - Attract media VCs and financial companies
  - Establish a registry of media copyrights.
- Content Development Fund that supports bilateral co-production agreements and export of media production, use of IT in production etc.

4 Closing

Ascendas-Singbridge is confident that Chongqing will successfully transition into a high value-added manufacturing-and-services economy. We wish the city's leadership all the best and will continue to invest in the future of China.

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Prepared by: Ascendas-Singbridge Pte Ltd

For the Mayor of Chongqing, Mr. Huang Qifan

Adapt to the Emerging Trends in Global Cooperation, Embrace the New Strategies for National Development,

—Make Every Effort to Open up New Prospects for Innovative Development in Chongqing

Zhu Hai

Executive Vice President of Schneider Electric, President of Schneider Electric China

I With steady progress in the “Belt and Road” initiative, Chongqing sees historic opportunities

(I) With the emerging international trends, “Belt and Road” initiative is creating a new pattern of opening-up and cooperation

1. The integration of regional economies is gaining speed; China is well positioned to take lead in regional economic growth

The global economic integration process is accelerating in the sense that industrial cooperation between countries is becoming closer and closer and commerce and trade exchanges are growing increasingly frequent. In this process, international cooperation is intensifying by way of regional cooperation, as many countries are pushing for regional exchange and cooperation through strategic regional alliance and bilateral partnership.

China, the second largest economy in the world, has maintained quick growth for years, greatly contributing to global economic stability. As the integration of regional economies proceeds further, China is in a position to play a more important role in spearheading regional economic growth, which not only provides the Asian and Pacific regions with economic stability and growth assurance but will also fuel another round of economic growth in China.

2. Chinese industries are developing into a new stage: from "bringing in" to "going global"

Chinese economy has entered the phase of "new normal" after years of rapid growth. Nevertheless, the resource advantages that once supported Chinese industrial development are no longer substantial after dozens of years of sustained fast development. Chinese industries per se must complete a "transformation and upgrading" to maintain the growth momentum.

In this "transformation and upgrading" process, it is critical to shift the industry development mode and adjust the industry structure. We need to adjust the role of Chinese industries in global industrial system as appropriate to their present

situation and features such that they may seize a more favored position in global industrial value chain system. To achieve this goal, on the basis of the existing "bringing in" strategy, the state has formulated a "going global" strategy, which is in line with the general trend of global economic integration as well as the present situation of Chinese economic and industrial development situation. It is expected to introduce additional vigor to China's future economic growth.

3. The emergence of the "Belt and Road" initiative ushers in another round of development

The implementation of the "Belt and Road" initiative sets the direction for China's opening-up and cooperation. This initiative connects the economic and trade exchanges among the countries along the route. China quickens its "going global" paces under the guidance of "Belt and Road", which serves as a media for exporting the capital, technology, human resources, and management expertise accrued over the years and because of which it is easier for Chinese products and services to go global.

This initiative amounts effectively to another opening-up, which is not only even more profound and thorough but bilateral as well, accompanied by more intimate cooperation and covering the full spectrum of economy, industry, and culture. An all-around "going global" campaign will enlarge the market of Chinese manufacturing and service sectors, stimulating Chinese industrial upgrading, to the finding of outlets for excessive production capacity, and to the development of service and trade sectors.

4. Chongqing as an important hub in "Belt and Road" sees a historical development opportunity

Chongqing, as an instrumental and strategic pivot in the "Silk Road Economic Belt", is favorably and strategically situated in the western center of the "Yangtze River Economic Belt" and in the central part of the "Maritime Silk road". In addition to its geographical advantages, Chongqing is favored as well by a strong industrial base and a complete industrial system. With these advantages adding up to a strong support to national strategies, Chongqing has therefore what it takes to become an important hub of the "Belt and Road" initiative.

In supporting China's national strategies, Chongqing sees a historical opportunity to develop its own economy as well. As the bridgehead of the "Silk Road", Chongqing is sure to become an important location for materializing national strategies, as a result, relevant policy support and industrial resources will flow and gather here. Chongqing as a window to international exchange and cooperation, its relevant industries are to experience another development peak. Existing industries and enterprises in this city are to have a "foretaste" of the benefits and will seize a head start in "transformation and upgrading" and "going global" races.

(II) With the future prospect of a Free Trade Zone (FTZ), Chongqing is expected to be included in the big demonstrative opening up zone.

1. Chongqing is expected to become the first inland FTZ in China

In 2013, China decided to set up a free-trade zone (FTZ) in Shanghai, unveiling the construction of FTZs across China. In 2015, the state reviewed and approved a general plan for creating FTZs in Guangdong, Tianjin, and Fujian, an evidence to

the state's commitment to further reforms and opening up. With the initial results of FTZs known, the setting up of the third group of FTZs is being considered. With unique advantages as described above, Chongqing is expected to rank among the third group of FTZs, the first one in western China.

2. Once an FTZ is set up in Chongqing, it will help Chongqing build an international exchange and cooperation platform

If an FTZ is set up in Chongqing as expected, a forceful boost will be lent to urban construction, economic development, industry transformation & upgrading in this city. From a policy perspective, an FTZ provides a new highland of institutional innovation; from a trade and exchange perspective, an FTZ creates a service and trade pivot in "Belt and Road" and operates as a traditional commodity trade base. Supported by preferential FTZ-related policies, an FTZ may not only become a platform for attracting capital, technologies, human resources, and businesses but may also act as a going-global springboard for domestic capital, enterprises, and technologies.

(III) Offer opportunities for Chongqing economic and industrial development while supporting state strategies

1. Encourage exporting of local industries and support local enterprises' globalization

By building a "going global" platform on basis of "Belt and Road", Chongqing may assist the local enterprises in their overseas investment and operation, in the process of which these enterprises may become the first to be served by the platform. Chongqing, a key industrial city in western China with a solid industrial base, is under great pressure of needs for transformation and upgrading. Fortunately, the creation of an FTZ and related service platforms may help Chongqing enterprises go global and become larger and stronger in a worldwide scale by basing in Chongqing while consolidating international resources.

2. Take advantage of these opportunities to build a "Belt and Road" industry base

The process of supporting the state's "going global" strategy and building Chongqing into a strategic "Belt and Road" hub will definitely involve various outbound and inbound services, which may by themselves be effective in encouraging the development of competitive industries in Chongqing. Advancing commerce and trade exchanges involves e-commerce, logistics, and warehousing services; Promoting the integration of various sectors involves finance, consultation, training, as well as producer services such as production, R&D, design, and human resources. Therefore, in supporting the state's strategies, Chongqing is certain to see the formation of industrial clusters typical of "Belt and Road". The development of this cluster is of critical significance to industrial transformation and upgrading in this metropolis.

II New Situation, New Environment and New Opportunities Are Surely Accompanied with Greater Challenges

(I) How to put to full play the city's advantages and become an important hub in the implementation of state's strategies

1. How to make bold yet reasonable innovations when building a high standard FTZ

FTZs are a major innovative attempt of the state to push forward the opening-up process with the intention to find out a path compatible with future development. For this reason, the state holds high expectations on FTZs. With the preliminary and promising results of FTZs, it's reasonable to expect that the third group of FTZs will be announced by the end of this year.

FTZs are rightly characterized as areas of opening-up and innovation. From an opening up perspective, FTZs are an important breakthrough in the country's opening up in both magnitude and intensity. From an innovation perspective, the setting-up of FTZs is itself an innovation, whereby the state places a good foundation for FTZ innovation of various levels, including institutional innovation and development mode innovation.

Although some achievements have been made by the existing FTZs, given their current performance they have not fully lived up to the state's expectations, particularly in the following aspects: a large volume of commodity trade in contrast with a small volume of service trade; a large volume of bringing-in in contrast with a small amount of going-global; a large amount of commerce and trade exchange in contrast with a small amount of industrial technology exchange. If an FTZ is set up in Chongqing eventually, Chongqing should consider making brave innovations in policy, institution, and mode to better materialize the intentions of FTZs.

2. How to leverage Chongqing's strengths in line with state's strategic direction

The four major existing FTZs have their own features: Shanghai FTZ is oriented globally with emphasis on finance; Guangzhou FTZ is oriented toward Hong Kong and Macau, with emphasis on service and trade liberalization; Tianjin FTZ is oriented toward Northeast Asia while pushing for Beijing-Tianjin-Hebei integration; while Fujian FTZ is oriented toward Taiwan, with emphasis on cross-strait economy and trade cooperation.

Geographically speaking, the four FTZs are distributed in the eastern coastal regions, so Chongqing displays prominent geographical features if it becomes the first inland FTZ in China. Therefore, it will not be a minor challenge to Chongqing to find a distinctive industrial orientation so as to play a more important role in the construction of "Belt and Road", and the "Silk Road Economic Belt" in particular, while retaining its geographical features.

(II) How to advance its own economic construction and industry development while supporting the state's strategies

1. How to serve the local sectors and enterprises while furthering the state's strategies

As an important hub in the state's "Belt and Road" initiative, Chongqing is sure to serve the state's overall strategies and be oriented toward the world. Chongqing, while playing well this role, also needs to figure out how to take this opportunity to

further its own industrial transformation and upgrading and achieve "being based in Chongqing, serving the country" purpose. This will not only have a direct impact on its economy but will also be a matter concerning the success or failure of its strategic role.

In the process of serving "bringing in" and "going global" guidelines, this city itself is a good example. It promotes the industrial upgrading and development by importing capital, technologies, and human resources. At the same time, it exports capital, technologies, human resources, production capacities, services, and commodities, which opens the possibility for Chongqing enterprises to transform and become bigger and stronger worldwide. How to include the local industries and enterprises into the service scope, this becomes therefore an important way to promote Chongqing development and test this city's strategic support capability.

2. How to develop "big trade" sectors while accelerating the construction of the FTZ

Commodity trade shall not be the only objectives of the state in setting up a FTZ. Chongqing, in the design and implementation of the FTZ, needs to have an overall and balanced consideration, combine commodity and service trades and build "big trade" into a competitive sector with Chongqing characteristics.

Unlike with commodity trade, both the development space and the development potential are greater with service trade, particularly with producer service. Exporting services to the countries along the “Belt and Road” route is an important tool for strengthening regional economic ties. Provision of finance, information, R&D, human resource, and training services internationally is not only in alignment with the needs of the neighboring countries, but also encourages Chinese industry transformation and upgrading. Service trade poses a higher demand on platform construction and service capability than commodity trade does. Thus, advancing service trade and promoting the formation of "big trade" sector while developing commodity trade would be critical to Chongqing's effort to showcase its features.

3. How to support the state's strategic tasks and build Chongqing's own competitive sectors

When building a hub that serves the state's strategies by means of an FTZ, Chongqing will inevitably deal with the construction of a service system. Unlike a traditional service system that serves sector development, the service system serving the "Belt and Road" initiative is more extensive, provides better services, and covers more sectors. A gigantic strategy-serving system of such a scale cannot be constructed or operated by the government alone, but needs the participation of excellent enterprises from related sectors, like financial institutions, training agencies, and outsourcing contractors.

It will only be possible to construct such a service system if we can consolidate all the resources of related sectors and enterprises, make use of government service platforms and public service functionalities, and draw on government's innovations.

III Priorities and Suggestions for Innovative Development of Service Trade Industry in Chongqing

(I) Suggestions on the philosophy of development: Four combinations

1. Combination of "bringing in" and "going global"

"Belt and Road" is a bridge, and so it must be a two-way passage. Only mutual exchange and cooperation are able to

create a closer tie between China and its neighbors. Chongqing therefore must be mindful of combining "bringing in" and "going global" while developing its service trade so that the countries on the route may make best use of their advantages, combine their strengths to make up for their shortcomings, have a reasonable division of work, share the resources, and ultimately bring about win-win results through bilateral economy and trade exchange.

2. Combination of soft environment and hard platform

Ecological environment is critical to industrial development. Chongqing should, on the one hand, address the issue from institutional innovation to work on the building of the soft environment and, on the other hand, should consolidate the resources of various sectors and refine sector service system by means of sector public service platform construction so that the enterprises are enhanced in their outbound capacity while serving relevant enterprises.

3. Combination of localization with nationalization

On the one hand, Chongqing should identify its position as a hub to the state's "Belt and Road" initiative, build a modernized FTZ, and provide service to domestic market and the countries on the route. On the other hand, Chongqing should fully leverage its local resources and serve the "bringing in" and "going global" effort of the city.

4. Combination of commodity trade and service trade

One the one hand, commodity trade and related sectors shall be built upon the advantages of the construction of FTZ; on the other hand, service trade sector shall be made to grow bigger and stronger to serve the state's strategies.

(II) Suggestions on the priorities in development: Focus on producer services, and make major breakthrough in four sectors

It is suggested that Chongqing, in full support of the national “Belt and Road” initiative, should focus on producer services, specializing in logistics, finance and consulting services, rely on advantages of local industries and enterprises, aim for nationwide reach, seize the opportunities presented by FTZ construction, open up towards the countries and regions along “Belt and Road”, create an environment for innovation and cooperation, build a cooperative platform for industrial resource consolidation, clear the bilateral communication channels, and eventually make substantial advance in the development of its service trade industry.

1. Feature the development of financial service sector, and promote the development of internet finance sector

Push Sino-Singapore financial cooperation to integrate domestic financial and capital resources. Chongqing should take advantage of the China-Singapore (Chongqing) Demonstration Initiative on Strategic Connectivity project to bring in financial companies from Singapore, and utilize Singapore as a channel for indirectly attracting international capital; meanwhile, institutional innovation should be applied to attract domestic financial firms and capital resources, so that the city,

with concentrated financial firms and capital from home and abroad, can be built into a financial service base of "Belt and Road". Financial services shall be boosted to better serve the state "Belt and Road" initiative, with service scope covering foreign investment in China, cross-border investment of domestic capital, overseas acquisition and investment by domestic companies, cross-border startup project financing, financing in China by foreign enterprises and projects, financing and guarantee for overseas outsourcing projects, financing and guarantee for cross-border merchandise trade, etc.

Develop Internet finance and promote RMB settlement. Chongqing should bring in Internet finance companies from home and abroad and "Internetize" existing finance business to build itself as an internet finance center for the "Belt and Road" initiative. Cooperation should be developed with finance and internet finance firms in China to establish domestic channels for internet finance; meanwhile, cross-border payment business should be promoted vigorously in the international trade, particularly e-commerce business and other related sectors. Besides, RMB settlement business should also be furthered by capitalizing on the growth of cross-border trade and financial service industry.

2. Develop logistics into a competitive sector, and promote cross-border e-commerce development

Establish a modernized modern logistics system and facilitate the development of the logistics sector. Starting with a top-down design, Chongqing should utilize informatization technology and introduce the concepts of internet+ and IOT+ to build a highly modern logistics system. Waterway, highway and airway resources, as well as Yu'Xin'Ou (Chongqing-Xinjiang-Europe) international transportation resources, should be consolidated to develop a Sino-foreign 3D logistics network in which Chongqing is a hub. Customs, logistics, warehouse and other management platforms should be interconnected with one another using IT tools to improve the efficiency of the logistics network.

Attract domestic and foreign e-commerce businesses to build a cross-border e-commerce center. An open logistics platform should be used to attract domestic and foreign e-commerce businesses, which are to be served by an open, unified, and intelligent logistics system. Resources should be consolidated to support e-commerce development. A bilateral channel cleared of obstacles shall be created in an effort to build a Chongqing-centered network for imports and exports, enabling domestic and international logistics flow.

3. Start to develop international outsourcing service

Domestic industry and service in manufacturing and processing, R&D design, telecommunication and information infrastructure, and human resources should be consolidated to provide worldwide outsourcing services. At the initial stage, priority can be given to manufacturing outsourcing, software outsourcing, and information infrastructure outsourcing services.

Consolidate domestic needs and seek outsourcing services from abroad. In order to meet the needs for industrial transformation or upgrading in China, Chongqing can consolidate the needs of domestic businesses to outsource R&D, production and HR services together.

Leverage foreign and domestic capital and industrial resources and explore the overseas market for general contracting of engineering projects for Engineering Procurement & Construction (EPC) projects. Domestic resources in respect of capital, technology and management should be consolidated in order to explore the overseas market for general contracting of engineering projects. To exploit advantages of China, In seeking EPC opportunities, priority should be placed on energy, transportation, water service and other infrastructure construction, as well as plant construction projects when

seeking general contracting projects in foreign countries. Concurrently, the local advantages of Chongqing should be utilized to obtain contracting projects in urban rail transit and other industries.

4. Develop consulting services in support of "bringing in" and "going global"

Provide foreign companies and institutions with consulting services on investment and financing in China. Consulting firms can provide foreign companies and institutions advices on Chinese policies and regulations, Chinese markets and industries, investment environment and strategies, personnel training, project financing in China, patent application, and cooperation in China.

Provide domestic capital and businesses with "going global" related consulting service. In view of the demand for "going global" by domestic companies, consulting services should focus on foreign policies and regulations, international markets and industries, investment and plant construction abroad, and personnel training, etc.

(III) Suggestions on specific measures: Center around the key areas of industrial development to build four major platforms

It is suggested that Chongqing should build an open-style, resource-gathering platform to consolidate all industrial resources including capital, technology, personnel and information. Chongqing, as a central node, should build a "one-to-many" bidirectional channel to enable a smooth and efficient flow of goods, capital, human resources and information along "Belt and Road", so that resource allocation can be optimized and foreign and domestic industries can exchange and cooperate with one another.

1. Put Internet + concept into practice to build a "Belt and Road" financial service platform

(1) Overseas investment and financing platform

Leveraging its role in Sino-Signore cooperation, Chongqing should make full use of the future FTZ in financial industry and consolidate foreign and domestic capital resources to build an Internet+ investment and financing platform. A capital platform, clear of obstacles, should be built to promote both foreign investment in China and overseas Chinese investment; the gap between capital supply and demand should be bridged by both assisting overseas projects in its financing activities in China and guiding domestic capital to go global in the form of project investment. The financial industry and the service trade industry should have a coordinated development, meaning financial services, such as financing and guarantee for general contracting of overseas projects and supply chain financing, should be provided in full support of the growth of service trade industry.

(2) Cross-border RMB settlement platform

A cross-border RMB settlement platform should be built to fully integrate existing RMB settlement business into the cross-border financial service platform. At the same time, the RMB settlement business should be developed in a synchronized way with the service trade industry. RMB settlement should be encouraged and promoted in overseas investment, overseas project financing, cross-border trade, cross-border outsourcing, and other sectors.

Example: The "Entrepot Finance" Platform Built by Singapore

Through development characterized by “entrepot finance”, Singapore has been transformed from “Gibraltar of the Orient” into “Switzerland of the Orient”, following the successful shifting from “entrepot trade” to “entrepot finance”. In the concept of “entrepot finance” lies a government-built platform where worldwide capital are attracted to Singapore and invested in neighboring regions. A series of policy innovations, especially the institutional innovation in tax, has improved the competitiveness of Singapore in attracting capital; besides, various personnel development measures have been designed to support the growth and expansion of the financial industry.

2. Implement the idea of coordinated opening up, and build a logistics service platform of “Belt and Road”

(1) Modernized intelligent port

The concept of intelligence should be applied to build a unified intelligent port platform. Port management systems for each industrial park should be integrated, and relevant logistics and warehousing resources should be consolidated; water, land and air transport systems and resources should be integrated; management system for customs, logistics and warehouse should be interconnected. Besides, technologies such as IOT, Internet and informatization should be used to improve the intelligence level of the port.

(2) Open logistics platform

An open logistics service platform should be built as an interface for third-party logistics companies, to attract foreign and domestic e-commerce businesses and logistics service providers using unified management and standardized services.

(3) Interfacing bases and platforms along the Yu'Xin'Ou railway

Following the government-led coordination, a strategic partnership should be forged with the countries along the Yu'Xin'Ou railway. Chongqing should lead the domestic e-commerce and logistics enterprises and consolidate domestic capital and resources to build interfacing logistics bases overseas and create a “one-to-many” bidirectional channel, which will contribute to a balanced development of bilateral trade. In addition to construction and interfacing of physical bases, Chongqing should also interface with its foreign counterparts in finance, e-commerce and logistics platforms.

Example: The start of cross-border e-commerce service provided by local enterprises

Over recent years, cross-border e-commerce business has been booming. Cross-border services have been provided by all major e-commerce companies, ranging from the international player Amazon to the domestic giants like Tmall.com, JD.com, WoMai.com and yhd.com, as well as the fast growing e-commerce platforms dedicated to cross-border business or online overseas shopping. It is doubtless that cross-border e-commerce service has become a “must have” business for these enterprises. Seeing the continuous growth of cross-border business, e-commerce players are speeding up their construction of overseas platforms. For example, Ali, JD and other companies have built, either independently or jointly, bases and platforms in foreign countries. In the process of developing and constructing overseas bases and platforms, the government-led efforts to seek cooperation from foreign countries and achieve coordination among e-commerce firms would not only satisfy the demand for overseas business development but would also considerably reduce investment costs and improve operational efficiency.

3. Integrate into the international industrial division of labor, and build an outsourcing service platform on "Belt and Road"

(1) Interface platform for "Belt and Road" outsourcing projects

A bidirectional interfacing interface platform shall be built for outsourcing projects to provide domestic enterprises with overseas demand for outsourcing services and publish domestic outsourcing demand information for the benefit of foreign companies. Focus on key areas is required and efforts should be strengthened to speed up the construction of platforms for processing, R&D, software and human resources outsourcing; and increase the speed of connecting supply and demand via internet is essential. The platform should be operated in an open manner to attract more outsourcing companies from home China and abroad and improve the success rate of project matching. Overseas platforms, in addition to the domestic ones, should also be built, where local and domestic outsourcing requirements are gathered to facilitate a supply-demand interface.

(2) General contracting platform for overseas engineering projects

A general contracting platform should be built to collect information on construction outsourcing projects in the Middle East, East and North Africa, East and North Europe and other regions and to subcontract these projects to domestic companies. This platform should interface with the financial service platform and consulting service platform to provide a full lifecycle service, starting from general contracting to consulting, subcontracting, financing, and investing. Apart from serving domestic companies and capital, the platform should pay additional attention to interfacing general contracting of infrastructure construction projects in support of the state's strategies on export.

Example: Schneider Electric uses its global network and experience to provide services for companies in general contracting of overseas projects

As an international company with a history of 180 years, Schneider Electric has a worldwide presence, with offices in more than 130 countries and over 250 factories all over the globe. Benefiting from its long-term internationalization, Schneider Electric has gained an in-depth understanding of laws, regulations, cultures, customs, and plant construction standards in various countries. Schneider Electric, with its accumulated rich experience, has helped many businesses venture out to the overseas market. For example, Schneider Electric arranged their plants in the U.S. and Mexico to help a Chinese company successfully execute an oil tank project in Nicaragua; in a Chinese-constructed solar photovoltaic power station project, Schneider Electric integrated its global network resources so that the products were manufactured in a third country before being directly transported to the project site, substantially cutting down the transportation costand the project implementation period was shortened; the profit of the general contractor increased as a direct result.

4. Perform full service exchange and cooperation, and build a consulting service platform for "Belt and Road"

(1) International investment and legal advice platform

An international investment and legal advice platform should be built to gather resources of nationally and internationally renowned consulting firms and experts to advise domestic businesses on overseas investment or advise foreign businesses on investment in China.

(2) International engineering consultation platform

An international engineering consultation platform should be built to offer better service through bringing in the forces of domestic and foreign companies experienced in construction and management of overseas projects. This platform should be combined with the general contracting platform for overseas engineering projects to achieve an interaction between consultation and general contracting so that advice can be given for the general contracting projects backed by integrated platform resources.

(3) Personnel training platform

A personnel training platform should be built, where training institutions are brought in to provide training in management, software development, language, special professional skills and other skills required in outsourcing projects. Meanwhile, domestic strengths in technology and management should be leveraged to offer training services related to foreign personnel. An online training platform should be built to realize integration and interaction between on-line and off-line training.

(4) Special fund for guidance on "go global"

A special fund should be set aside for local companies in Chongqing to guide them in the "go global" process. The government may use this fund to subsidize local enterprises on costs in consulting, training and other activities on the abovementioned platforms associated with overseas investment, factory set up, and outsourcing project contracting. Moreover, this fund can also be used to cover the cost of regular "go global" training provided by prominent enterprises or experts on the platforms for the entrepreneurs and related personnel in Chongqing. This is not a rare practice. For example, the French government invests in the support of business and personnel training every year.

Example: French "Future Industry" personnel training program

In 2015, France announced the "Future Industry" strategy to promote industrial transformation and upgrading. To achieve this objective, multiple measures have been taken, one of which is personnel training. The government set up special funds to train high-end R&D and management personnel, as well as people skilled at intelligence, in order to improve the vision and level of management and enhance technical power and foresight. Along with government-provided training, the enterprises will also receive monetary support or subsidies in other forms for their investment in personnel training.

“Made in China 2025” and Hitachi’s “Social Innovation Business”

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1 Introduction

The “Made in China 2025” project, proclaimed by the State Council in May, 2015, is intended to transform China away from its current status as a quantity-based manufacturing powerhouse,towards a advanced industrialized country with a high emphasis on high technology products. The project is expected to not only to help advance the manufacturing sector but also upgrade all industries, reform the country’s industrial structure as well asimprove quality. Amid this backdrop, Hitachi is promotingits “Social Innovation Business” while also reforming internal structures and further improving quality. This document gives an overview and examples of Hitachi’s Social Innovation Business, R&D activities, and “Society 5.0,” an initiative for advancing the Social Innovation Business further, which was adopted by the Government of Japan in line with our proposal.

2 Structural Reform of Hitachi: Social Innovation Business

2.1 Overview

In 2009, Hitachi declared that the Social Innovation Business would constitute the core of its business[1], under the philosophy of “Contribute to society through developing excellent technology and products.”Since then we, have been committed to this initiative as a group-wide effort. Though our Social Innovation Business we provide high value-added productswhich combine social infrastructure and information technology. The following gives an overview of thisapproach.

The extent to which Individual products or systems can resolve problems inthe fields of environment, energy, industry, and healthcare is limited. Our Social Innovation Business involves the providing social infrastructure through integrated solutionsfused with IT products and systems, aimed at the realization of a sustainable society. Combining our infrastructure technology and highly advanced IT, we are committed to offering total solutions for solving diverse problems faced by society or our customers. The characteristics of our Social Innovation Business are as follows:

- **Global Business Management:** For conducting business in countries and regions Hitachi needs to understand local markets and cultures and act flexibly. Hitachi is sharing business management with local organizations, allocating human-resources world-wide, forming international partnerships and implementing global R&D activities so that we can respond to the issues of our customerslocally or regionally.

• **Resource Concentration:** In order to promote the Social Innovation Business, Hitachi is focusing its business resources on high-value products with superior functions and performance. In critical business bases such as China, we have established full value-chain local networks, which span from R&D to design, production, sales, maintenance and servicing ("local production and consumption").

• **Realization of Integrated Service Business:** Hitachi is also committed to providing integrated services to resolve management issues of customers by sharing fundamental points and proposing optimal solutions based on analysis of a vast amounts of data.To promote such an integrated service business, we strive to provide solutionswith an eye on circumstances 10 or twenty years into the future.

2.2 Examples

Hitachi has been promoting the Social Innovation Business in a wide range of areas. The following describes smart and green manufacturing in China, which is directly relevant to "Made in China 2025".

• ***Total Solutions for Factories***

As a factory consumes a significant amount of energy, energy saving and reduction of CO_2 exhaust is an important issue. Aiming to both develop industry and protectthe environment, we review a factory's operation comprehensively to create systems which promote energy saving and enhance efficiency. Hitachi's total solutions cover the whole factory premises, from backyards and power facilities to computer rooms, offices and cafeterias. Utilizing monitoring and measurement systems for production facilities, our solutions measure the amount of energy consumption in detail. Such visualization of energy consumption identifies areas where consumption of energy can be reduced, making it possible for us to offer total solutions. For example, to promote energy saving, we provide highly-efficient products for the production facilities, while optimizing the shapes and materials of motor iron cores, thereforecontributing to energy-saving operation. In addition, we pursue further enhancement of efficiency by implementing inverters for optimal control. For power receiving and distributing facilities, we introduce amorphous transformers for decreasing the amount of standby energy. We also apply IT to make more energy saving possiblefor the whole system.A factor's entire operations can be even greener when our total solutions monitor power receiving/distribution and utility facilities, and utilize systems for measuring data, controlling the number of machines in operation and getting more power saving from air-conditioning.

• ***Smart Logistics in China***[2]

It is said that the costs for logistics in China account for 17 to 18% of GDP, a ratio significantly higher than the rate in Japan (8.6%). Thus, more efficient logistics operation is needed to contribute to reducing the total costs. The global logistics services of Hitachi combine three operational elements: component procurement, logistics & warehousing, and IT. With this combination, we can expect the following improvements in helping our customers resolve their complex management issues.

- Cost Reduction (related to P/L): Cost reduction of procurement, logistics and IT
- Inventory Reduction (related to B/S): Operational enhancement, optimized inventory level and shorter lead time

To examine the effects expected from introducing these services, a Hitachi group company in Suzhou, China, conducted a verification test with a domestic supplier, who was starting “milk runs” on a trail basis. The test, which monitored the product arrival (shipping) status pre- and post-service introduction, while obtaining logistics data, verified the effects for decreasing both costs and inventory level.

For the future direction, Hitachi is currently studying feasibility of offering high-value services which analyze and evaluate big data. The following studies are ongoing.

- Inventory Analyzing Services: We enhance production management functions by utilizing inventory information accumulated in integrated logistics database to optimize the amount of inventory and order points.
- Supplier Evaluation Services: We analyze supply trends by examining information on secured orders, business status of each supplier, and use this to improve supplier management functions.
- Business Base Optimization Services: We formulate plans determining business bases that minimize costs. This is needed when a customer changes its supply chain, and needs to determine production facilities and warehouses from a number of candidate locations.

The above show many of the possibilities for new high-value-added services, through applying IT with big-data technologies.

2.3 Direction of the Social Innovation Business[3]

The world is undergoing significant changes. As digitization progresses, industrial structure is shifting from supply of goods to services, from monopoly to sharing, from closed to open and from individual optimization to total optimization. As for our innovation business, Hitachi used to create value by utilizing IT for individual areas separately as seen in our business of adding high value in fields such as power and energy, traffic, construction machinery, manufacturing, distribution, urban development and buildings, and healthcare. Our new approach isto link these fields with digital technologies. For the industrial and logistics sectors, Hitachi shall go beyond mere IT utilization infactories,we shall digitally link components of in the supply chain, including distribution, logistics and settlement of accounts, and find the best solution. We are aiming to be a“best partner” for companies in the age of internet of things (IoT).

3 R&D for Reinforcing the Social Innovation Business

3.1 R&D for Driving the Social Innovation Business

Hitachi’s R&D[4] activities createnew technology and knowledge while producing new values, which can be reapplied to our business, therefore reinforcing innovations. For this, we are promoting three strategies. First, we are expanding collaboration with our customers. Issues faced by society and our customers, involving energy, the environment, food and water supply, traffic systems and security, are becoming more and more complicated. Hitachi,shares these issues and strives to provide solutions. Towards this end we have established a customer-oriented R&D system by expanding our overseas R&D bases. We have also established common platforms for collaboration with our customers. Secondly, Hitachi strives to create innovations that can meet market needs. To create innovative and competitive products and services in the global market, we

will enhance our technical base further. We will continue our push for technological integration, it being important to create new solutions combining separate technologies in the optimized manner. Hitachi is also committed to addressing future issues. For sustainable growth of society, customers and Hitachi Group, it is essential to carry out basic research, based on creative visions,which society and customers are not yet aware. Attempting to predict new social trends, Hitachi is advancing its long-term R&D activities for exploring new fields. Partnerships and networking are indispensable for realizing these visions. Hitachi has been actively pursuing its open innovation policy with our customers, external technical partners, and countries and regions.

3.2 Main Roles of R&D Division

(1) Development of technologies that cannot be developed within single business units

The R&D divisionhasaccess to various operational resources. It also has access toknowhow accumulated from best research practices, as well as universal basic technologies,gained over the years of experience in markets and technical areas beyond the reach of business groups. In addition, it can select and concentrate on activities by allocating research resources flexibly according to the level of urgency or importance of the issue at hand. This has enabled the R&D division to address highly technical issues in line withrequests from markets or business groups.

(2) Development of Technology Covering Multiple Business Fields

The Social Innovation Business requires the development of technologies that cover multiple business fields, given its nature of producing high value by combining social infrastructure technology and IT.

R&Dis also necessary when determining a business model,so that cost structures can be improved. There are also a number of cases where developing technologies and know-how,for various differing market segments can lead to the overall advancement of technologies in various areas.

(3) R&D for Creating Future Markets

For the most critical issue of sustainable growth of society, customers and Hitachi Group, we have adopted the following principles for conducting our R&D.

- Possess deep knowledge on market information for expanding our business areas
- Possess deep knowledge on cutting-edge scientific information for offering a wide-ranging technical support in the expanded business areas
- Study methods, including those in humanities and systems science, to be aware of signs of social changes

For these principles, open innovation plays a critical role.

3.3 Hitachi's R&D Strategy

(1) Customer-Oriented Research Approach

Customer-oriented research approach represents establishment and upgrading of the collaborative process, which starts with vision-sharing with customers and moves on to creation of new concepts, prototype development, demonstration and on-site verification. Hitachi has been developing its original service design method as a way to visualize issues in cooperation with customers and formulate and analyze visions or solutions. For example, for efficiency enhancement in railway-carriage maintenance work in the United Kingdom, construction of data centers and particle-radiotherapy facilities in North America and software development in China, a method was adopted which identifies potential needs or fundamental issues of customers through on-site observation by researchers. We will accelerate our collaborative process by systematizing the methods which we have already developed, as well asby turning the best practicesinto IT tools so that they can be utilized globally. In particular, for sharing visions and philosophies, Hitachi will make best use of Cyber-PoC(Proof of Concept), which visualizes values to be provided by our services and solutions in cyberspace, where diverse simulation tools are integrated.

(2) Enhancement of Technical Foundations for Creating Innovative Products

Hitachi will enhance its wide-ranging technical foundations through creating innovative products, software and services, which can realize our Social Innovation Business. Forthe healthcare sector, for example, we are reinforcing development of motor-driven MRI and particle-radiotherapy equipment for cancer treatment. Other examples of our development include virtualization technology for large-capacity storage systems in the information sector and large-scale analysis technology to develop shock-absorption structures designed for high-speed rails in the railway sector. We have also developed active damping technology for the world's fastest elevators in Guangzhou for the infrastructure sector and double-sided cooling technology which reduces the size of inverters for the automobile sector. Hitachi will move its effort for value-creating innovations forward by fusing these technical foundations.

(3) Long-Term R&D Effort

As the largest mission of R&D is to drive long-term growth, we will attempt to identify future issues and further our development of original, most advanced technologies, which can lead to social innovation or paradigm shift. Specifically, in physical science, we have been conducting research on electronic atom-resolution microscopes, complex simulation technology for physical phenomenon, and its theory development, all of which help create innovative materials. In life science, our research extends to regenerative medicine and analysis of single-cell genes. Moreover, in information science, research has been going on for new-concept computing for finding the best combination at incredible speed and analysis of brain activities and human behaviors. With the vision of sustainable society, Hitachi has also been promoting new themes based on issues such as graying population, energy and food supply.

3.4 R&D Examples in Manufacturing and Industrial Sectors

Recent R&D examples for smart manufacturing include the followingsystems:

- **Digital Operation Modeling:** For improving operation quality by clarifying the relationship between digitizedwork data and product quality. The modeling is expected to contribute to production of higher quality by detecting defects or errors on assembly lines or cells in images.
- **Human-Robot Harmonization:** For automatic designing of a sequence of assembly, production-line structure and robot movements based on design data. Operators will deal with complicated work in a multiple number of cells, while robots in basic cell units can be dedicated to simple work in their own cells, which can be reorganized flexibly.
- **Delivery Sharing Systems:**For minimizing delivery delays and cost increases caused by traffic congestion with cross-sector delivery sharing systems.Such systems utilize a delivery-sharing simulation tool for identifying issues and ideas for their resolution and for visualizing expected effects.

4 Fourth Industrial Revolution, Japanese Version: “Society 5.0”

4.1 Background of Our “Society 5.0” Proposal

A proposal by Hitachi, with its experience of the Social Innovation Business, of“Society 5.0,”[5]the fourth industrial revolution, Japanese version, to the Government of Japan has been adopted for the country’s 5th Science and Technology Basic Plan. Society 5.0 intends to apply to a “super smart society” the concept of the Social Innovation Business, that is, a combination of multiple technologies such as IoT and artificial intelligence (AI) to create future products and services. The Society 5.0 initiative is characterized with its philosophy of usingIoTnot merely to enhance industrial efficiency and strengthen the manufacturing sector but also to consider it in a wider sense as a solution of social issues like ageing population and energy. The initiative attempts to shape the kind of desirable society of the future and resolve accompanying issues with innovative ideas.

4.2 Overview

1) Concept of Society 5.0

At this point of great technological change, as exemplified by IoT, we have seen national initiatives adopted, such as “Industrie 4.0” of Germany and the “Industrial Internet of Things” of the United States as well asMade in China 2025. The Japan Revitalization Strategy, adopted in 2015, positions a “fourth industrial revolution” as a central theme for realizing revolution in productivity, and in FY2016 specific actions are expected to be clarified in the year’s revision. The relevant ministries are making effort for the initiative by adopting a new robotics strategy and establishing a consortium for IoT promotion. Under these circumstances, the 5th Science and Technology Basic Plan defines that the industrial and information societies will be followed by a super smart society, and the government revealed policy to push forward the Society 5.0 initiative strongly in public-private cooperation to made such a society a reality. Society 5.0 aims at constructing an IoT

platform, common to the 11 systems set forth in the Comprehensive Strategy on Science, Technology and Innovation 2015 to address economic and social issues.

The concept of Society 5.0 emphasizes both enhancement of industrial competitiveness and construction of human-centered society. It is intended to create new industries and address issues of ageing population and energy as well as improve industrial productivity. Society 5.0 is thus named after the fifth, “super smart,” society which will follow those of hunting and gathering, farming, industry, and information.

2) Advancement of society

・From individual changes to an Increase in personal power

In an advanced society individuals will take center stage. Against a backdrop offused cyber and physical spaces and development of biotechnology, people will be able to leadtheir ownlifestyles. They will be healthy, feel safe and the living will be easy.

・ Change of Companies: Competitiveness enhancement through offering new values

Advanced society can be realized with companies promoting innovation and globalization as well as efficiency enhancement and adjustments of business models by further computerization. Because they are expected to offer new values to individuals, companies would try to create innovations which look at societal changes of the future while retaining,as their starting points of business, traditional concepts of values for customers and social issue resolutions. For this aim, they would attempt to strengthen international competitiveness by creating new cross-sector businesses and services.

・ Resolving Social Issues: Creation of productive and lively future

In advanced society, issues that Japan is facing, such as a shrinking, and aging, population, natural disasters, would be resolved while productive and lively future be created.

3) Towards realization of an advanced society

Japan is country suffering from the following“advanced-nation issues”. The country is currently applying new technologies such as IoT and AI in an attempt to to address these problems. Nevertheless, it is still important to use technological strengths and knowhow built up over the years to develop new services and values.

・ Shrinking Population and Lowered Competitiveness: Smart society in which a shrinking population is not an issue.

・ Aging Population and Social Advancement of Women: Society wherein all people, the elderly and women, can be active contributors

・ Natural Disasters, Terrorism and Obsolete Infrastructure: Safe society both in cyber and physical spaces

・ Shortage of Natural Resources and Water: Society which contributes to solving environmental issues of global scale

With IoT, AI, robotics and other technologies, this advanced society would; (1) create data for every event, enabling us to understand what needs areto be met for whom, when and where in large areas withhigh accuracy, and (2) offer optimized values and services efficiently and immediately with autonomous and automated systems. For utilizing data, which are called the fourth management resource, the key is to understand how we should construct a virtuous cycle of (1) and (2). It would also be important to have an aim to create new strengths. In addition to our traditional strengths in manufacturing, Hitachineeds to enhance its ability in “destructive innovation” and “society-oriented innovation,” which should be based on

“sustainable innovation” and “technology-oriented innovation.”

5 Conclusion

The high-value-added society, to which the city of Chongqing is aspiring through its industrial structural reform, is similarto the future envisioned by Hitachi. Thus, we believe that we can contribute in numerous aspects to Chongqing in its effort of building such an advanced society.We believe that the there is much potential for furtherChinese-foreign cooperation in various projects, and we are looking forward to the further support ofthe Government of Chongqing in this respect.

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FinTech -- A Player in Charge of a Shift in Service Trade

Mitsubishi UFJ Financial Group

It is a natural course of development that the key driver of sector growth shifts from the manufacturing industry to service industry. Among the service industry categories, the financial industry plays a particularly important role to provide funds for new business ventures. Effectively-functioning financial industry helps speed up the metabolism of the overall economy, contributes to the advancement of the service industry, and as a result underpins the development of the country's overall economy.

Now, a paradigm shift is beginning to take place in the financial industry. It is a new business called FinTech. FinTech has an innovative presence that is completely different from culture of conventional financial institutions like MUFG, but at the same time, FinTech demonstrates its superior ability in collecting and analyzing information, reducing uncertainties about the future of corporate customers, which are exactly what the financial industry does.

We -- private financial institutions -- are completing fiercely to create a new de facto standard business model for FinTech. Governments across the globe are looking for a way to create a system that can underpin the development of FinTech, while attempting to figure out the risks in a cautious manner. In China, major cities are said to have issued draft P2P (peer-to-peer) regulations in 2014, ahead of the rest of the nation. In Japan as well, the Financial Services Agency set up a working group this summer in an aim to amend the relevant laws in 2017.

I would like to discuss the possibilities and risks of new service models to be derived from FinTech, how conventional commercial banks respond to them, and what kind of new risks authorities need to brace for.

1 The Advent of FinTech and the Expansion of Financial Services

（1）Various Forms of FinTech

FinTech can be broadly categorized into two forms: one being virtual currencies, which operate outside of the conventional currency system, and the other developing based on the conventional currency system.

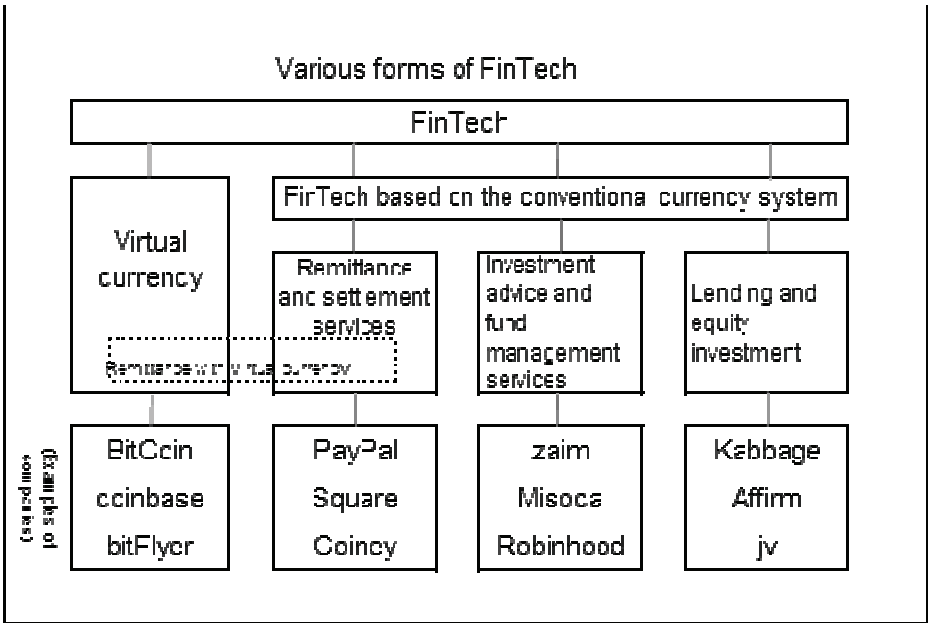
The most famous virtual currency is Bitcoin. The ingenious technology and mechanism of this new currency is remarkable, but unexpected accidents occur to any technology and mechanism. There may be limited use in settlement, but it is premature to fully put our confidence in it as a currency. For a bank, the block chain technology behind virtual currencies is more interesting than the currencies themselves. In other words, this technology might be used for the recognition of such individual transactions as financial transactions and associated real estate deals and ensuring their irreversibility. We, MUFG, are also considering an overseas remittance service using the block chain technology through a capital and business tie-up with a U.S. company called Coinbase.

The other form of FinTech, which is developing based on the conventional currency system, is already promoted as one of the important strategies of many banks and is further classified into three types: 1) providing settlement, remittance, and other services, 2) providing fund management and investment advice to individuals and cooperates, and 3) performing the function of matching the supply and demand of funds including loans and equity.

Settlement and remittance services are relatively simple in terms of their mechanism and are already available in many countries. American companies including PayPal and Chinese companies including Ali Baba are already widely known. In the field of overseas remittance, there are remittance companies that have provided services at low fees for more than 10 years, although it is not that they operate based on such an advanced technology that would be referred to as "tech." Nowadays, convenient payment and remittance services using cell phones, e-mail, social networking services (SNS), and other mobile terminal functions are available at low charges.

Investment advice and fund management services are comprehensive packages of services which cater to advanced needs such as investment and asset management, including settlement and remittance. Information collection, information analysis, decision making, and correct fund operation to suit the purpose of customers are the challenging aspects. This type of services is more advanced and complicated than settlement and remittance, and is still in an early phase of development.

Services matching the supply and demand of funds, including loans and equity, are advanced but also involve higher risks. The basic task is to match funding needs with investing needs by collecting and analyzing information, which is a strength of ICT companies. Information is collected from Facebook and other social networking services which help connecting those who want to borrow funds, on-line shopping histories, credit card payment histories, etc. to calculate the probability of borrowers' bankruptcy. Then, suitable loan conditions, such as the interest rate and maturity date, are presented to the fund manager, eventually creating a flow of funds from investors to borrowers.



（2）The Power of Big Data and Artificial Intelligence

The level of complexity of services provided by FinTech companies may be arranged in the order of: 1) Settlement and remittance, 2) investment advice and fund management, and 3) lending, with the level of difficulty increasing in this order. Big data and artificial intelligence (AI) support the evolution of FinTech into such complicated services.

Simply put, big data refers to electronic records of innumerable events and phenomena on earth. It includes records of individuals' conversations, movements and payments, transactions between corporates, weather, disasters, etc. Such huge amount of records evolved into big data with the advent of artificial intelligence. In other words, we have gained the ability to process a tremendous amount of data so that we can identify patterns of various social or natural phenomena and discover their causal relations.

（3）Expansion of Financial Services

① *Promising Settlement/Remittance and Investment Advice/Fund Management Services*

Then, how will FinTech make a difference in financial services?

As mentioned before, new services are already spreading all over the world in the fields of settlement and remittance. One could say that settlement is the task to make debit and credit records correctly and irreversibly. It is easy to imagine that the full potential of information communication is brought out to improve productivity and safety.

Investment advice and fund management services are comprehensive management services for making investment decisions and cash flow management, which are the basis for settlement and remittance. These are far more sophisticated services than settlement and remittance as they give users a guideline for the next action to take. The power of big data analysis by artificial intelligence is expected to be fully utilized.

MUFG の仮想キャラクター

This year, MUFG will start a voice-interactive over-the-counter business support service for smartphones, featuring a virtual character called MAI. The service may also develop such that customers simply say what they have in mind, the virtual character understands their intention and proposes investment products that suit their preferences. In the long run, MAI will work in conjunction with big data, while artificial intelligence will analyze the huge database of accumulated past data, to give advice tailored to each customer's needs. I think this opens up many possibilities.

② *The Promising but Risky Field of Lending*

Services involving lending might have more potential for growth, but entail higher risks. They are more risky for two reasons: one is the difficulty of predicting the future and the other is the difficulty of handling when predictions go wrong.

Difficulty of Predicting the Future

FinTech excels at identifying causal relations between pieces of data by finding patterns in enormous amounts of past data. That is to say that future predictions are supported by thinking based on experience.

Household and corporate economic activities interact with each other to create macroeconomic trends which may help individual corporates come up with new ideas or may drain their vitality. They occur chronologically by repeating interaction. Predicting the economy by artificial intelligence and big data basically means predicting a posteriori the future from past patterns.

Therefore, it is easy to predict the near future. On the assumption that the economy moves in a cycle, the remote future can be predicted as well. However, when an abrupt structural change such as the emergence of the steam engine or artificial intelligence occurs, FinTech's ability to predict the future will decrease drastically.

Difficulty of Handling when Predictions Go Wrong

A more difficult situation occurs when predictions go wrong. There is always a chance that predictions go wrong. In the field of financing, wrong predictions lead to creation of bad debt in the worst case. When financial institutions write off bad debt, debtors have their collateral disposed of.

If the cause lies in the business model of the borrowing company, the financial institution may stick to their stance as a private-sector institution and handle the situation based on economic rationality. However, bad debt is often created during macro-economic recessions. It cannot simply be written off, as it is something created partially due to a worsening of the environment. The financial institution must decide what actions to take, considering the damages to society. It may sometimes reach out to the parent company, local governments or other stakeholders to provide the support. The financial business is not solely about providing individual financial services: if something happens, financial institutions must proactively work on concerned parties to seek for ways to minimize the economic loss of society.

It is possible to have artificial intelligence take over decisions on individual services. However, the subsequent handling of bad debt can probably be done only by humans at least for now.

2 How Major Conventional Financial Institutions Should Adapt to such Change

I believe that in Chongqing, too, key drivers of the financial industry are still major commercial banks. That is basically the case with Japan as well, but I would like to discuss how conventional financial institutions can ride a new wave of innovation by introducing our experience.

FinTech aims at eliminating uncertainties and invigorating corporate and individual economic activities. This is the essence of the financial business, and we should not view FinTech as a secondary business. We need to make genuine and organized efforts.

（1）How MUFG Takes Up FinTech

We, The Mitsubishi UFJ Financial Group, are a large organization with more than 100,000 employees on a consolidated basis. We may be regarded a rather conservative organization as we focus on stable management due to our emphasis on the confidence of society.

We set up a division in charge of FinTech business a year and four months ago in May 2015. The former IT Initiative Division in The Bank of Tokyo-Mitsubishi UFJ (BTMU) was reorganized to establish the Digital Innovation Division. The purpose of this division is to achieve results in the long term by cultivating the potential of innovation and contributing to the development of the bank. Two months later, the division was transferred from BTMU to MUFG, and enlarged its scope of operations to all financial services provided by the MUFG entities, such as commercial banking, securities, trust banking and leasing.

（2）Management on the Division Level

The management of the division in charge of FinTech requires an approach different from the conventional approach adopted by other divisions. Usually, divisions set their goals every half year and so does each of their division members. It is not acceptable that goals that have been set are simply not achieved.

As mentioned before, the Digital Innovation Division, however, needs to create something out of nothing, instead of working to expand the existing business, for example, by 10 percent. If a goal can be set easily, that cannot be regarded an innovation; or, if they were forced to set a goal, they would only set an attainable goal.

Of course, it is not that we do not have any guidelines. The division decides on several initiatives they will always work on and works as a unified team for their achievement. Some innovations may not bear the fruit of innovation. Failure will also be accepted as an outcome of initiatives. Some people do question such a relaxed target management when other divisions are doing their utmost to achieve their targets, but totally different ideas are necessary for creating something out of nothing, and so should a totally different management method be applied to the division.

（3）Open Innovation and Required High-level Communication Skills

①*Open Innovation*

Even if totally different ideas are necessary, the division’s members are not a group of employees isolated from the rest of the bank and society to do nothing else but pursue research and development. Rather, they are the opposite. There is probably no other division that holds conferences and meetings as often as the Digital Innovation Division. They frequently have meetings with the front office business units as well as lawyers, accountants, and other outside experts.

There is a concept of how to acquire external knowledge called open innovation. To acquire the knowhow of venture companies, attempts were often made to fully purchase the entirety of their human resources, teams or companies and integrate them into one’s organization. However, this method tends to lead to the extinction of creative cultures and the outflow of hired personnel. The concept of open innovation was devised to address this issue. We allow our business partners to access the bank’s internal data and use it to develop various new services. We also host events such as idea competitions

and test new ideas as new services of the bank.

② The FinTech Team: a Group with High-level Communication Skills

The field of FinTech requires a feel for uncovering customers' needs and the ability to think flexibly to devise solutions. Therefore, there must always be encounters between people and an exchange of ideas both in the bank and between the bank and the outside world. Unlike the image of working silently in a laboratory, the FinTech team is truly a group of people who have both advanced technological expertise and high-level communication skills.

An innovation like FinTech provides creators with the power to develop new things. It is very exciting for a creator to imagine what services to provide by using such power. It must be reminded, however, that what matters is how to meet customers' requests, not what can be done with new technology. The larger the power of leverage, the more companies will be required to have high communication skills, listen to the voices of society, and place the focus of ideas on society.

3 Changes in the Chongqing Economy Made by Financial Changes

Lastly, I would like to talk about what kind of contribution the emergence of FinTech will make to the economy of Chongqing. FinTech is a product of advanced ICT and will play a major role in the development of the local economy. But it entails high risks as well as potential returns.

（1）Expansion of the Urban Economy

Settlements and remittances, traditionally executed with cash, will be able to be executed online easily, smoothly and accurately by the use of FinTech. Since access to the convenience of FinTech is affordable, requiring only a cell phone or computer, it will easily spread to the whole nation. The connectivity of economic activities will dramatically improve throughout the country.

Improvement in connectivity means much, especially to a big city like Chongqing. FinTech will improve the connectivity of the information and finance of that base. Once people obtain a variety of information, they make payments online and then actually go to the city to consume the services. They use online shopping to buy clothes at home and then wear them when they go out to the city. They go out for a concert or dinner, and gain happiness through the intellectual excitement they feel during artistic activities or conversations with friends. Improvement in connectivity will make the Chongqing urban economy expand even further.

（2）Improving Productivity of the Urban Service Economy

It is not only demand that grows. The flow of money is the flow of information. In a service economy, new ideas are born where information is continuously exchanged. Ideas are the source of added value for a service economy. Various companies scattered in the vicinity of Chongqing, especially young companies with novel ideas, can be connected to financial services online. If loan-type FinTech provides short-term working capital, those ideas will blossom into actual business and help vitalize the Chongqing economy.

There is an expression, “financial inclusion,” and being financially included means being included in the supply chain of the GDP. If those people with the ability to create value, formerly scattered around Chongqing like isolated points are connected with lines and planes, we can expect the productivity of the service economy to increase.

（3）Benefit for policy implementation as a result of increased coverage of macroeconomic statistics

FinTech also offers more practical benefits for Chongqing. The expansion of financial transactions through FinTech reduces cash transactions, which means that an increased portion of the private sector’s economic activities will be electronically recorded in some way. Recording economic activities lays the foundation for the compilation of macroeconomic statistics. Increasing the coverage of statistics improves the accuracy of statistics, which can enable timely and well-informed implementation of policies based on the accurate understanding of facts.

Obviously, increased coverage of economic activities means increased ability to keep track of taxable incomes. In other words, the expansion of FinTech will help local governments secure funds necessary for implementing policies.

4 Risk Assessment

FinTech offers a variety of benefits, but it may cause confusion if controlled improperly. One particular concern is that it occurs in an electronic world, which cannot be seen physically, so that people may be late in noticing.

As stated previously, credit analysis by the use of FinTech is relatively reliable in financing for short-term working capital. If credit costs can be correctly calculated and applied based on histories of probability, confusion will be limited even if a company goes bankrupt.

In the financial world, however, money is money, no matter where it comes from. If short-term working capital is used for any other purpose such as investment in stocks or real estate, nobody will notice immediately. Therefore, it becomes important who monitors each individual loan. This is a basic point applicable to regular bank lending, corporate bonds and securitized products as well.

One problem in both the securitization of U.S. subprime loans and China's local-government financing vehicles is that the party responsible for monitoring is not clarified. It is easy to imagine the financial process being subdivided through financial engineering and outsourced in the world of FinTech. The very same thing could happen as it did with the financial crisis caused by the securitization of U.S. subprime loans. If it is unclear where the monitoring responsibility lies while authorities must supervise the whole thing, the financial market will be extremely vulnerable. All investors, borrowers, and intermediaries between investors and borrowers could be driven only by their own short-term self-interests in a narrow range. These moves will only result in playing an endless game of cat-and-mouse with authorities threatening punishment.

Technology only works as leverage to tap the latent potential of humanity. FinTech has the power to boost the potential growth of the Chongqing economy. In order to make it work properly, the city, central government and private financial institutions including us must acquire the advanced financial literacy required to understand the essence of the evolution going on in the world of FinTech.

The Potential of Developing Trade in Services through Internet Finance in Chongqing

—A Proposal for the Future with Comparative Case Study of Other Countries

Takahiko Yasuhara

Managing Executive Officer, Mizuho Bank, Ltd.

1 The role played by Internet finance in the development of the trade in services economy in Chongqing.

(1) How the application of technology fits into a trade in services approach for the future

The Chinese government is putting great emphasis on developing trade in services as part of its "new normal" transformation and reform policy for the economy. As described in the February 2015 report, *Guiding Ideas for Accelerating Development of Trade in Services*, the government intends to promote development of trade in services in high-tech fields such as communications, finance, and insurance to complement the country's already strong tourism and contract construction industries. Furthermore, the July 2015 action plan "Internet Plus" describes how furthering the integration of internet technology in new industries is also seen as an important part of industrial policy. The application of technology is seen as an integral part of the trade in services approach and the above report cites "aggressively pursuing a development model for information based innovative trade in services" as one of the city's core mission statements.

Chongqing is also following this trend by setting development of trade in services as one of its core policies. For example, the city's 13th Five-Year Plan speaks about how initiatives for five categories of trade in services form a key part of its plan to foster new industry and develop the service economy to accelerate globalization. Prior to this, in November 2015, the local government released *Chongqing Municipal Government's Opinions on Accelerating the Development of Trade in Services and Outsourcing* (*Chongqing Shi Renmin Zhengfu Guanyu Jiakuai Fazhan Fuwu Maoyi Fuwu Waibao de Shishi Yijian*), setting a target of compound annual growth-rate of 30% for trade in services by 2017. The paper outlines a development plan focused on the enhancement of seven trade in services areas, including cross-border e-commerce, cloud and big data; all of which closely related to internet connectivity.

(2) The potential of Internet finance and the current environment in Chongqing

As aptly described in the above-mentioned 'Internet Plus' action plan, the application of internet technology holds great potential in a wide-range of fields, but with IT based financial services (known as FinTech) rapidly growing worldwide, we will be focusing on one particular area of interest; financial services using mobile internet, the cloud and big data (hereafter

Internet finance). In China the July 2015 report *Guiding Ideas to Promote the Development of Internet Finance*, a set of basic principles regarding the sound development of Internet finance released by the People's Bank of China and ten other parties suggests that going forward, system infrastructure for both policies aimed at cultivation and regulation will be continued. At present, these services are mainly domestically orientated, although if the cross-border market continues to expand, we can expect a ripple effect not limited to the trade in financial services domain, but also extending into other trade in services areas such as e-commerce through advancement in payment systems.

Applying this to the current Internet finance environment in Chongqing, we feel that the foundations upon which to further develop the industry are already in place. For example, Chongqing and its "Liangjiang new area" were chosen as pilot areas for innovation projects and e-commerce; an area deeply connected to Internet finance, as part of a central government trade in services policy. The city is also known as the financial center of the upstream Yangtze basin, and its well established industrial infrastructure, coupled with recent government incentive schemes has been helping it to attract both foreign investment in financial services and major Chinese companies in payments and e-commerce. Local government also has its own agenda on the development of Internet finance and this is clearly described in the Chongqing version of the national "Internet Plus" action plan. However, as the local government is well aware, the spread of Internet finance brings with it the problem of mitigating possible increases in financial risk. The promotion of, and how developments might affect and interact with incumbent financial institutions are issues that have been faced by other countries and will likely also be of relevance to Chongqing.

Below we will look at how other developed nations are approaching the issue of fostering the robust development of Internet finance in a series of case studies. These will then be used to identify what kind of business models could be used by Chongqing financial institutions and venture companies, as well as what kind of supportive governmental policies and regulatory environment may be required to ensure the normalized development of Internet finance in the city.

2 Overview of FinTech

The word "FinTech" is an amalgamation of the two words "finance" and "technology" and is mainly used to refer to the use of IT in finance.

More specifically, in recent years has come to be used to describe the use of IT in advanced financial services. Finance is already an information industry and use of IT is ubiquitous, with software for accounting systems, ATMs, online banking, international remittance infrastructure all traditionally developed in co-operation with IT vendors. However, the rise of FinTech has brought with it non-financial companies into the marketplace like IT ventures and logistics providers who provide their own financial services directly to customers.

Such IT ventures have begun to utilize their superior technological know-how to provide highly convenient, low-cost financial services directly to end-users across a wide range of areas. This gives them the potential to revolutionize the structure of the industry and competitive principles, threatening incumbent's business practices.

FinTech has captured the attention of the entire world, with various programs and efforts being made across both the public and private sectors. The "World Economic Forum", a non-profit foundation made up of members including some of the world's major companies set up a subcommittee called "Disruptive Innovation in Financial Services" that released a 2015 investigative report and also discussed the issue at its January 2016 annual Davos meeting. Elsewhere, in 2014 the then

Chancellor of the Exchequer of the United Kingdom, George Osbourne, announced that he wanted his country to become the "global capital of FinTech" and a set of initiatives centered around the Financial Conduct Authority (FCA) are already underway.

A large number FinTech companies are also actively providing financial services in Japan. (fig. 1). Signs of the sector further developing are clear with the establishment of the FinTech Association Japan. As more sophisticated financial services are targeted, collaborations between finance industry incumbents and FinTech are expected to become more widespread. The FinTech boom is sweeping over both the public and private sectors, with the administration also making efforts by creating initiatives such as the Ministry of Trade, Economy and Industry-led "FinTech study group", a study group focused on industry, finance and IT finance, and the FinTech Venture Advisory Council, set up by the Financial Services Agency.

Figure 1: Examples of major FinTech companies in Japan

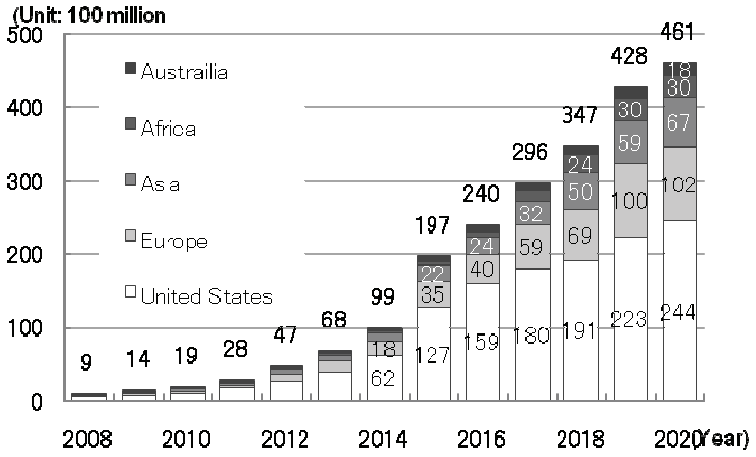
Field	Corporation	Outline of main services provided
Payments/Remittances	Coiney	Enables smartphones and tablets to be used as credit card reader terminals through the use of a small card reader attachment.
	LINE	Uses the messenger application “LINE” to perform individual money transfers.
Financing	Crowd Credit	Utilizes crowd funding to connect entrepreneurs in developing countries such as Peru, Estonia and Cameroon to investors in Japan.
	Rakuten Card	Provides online only loans for merchants selling on the Rakuten e-commerce mall without the need for submission of financial statements.
Personal finance management	Money Forward	Automatic household bookkeeping and cloud based accounting software utilizing accounting software technology.
Asset management	WealthNavi	Roboadvisor
	Finatext	Mobile finance applications such as “Asukabu” (interactive stock price forecast app) and “Karu FX” (foreign exchange app)
Security	Liquid	High-speed fingerprint verification
Block chain	bitFlyer	Bitcoin exchange

Source: Taken from publicly available materials of the respective companies, compiled by Mizuho Financial Group

3 Factors behind the rise of FinTech

The FinTech market has grown continuously and this trend is expected to continue (fig 2.)

Figure 2: Total Value of FinTech investments with forecasts through 2020



Source: Market Research.com “Five Banking Innovations from Five Continents: USA, Europe, Asia, Africa, Australia” compiled by Mizuho Financial Group

The rise of FinTech is thought to be the result of 3 main factors

(1) Developments in IT

Computers have become both exponentially more powerful and dramatically more affordable. It is said that the Apple iPhone 6 actually has more than ten times the processing power of "Deep Blue", the IBM super computer that defeated the world chess champion in 1997. The penetration of high-performance mobile devices such as smartphones and improvements in connectivity speed has made it easy for consumers to access a wide range of services. A vast amount of data has been generated through the use of social networking services, review sites, customer purchase history and GPS data. The ability to communicate, store and quickly analyze this data has greatly reduced the information production costs in financial services. This, along with reduced channel cost from IT advances, has lowered the barrier to entry into the industry, allowing new players such as IT ventures and other non-financial companies to expand their businesses by focusing on tapping into customer needs not covered by incumbents.

(2) Shifts in consumer behavior-patterns

The so-called “Millennial” generation of people born between the years 1980 to 2000 now makes up a third of the population of the USA. These "digital natives" are the first generation to be born in and grow up in an environment where the widespread use of digital devices and the Internet is the norm. They are highly receptive to digital services and in one survey 73% of that age-group answered that they hoped emerging companies such as Google and Amazon would provide financial services. (fig. 3) This Millennial generation is considered to be the primary users of FinTech.

(3) Reduction in competitor incumbent financial institutions' ability to provide services

The financial situation of a large number of Western financial institutions deteriorated as a result of the Global Financial Crisis stemming from the events of 2007 and the same institutions have also had to front compliance costs as they adapt to much tougher financial regulations post-crash. Restrictions on new investments and the shrinking of some areas of operations forced upon them by these changes in the environment are thought to be one of the main factors contributing to the consumer shift to FinTech.

Figure 3: What Millenials think about financial services

73%	Would be more excited about a new offering in financial services from Google, Amazon, Apple, PayPal or Square than from their own nationwide bank.
71%	Say that in 5 years, the way we pay for things will be totally different.
68%	Say that in 5 years, the way we access our money will be totally different.
53%	Don't think their bank offers anything different than other banks.
33%	Believe that they won't need a bank at all.

4 Incumbent financial institutions' FinTech initiatives

Jamie Dimon, CEO of JP Morgan Chase famously warned of the momentum and threat posed by FinTech in a 2015 letter to shareholders, addressing them with the phrase: “Silicon Valley is coming”. Incumbent financial institutions are increasingly cautious of developments in the FinTech space and are adopting two main strategic approaches to the new competitive environment.

(1) Strengthening internal IT capabilities

American investment bank Goldman Sachs has assigned around a third of its workforce to the technology department, changing the department’s position from a merely back office role to one of the core-competencies across the whole firm. JP Morgan Chase is also continuing with its efforts to hire the best digitally minded talent to create and run technology oriented financial projects.

(2) Open innovation activities

As the number of FinTech services available increases, financial institutions are increasingly looking to both internal and external innovations to bring new efficient, responsive products and services to market. For example, the UK based bank HSBC has set up a 200 million USD venture capital fund with the aim of gaining access to the ideas and know-how possessed

by FinTech firms via M&A activity and direct investment into technology ventures. Many other Western financial institutions, including UBS, are also attempting to tap into early-stage technologies through a wealth of incubation schemes, acceleration programs, and hackathons. Elsewhere, Wells Fargo has integrated "EyeVerify" biometric authentication technology, developed as part of its startup accelerator program. Instead of inputting usernames or passwords at log-in, the system verifies users by using a smartphone camera to look at the pattern of blood vessels in the whites of their eyes.

Similar initiatives are also underway at Japanese banks

At Mizuho Financial Group we are taking a pro-active approach to technology and have set up advisory committees made-up of experts in relevant fields. Our specialist FinTech department, the Incubation Project Team, is focused on the discovery of and collaboration with FinTech companies. Through our accelerator program and holding events such as hackathons we are building an international network of FinTech firms (fig. 4). For example, in May 2016 we held a hackathon "Mizuho.hack: Create a new "bank" with Pepper" to develop a banking application to use with the humanoid Pepper robots located in some of our branches. Additionally, we also have access to information about the latest Silicon Valley FinTech trends and network through our investment in a fund managed by Tokyo/Silicon Valley venture capital company WiL.

Figure 4: Main FinTech initiatives at Mizuho Financial Group

Initiative	Partner	Overview
Accelerator Program	NTT Data	Using NTT Data's "Open innovation support program" to promote global tie-ups and new business creation with Mizuho Financial Group and selected VCs.
Hackathon	Softbank Robotics etc.	Open invitation for innovative ideas and applications for Softbank's humanoid robot "Pepper" with the aim of creating new banking services.
Investment in venture capital funds	WiL	Investment in "WiL Fund I, L.P." a seed investment venture capital fund specializing in the United States and Japan
	500 Startups	Investment into "500 Startups JP, L.P." a global venture capital seed fund and startup accelerator
Private Equity	—	Creation of "Mizuho FinTech Fund" with the aim of investing in FinTech businesses
Industry-Academic Collaborations	The University of Tokyo	Support of Tokyo University's leading AI education program
Development of new services	Money Forward	Automatic invoicing, accounts receivable reconciliation and automated payroll services for mainly SMEs
	Moneytree	Provides "Lifetime financial record by Moneytree" service offering unlimited access to statement of account activity accessible via smartphone

Compiled by: Mizuho Financial Group

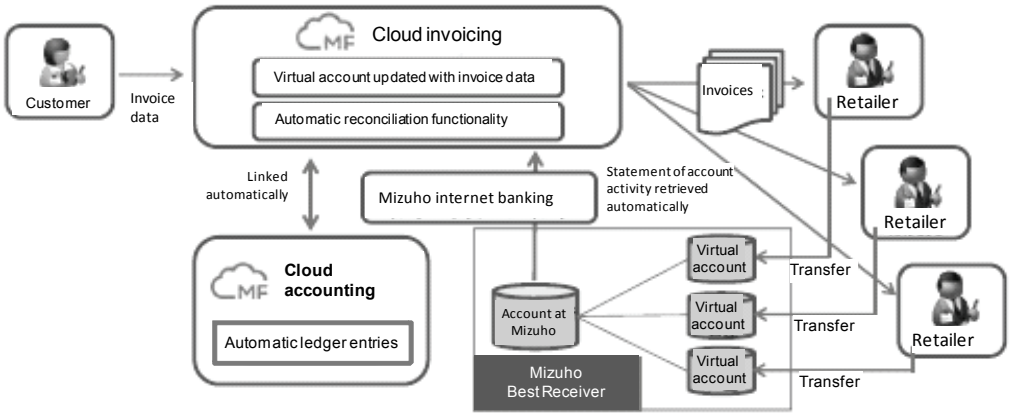
Automatic invoice and accounts receivable reconciliation for corporate customers is an example of a service created in collaboration with a FinTech company, "MoneyForward" (fig 5.). Mizuho Financial Group provides a cash management system to provide major and small-medium enterprises with solutions to their complex payment needs. Meanwhile, MoneyForward uses account aggregation technology to provide cloud account management software to mainly SMEs. By combining the two companies' services, ordinarily time-consuming accounting tasks from invoice creation all the way to reconciliation of accounts receivables can be automated, greatly improving administrative processing for SMEs. Both

companies have also started payroll automation services.

Not only megabanks, but regional banks are also stepping up FinTech efforts. Regional banks, after a round of cost-cutting through synergizing system infrastructure, are now focusing on strengthening IT investments with the aim of increasing revenue. For example, The Toho Bank, Ltd., headquartered in Fukushima prefecture, has begun to offer an automated inheritance consultation telephone service available 24 hours a day, 365 days a year. Another bank, Fukuoka Financial Group (headquartered in Fukuoka prefecture) is also stepping up its efforts with initiatives such as holding a business contest using IT and the establishment of a new financial services platform, "iBank".

Figure 5: Automatic invoice and accounts receivable reconciliation support service for corporate customers

a collaboration between Mizuho Bank and Money Forward



Source: Created by Mizuho Bank, Ltd.

5 FinTech initiatives by public sector organizations

These kinds of initiatives can be broadly split into two kinds.

1. Changes to financial regulatory framework to adapt to developments in advancements in IT

Developments in IT are revolutionizing financial services, but regulators have not always been able to keep up with these fast-paced changes. Countries are now working to put together legislation that protects consumers, ensures information security and keeps the financial system stable while at the same time enabling companies to provide highly convenient services.

2. Government backed advice, financial support and training for entrepeneurs with the aim of supporting their entry into the local FinTech market

Governments are also providing a kind of regulatory sandbox, a controlled environment outside of the current regulatory framework for companies to trial experimental services.

It is hoped that by creating an environment conducive to continuous innovation in financial services they will increase the competitiveness of their respective financial sectors, thereby stimulating the economy and creating jobs.

Initiatives worldwide

The United Kingdom is one country that is focusing on FinTech initiatives. In 2014 the FCA launched Project Innovate. This is a support framework designed to "promote competition through disruptive innovation" and to "encourage innovation in the interest of consumers" in the financial sector. "Project Innovate" gives businesses a dialogue with regulators, providing various types of support. This includes modification of regulatory barriers to innovation and allowing participants to see how legislation could affect potential projects. In its first year the project has helped more than 175 innovative businesses, five of which have now been authorized to undertake regulated activities.

Among the initiatives of the FCA, the Regulatory Sandbox, a progressive approach to promoting market entry of FinTech businesses and fostering competition in financial services has recently been gaining lots of attention. The Regulatory Sandbox aims to create a safe space in which businesses can test innovative services in a live environment without immediately incurring all the normal regulatory consequences of engaging in the activity in question. In 2015 these initiatives contributed to 6.6 billion pounds in profit and the creation of 60,000 jobs in FinTech in the United Kingdom.

In 2015 the Monetary Authority of Singapore (MAS) announced it would be supporting the growth of the use of technology in finance by spending 225 million Singapore dollars over five years on a Financial Sector Technology & Innovation program to create a FinTech friendly ecosystem. Additionally, it also set up the FinTech & Innovation Group (FTIG), a specialist division to propel the use of technology and innovation in the financial sector and the FinTech Office, a one-stop platform for FinTech needs jointly operated by the National Research Foundation (NRF) in 2016.

In the USA, the biggest market for FinTech, innovation initiatives are also underway. In March 2016, the financial regulatory authority, the Office of the Comptroller of the Currency (OCC), released a white-paper that expressed its views on "responsible innovation" and asked for comments from a wide range of associated parties. The OCC has been clear in stating that it aims to create supervisory systems and a regulatory framework that is supportive of "responsible innovation". It has done this by "formulating eight principles to guide the development of its framework for understanding and evaluating innovative products, services, and processes that OCC-regulated banks may offer or perform".

Figure 6: The eight guiding principles of the OCC

1. Support responsible innovation
2. Foster an internal culture receptive to responsible innovation
3. Leverage agency experience & expertise
4. Encourage responsible innovation that provides fair access to financial services and fair treatment of consumers
5. Further safe and sound operations through effective risk management
6. Encourage banks of all sizes to integrate responsible innovation into their strategic planning
7. Promote ongoing dialogue through formal outreach
8. Collaborate with other regulators

Source: OCC publication, compiled by Mizuho Financial Group

There is also international co-operation in FinTech. For example, in 2016 the United Kingdom established FinTech

Bridge, an information sharing co-operative agreement with Singapore and the Republic of Korea. Going forward, the FCA, MAS and South Korea's Financial Services Commission (FSC) will exchange ideas and information under the agreement with the aim of making it easier for FinTech businesses to develop in each other's countries.

Initiatives in Japan

In Japan, recent negative interest rate policies have only added to the difficulties already faced by financial institutions in the long-term low interest environment of the country. It is hoped that the use of FinTech will improve efficiency and sophistication of financial services.

To this end, public FinTech initiatives are now underway: In December 2015 the Financial Services Agency (FSA) set up a FinTech support desk to provide a one-stop location for consultation and information exchange related to FinTech. Innovative startups and entities considering the field can use the platform to consult with regulators about financial regulations and receive advice. The FSA, Ministry of Economy, Trade and Industry (METI) and Bank of Japan (BOJ) each have their own FinTech initiatives.

Regulatory efforts are also underway. An amendment to Japanese Banking law *Amendment to the Banking Act, Etc. in Response to Changes in Technological Environment through the Advancement of Information Communication Technology (Jouhou Tsushin Gijutsu no Shintentou no Kankyou Henka ni Taiou Suru Tame no Ginkouhou no Ichibu wo Kaisei Suru Houritsu)* was passed.

The amendment relates to FinTech because it relaxes regulations limiting banking groups from investing in finance-related IT companies and sets forth procedures for consumer protection infrastructure and measures to prevent money laundering (AML) and the financing of terrorism (CFT). This will pave the way for further revisions to governmental and ministerial ordinances and supervision guidelines.

(1) Relaxation of regulations limiting investment into finance related IT companies by banking groups

The financial regulation framework in Japan is based on traditional banking practices and in order to keep banks focused on their core business as well as to avoid other business risks, it limits operations to those defined in banking law. In principle, this prohibits them from engaging in non-banking activities. In business areas outside of those listed there are limitations in the percentage of the voting rights of a non-bank company they are permitted to hold. These limits are 5 percent (for banks and their subsidiaries) and 15 percent (for bank holding companies and their subsidiaries). This has made it difficult for banking groups to hold an IT company as part of their group, even if they intend to utilize it in the field of finance. This means that the results of innovative technological developments are not always visible in the sector.

However, legislators have acknowledged that banking groups need to strategically adapt and prepare for the future potential of FinTech. This amendment relaxes regulations by permitting them, subject to approval by the Financial Services Agency, to freely invest in finance related IT companies, provided that they engage in business that contribues to the sophistication of the industry or an improvement in convenience for end users.

(2) Rules pertaining to the prevention of money laundering, the financing of terrorism and consumer protection in relation to virtual currency

Virtual currency based transfers are quick, easy and the parties involved are anonymous, making them appealing to criminals and flagging it up for AML and CFT risks internationally. Additionally, in 2014, when the then largest virtual currency exchange in the world filed for bankruptcy it became clear that there were great discrepancies between the amount of virtual currency held and the amount actually taken in deposits from customers. This was followed by calls to implement consumer protection systems.

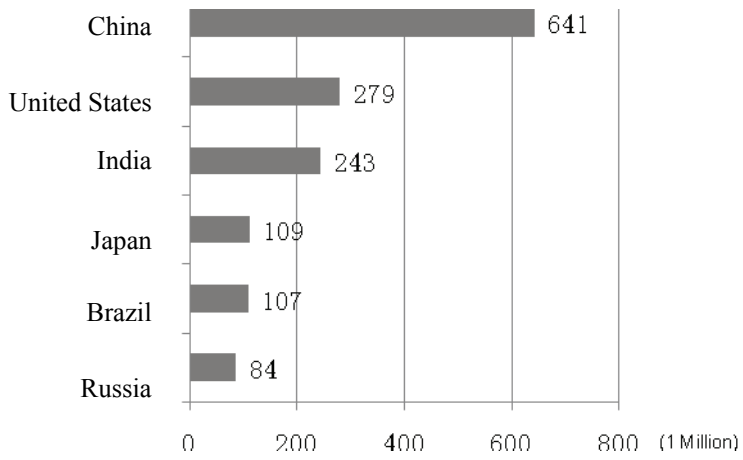
The abovementioned amendment first defines "virtual currency" and then introduces a requirement for businesses involved in the exchange of virtual and fiat currencies to be registered with the authorities thereby strengthening AML/CFT and consumer protection.

6. The rapid spread of Internet finance in China and further promotion thereof

The rapid spread of Internet finance in China

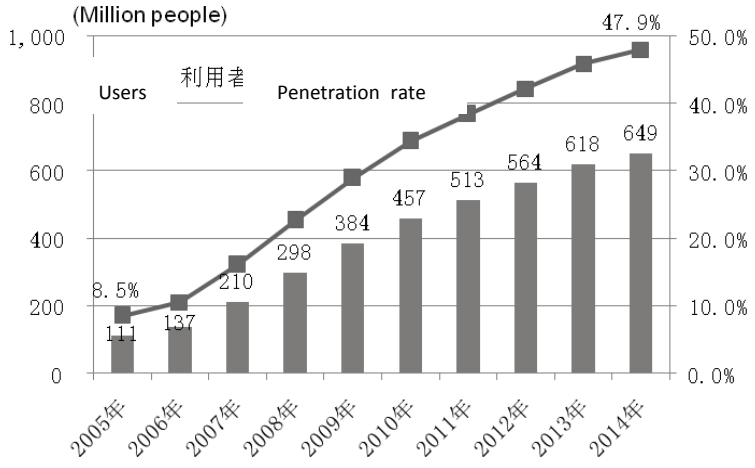
In 2014 China's Internet population reached 649 million accounting for roughly 20% of the world's users (2014 estimate fig. 7), and this provides the foundations for the development of Internet finance in the country.

Figure 7: Number of Internet users by country (2014)



Source: Taken from respective companies publications, compiled by Mizuho Financial Group

Figure 8: The scale of Chinese internet users and penetration rate



Source: wdzj.com, compiled by Mizuho Financial Group

McKinsey&Company estimates that by the end of 2015 the size of the Internet finance economy in China was 12-15 trillion renminbi, making it already one of the largest in the world[1]. The number of users is 500 million, the top worldwide.

Guiding Ideas for the Promotion of Internet Finance, a piece jointly published by the People's Bank of China and ten other parties in July 2015 breaks Internet finance into seven distinct segments:

1. Internet payments
2. P2P lending
3. Crowd funding
4. Sales of "Wealth management products"
5. Internet insurance
6. Internet trust banking
7. Internet consumer finance

Of these, "Internet payments" has the greatest market share. McKinsey&Company estimates the value of this segment at 11.7 trillion renminbi. The next most valuable segments are the sale of so-called "wealth management products" via the internet (0.61 trillion renminbi) and "financing", a segment that includes P2P lending (also 0.61 trillion renminbi). These figures show that the country is already a world-leader in the field.

Chinese government targeting further development in Internet finance

The above all show that the scale of Internet finance is already expanding at a fast rate and the government stands ready

[1]. *McKinsey&Company, Disruption and Connection: Cracking the Myths of China Internet Finance Innovation, July 2016*

to propel developments even further. The government has already shown that it is serious about the development of Internet finance by outlining its stance in a five year plan for the field detailed in the October 2015 document, *Proposal on Formulating the Thirteenth Five-Year Plan (2016-2020) on National Economic and Social Development*. The *Internet Plus* action plan and *Guiding Ideas to Promote the Development of Internet Finance* (both released in July 2015) set forth a course for adapting infrastructure to match the growth of Internet finance.

A Chongqing *Internet Plus* action plan is also in place and outlines the city's plan to focus on enhancing the Internet finance space.

7 Proposal for the future of Internet finance in Chongqing:

Creating an environment that promotes continuous creation and provision of innovative businesses in financial services through Internet finance will not only contribute to greater convenience for end-users, but also increase competitivity of the financial sector and stimulate the economy as a whole. From the examples we have looked at it is clear that these are the reasons many cities and countries are putting so much effort into attracting FinTech businesses.

We believe that attracting these companies and how they fit into the overall development of the city will be an important issue for Chongqing and that how the city uses its FinTech friendly ecosystem to differentiate itself from others will be crucial in maintaining competitive advantage. Below we reference the various examples covered to offer our proposal for city:

(1) Create an environment to foster Internet finance and attract businesses

The examples discussed in this essay show that targeted, proactive government policies are essential in the development of a thriving FinTech sector and in order to attract new businesses. Across the country, cities like Shanghai and Beijing have all announced policies aimed at luring Internet finance businesses to their respective areas. This is likely evidence of the assumed importance of the sector in establishing a compeititive advantage over other jurisdictions.

Regarding ecosystem infrastructure, we recommend the government show a strong commitment to schemes similar to those discussed by: 1.) Supporting startups through regulatory initiatives such as the Regulatory Sandbox (United Kingdom) and Fintech support desk (Japan). 2.) Provide financial aid such as rent subsidies for related businesses (Beijing, Shanghai).

(2) Foster an appropriate balance of competition and collaboration between incumbent financial institutions and new market entries

Creating an environment that promotes an appropriate balance of competition and collaboration between incumbent financial institutions and new market entries is important in the timely development of a healthy financial sector. In order to provide more sophisticated financial services Mizuho Financial Group and many Western financial institutions are aggressively pursuing tie-ups and collaborations with FinTech companies. However, when financial institutions provide similar services as FinTech businesses, or acquire technologies through direct investment or buyouts, they often face existing regulatory barriers. If regulations are too extreme against only incumbent financial institutions it will not only result in a decrease in the competitiveness of the affected institutions, but could also be detrimental for innovation in financial services. Countries like the United States and Japan are working to create an environment that promotes the appropriate level of

competition and collaboration between FinTech firms and financial institutions. We feel that an environment that promotes the mutual development of incumbent institutions and new market entries is essential for the creation of superior financial services.

(3) Consumer protection and maintaining the stability of the financial system

Consumer protection and maintaining the stability of the financial system are also both key issues. In *Guiding Ideas to Promote the Development of Internet Finance*, the Chinese government states that it intends to apply an appropriate level of supervision and management so as not to hinder the enhancement of Internet finance. Relevant governmental departments have announced regulations in the payment and lending fields and called for public comments and suggestions on the matter. They have also begun to investigate and deal with companies that do not conform. Nevertheless, FinTech is a young field, not only in China, but across the globe, and the pace of change is striking. Governments and financial regulatory authorities are considering how best to deal with FinTech. Their task is to quickly put together supervisory and regulatory frameworks that maintain the stability of the financial system and protect consumers, while at the same time allowing for the creation and enhancement of highly convenient financial services.

Across the world official bodies such as regulatory authorities, specialist departments, and advisory councils are all in ongoing discussions with FinTech businesses. These discussions form part of a wider initiative aimed at understanding and assessing innovative products and services in order to create relevant regulatory frameworks.

The goal is to build a system that, after evaluating the possible effects of innovative financial services on consumer protection and the stability of the wider financial system, promotes debate on the role of regulation and supervision through working with and engaging in information sharing with FinTech companies. Because FinTech is a global phenomenon, we believe that cross-border co-operation with foreign official agencies is also an effective way to approach the issue. As mentioned beforehand, Mizuho Financial Group is currently utilizing FinTech in a number of different initiatives, and we would be delighted if this knowledge and expertise could contribute to the development of Chongqing.

U-Air: When Urban Air Quality Inference Meets Big Data

Philippe Rogge

Microsoft Vice President, Chief Operating Officer, China

ABSTRACT

Information about urban air quality, e.g., the concentration of $PM_{2.5}$, is of great importance to protect human health and control air pollution. While there are limited air-quality-monitor-stations in a city, air quality varies in urban spaces non-linearly and depends on multiple factors, such as meteorology, traffic volume, and land uses. In this paper, we infer the real-time and finegrained air quality information throughout a city, based on the (historical and real-time) air quality data reported by existing monitor stations and a variety of data sources we observed in the city, such as meteorology, traffic flow, human mobility, structure of road networks, and point of interests (POIs). We propose a semi-supervised learning approach based on a co-training framework that consists of two separated classifiers. One is a spatial classifier based on an artificial neural network (ANN), which takes spatially-related features (e.g., the density of POIs and length of highways) as input to model the spatial correlation between air qualities of different locations. The other is a

temporal classifier based on a linear-chain conditional random field (CRF), involving temporally-related features (e.g., traffic and meteorology) to model the temporal dependency of air quality in a location. We evaluated our approach with extensive experiments based on five real data sources obtained in Beijing and Shanghai. The results show the advantages of our method over four categories of baselines, including linear/Gaussian interpolations, classical dispersion models, well-known classification models like decision tree and CRF, and ANN.

Categories and Subject Descriptors

H.2.8 [Database Management]: Database Applications - data mining, Spatial databases and GIS;

General Terms

Algorithms, Management, Experimentation

Keywords

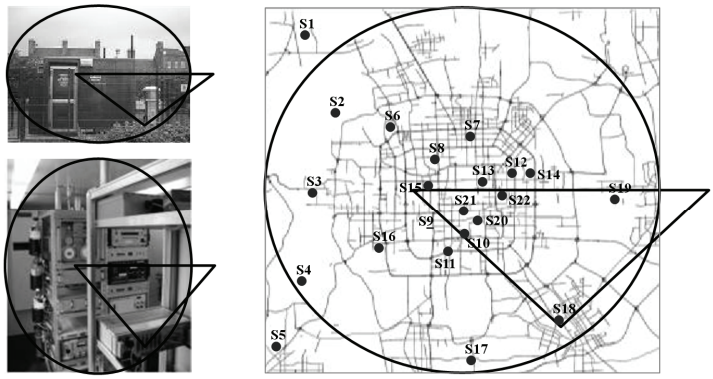
Air quality, city dynamics, human mobility, spatial trajectories.

1 INTRODUCTION

Real-time air quality information, such as the concentration of NO_2, $PM_{2.5}$, and PM_{10}, is of great importance to support air pollution control and protect humans from damage by air pollution. In reality, however, there are insufficient air quality measurement stations in a city due to the expensive cost of building and maintaining such a station. As demonstrated in Figure 1 A), an air quality monitor station usually needs a certain size of land, non-trivial money (about 200,000 USD for construction and 30,000 USD per year for maintenance), and human resources to regularly take care of it. As a result, for

KDD'13, August 11–14, 2013, Chicago, Illinois, USA.

instance, Beijing only has 22 stations covering a 50×50km land(113km^2/per station), as illustrated in Figure 1 B).



A) Configuration of a station **B) Air quality measurement stations in Beijing**

Figure 1. Examples of air quality monitor stations

Unfortunately, urban air quality varies by locations non-linearly and depends on multiple factors, such as meteorology, traffic, land use, and urban structures. As depicted in Figure 2 A), the air quality indices (AQIs) reported by stations S_{12} and S_{13} are quite different at 11am on 3/27/2013, though they are geospatially close (about 3km away). As shown in Figure 2 B), the phenomenon is not a coincidence according to the distribution of the deviation between the $PM_{2.5}$ of the two stations reported at the same time of day (from Feb. 8 to May 27, 2013). Over 37 percent of the cases have a deviation greater than 100. Figure 2 C) further shows the mean deviation among the 22 stations in Beijing, changing over time of day. Figure 2 D) presents the distribution of the deviation among these 22 stations cross 3 months. All these results well demonstrate the skew of air quality in urban spaces.

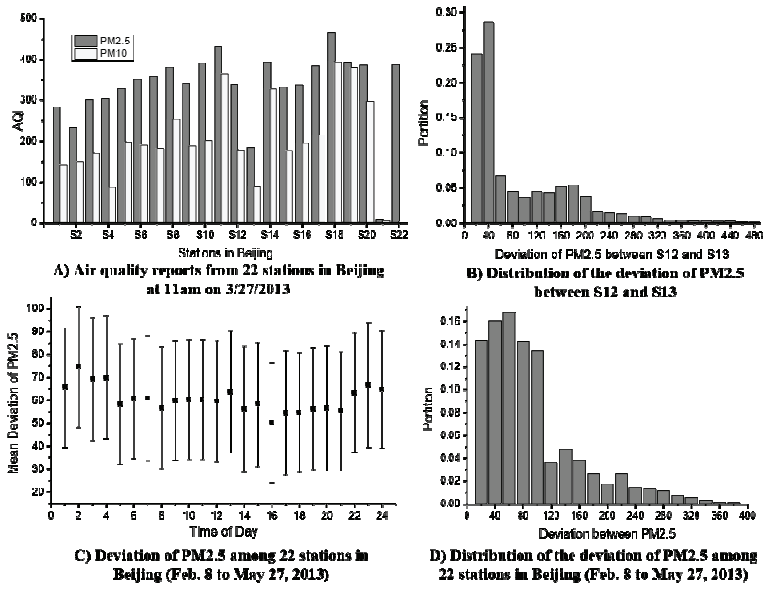


Figure 2. The difference between AQIs from different stations

In this paper, we infer the real-time and fine-grained air quality information throughout a city using (historical and real-time) air quality data reported by a limited number of existing monitor stations and a variety of data sets we observed in the city, such as meteorology, traffic flow, human mobility, structure of road networks, and POIs. Although environment scientists have been proposing models to approximate the relation between air quality and some factors like traffic and wind, these models are usually based on empirical assumptions and parameters that may not be applicable to all urban environments [9] (detailed in the related work section). The methodology based on crowd and participatory sensing (e.g., using sensor-equipped mobile phones) could work for a very few kinds of gas like CO_2 but not applicable to aerosols and other pollutants, such as $PM_{2.5}$, PM_{10}, and NO_2. The devices for detecting the latter pollutants are not easily portable and usually need a relatively long sensing period (e.g., 1~2hours) before generating an accurate AQI.

Recently, big data reflecting city dynamics have become widely available [11][14], e.g., traffic flow, human mobility, and meteorology, enabling us to solve this challenging problem from a data perspective. According to existing studies [9], these data have a strong correlation with air qualities (detailed in Section 3). Using machine learning and data mining techniques, we build a network between air quality labels and features observed across multiple heterogeneous data sources. Figure 3 A) shows an example (Sept. 19, 2012 1pm in Beijing) of the results inferred by our method (U-Air), demonstrating the advantage beyond linearinterpolation, as depicted in Figure 3 B). To verify the validity of our method, we first *remove* two stations (S_1 and S_2) from Beijing (marked with two boxes) and predict the AQIs of the two with the rest of stations (denoted by gray points). The reports of the two stations are then employed as a ground truth (S_1=M, S_2=G) to evaluate the prediction (refer to Table 1 for the semantic meanings of the colors and AQI descriptors). Clearly, our method well reflects the ground truth, while linear interpolation generated incorrect results S_1=S_2=U-S). The result also indicates another story. Besides providing accurate information of air quality, the research reported here can also suggest a location to setup a monitor station, where the inference of U-Air always differs from that of linear interpolation.

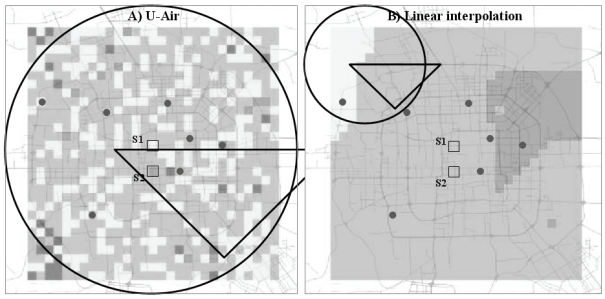


Figure 3. Results of PM10 generated by different methods

The challenges of our approach lie in three aspects. The first is to identify discriminative features from a variety of data sources. The second one is how to incorporate heterogeneous features into a data analytics model effectively. Equally treating these features does not work well. Third, the labeled data is insufficient though we have many observations represented by big data. While having many places to infer, only a few stations generate training data. The contribution of this paper lies in the following three aspects:

- We propose a co-training-based semi-supervised learning approach, which leverages unlabeled data to improve the inference accuracy. Additionally, the approach consists of two classifiers respectively modeling the spatial and temporal factors that influence air qualities.
- We identify spatially-related (such as POIs, road networks, and distance to an existing station) and temporally-related features (e.g., humidity, temperature, and traffic flow), contributing to not only our application but also the general problem of air quality inference. Moreover, instead of treating these features equally, we feed them into the corresponding classifier in the co-training framework, therefore, leading to a high inference accuracy.
- We evaluated our approach using 5 data sources consisting of the POIs, road networks, meteorological data, and air quality records of Beijing and Shanghai, and the GPS trajectories generated by over 30,000 taxis in Beijing, justifying the advantages of our approach over 4 baselines.

2 OVERVIEW

2.1 Preliminary

Definition 1*: Air quality index*. AQI is a number used by government agencies to communicate to the public how polluted the air is currently. As the AQI increases, an increasingly large percentage of the population is likely to experience increasingly severe adverse health effects. To compute the AQI requires an air pollutant concentration from a monitor or model. The function used to convert from air pollutant concentration to AQI varies by pollutants, and is different in different countries. Air quality index values are divided into ranges, and each range is assigned a descriptor and a color code. In this paper, we use the standard issued by United States Environmental Protection Agency, as shown in Table 1. The descriptor of each AQI level is regarded as the class to be inferred, i.e.,$\mathbb{C}$={*G, M, U-S, U, V-U, H*}, and the color is employed in the following visualization figures.

Table 1 AQI values, descriptors, and color codes

AQI	Values Levels of Health Concern	Colors
0-50	Good (G)	Green
51-100	Moderate (M)	Yellow
101-150	Unhealthy for sensitive groups (U-S)	Orange
151-200	Unhealthy (U)	Red
201-300	Very unhealthy (VU)	Purple
301-500	Hazardous (H)	Maroon

Definition 2: *Trajectory*. A spatial *trajectory* τ is a sequence of time-ordered spatial points, $\tau: p_1 \rightarrow p_2 \rightarrow \cdots \rightarrow p_n$, where each point has a geospatial coordinate set and a timestamp, $p = (l, t)$.

Definition 3: *POI*. A point of interest POI is a venue (like a school and shopping mall) in the physical world, having a name, address, coordinates, category, and other attributes.

Definition 4: *Road Network*. A road network RN is comprised of a set of road segments $\{r\}$ connected among each other in a format of graph. Each road segment r is a directed edge having two terminal points, a list of intermediate points describing the segment, a length $r.len$, and a level $r.lev$ denoting its capacity.

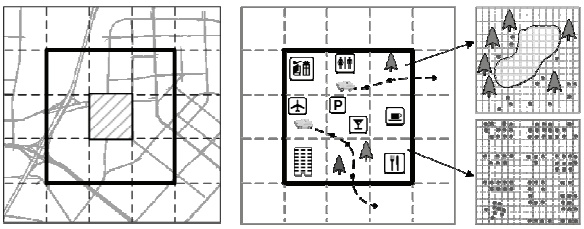


Figure 4. Illustration of grid, affecting region, POI, and trajectory

Definition 5: *Grid and Affecting Region*. We divide a city into disjointed grids (e.g., 1km×1km in the experiments) as illustrated in Figure 4 A), assuming the air quality in a grid g is uniform (while different grids may have different results). Each g has a geospatial coordinate $g.loc$ and a set of AQI labels $g.Q = \{q_1, q_2, \ldots, q_k\}$ to be inferred or already associated if having an air quality monitor station located. Here, k denotes the type of pollutants, and $q_k \in C$ (defined in Table 1) means the AQI label of the *k*-th type of pollutant, such as PM_{10}. We believe the air quality of a grid (filled by slashes in Figure 4 A)) would be influenced by the data (e.g., trajectories and POIs) observed in the *affecting region* $g.R$ that consists of the grid and its eight neighbor grids, as shown in Figure 4 B).

2.2 Framework

As shown in Figure 5, our framework consists of two major parts, offline learning and online inference, which generate three kinds of data flows: preprocessing, inference, and learning data flows.

Preprocessing data flow: In this flow (denoted by dotted black arrows), we receive spatial trajectories generated by vehicles (taxicabs in the experiments) and map each trajectory onto a road network using a map-matching algorithm [12]. The mapped data is then stored in a trajectory database for offline learning and also geo-indexed to improve the efficiency of

online inference.

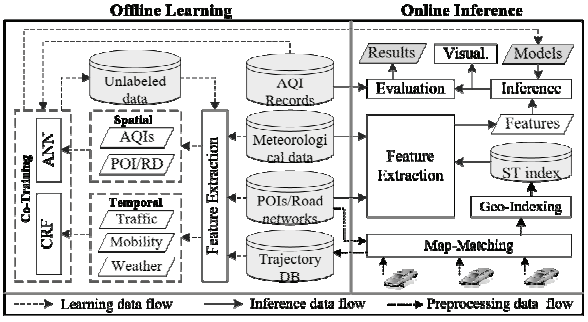


Figure 5. Framework of our system

Learning data flow: In this data flow (represented by broken blue arrows), we first extract features for each grid from a variety of data observed in its affecting region. In terms of spatio-temporal properties, these features can be categorized into two sets. One set is temporally-related (i.e., the value of the features vary with time), such as temperature, humidity, and average speed of vehicles, which are extracted from meteorological data and the spatial trajectories. The other feature set is only spatially-related, e.g., the density of POIs and the length of roads in a region, extracted from POI and road network databases. See Section 3 for details.

If an air quality monitor station is located in a grid, the grid is labeled by the AQIs reported from the station. The features extracted from the data observed in the affecting region of such a grid and the corresponding labels formulate a training set. As we only have a few air quality stations in a city while there are many places to infer, the data with labels are very few. To address this issue, we propose a semi-supervised learning approach based on co-training, where unlabeled data are used to improve the inference accuracy. Two separate classifiers are first trained respectively based on the labeled data using two separated feature sets. One is a temporal classifier (*TC*) based on a linear-chain conditional random field (CRF), which uses temporally-related features to estimate the temporal transformation of air quality in a

location. The other is an artificial neural network (ANN)-based spatial classifier (*SC*) that uses spatially-related features to model the spatial correlations between air qualities of different locations. The AQIs reported by existing stations are also employed as an input in the *SC*. As different air pollutants (e.g., NO_2 and PM_{10}) are influenced by these factors differently, we build an individual model for each kind of pollutant, as detailed in Section 4.

Inference data flow: In this flow (denoted as the red solid arrows), we calculate the features for each grid based on the data observed in the grid's affecting region. While the spatially-related features like distribution of POIs can be calculated offline, the temporallyrelated features are computed online; e.g., the traffic-related features are extracted based on the spatio-temporal (ST)-index built in the preprocessing flow. For each grid, we respectively feed the spatially-related features into the *SC* and temporallyrelated features into *TC*, generating two probability scores. By multiplying the two scores, we can select the most possible class as a label. As monitor stations usually update the reports every hour, we conduct the inference every hour. Detailed in Section 4.

Problem statement

Given a collection of grids$G = G_1 \cup G_2 = \{g_1, g_2, \ldots, g_n\}$, where

$g.Q$ ($g \in G_1$) is known and $g'.Q$ is unobserved ($g' \in G_2$),

$|G_1| \ll |G_2|$, a road network RN crossing G, POIs located in G, a trajectory dataset Tr passing G, and meteorological data of G, we aim to infer $g'.Q$, at periodic intervals, e.g., every 1 hour.

3 FEATURE EXTRACTION

3.1 Meteorological Features: F_m

The concentration of air pollutants is influenced by meteorology. Accordingly, we identify five features: temperature, humidity, barometer pressure, wind speed, and weather (such as cloudy, foggy, rainy, sunny, and snowy). Figure 6 shows the correlation matrix between the AQI of PM_{10} and the first four features, using the data we collected from August to Dec. 2012 in Beijing, where each row/column denotes one feature and a plot means the AQI label of a location. Apparently, a high wind speed disperses the concentration of PM_{10}, and high humidity usually causes a high concentration. A high pressure would result in a good AQI. The impact of temperature is not very clear, but, a good AQI is more likely when temperature is high and humidity is low, or when pressure is high and temperate is low. In short, these features are very discriminative in AQI inferences.

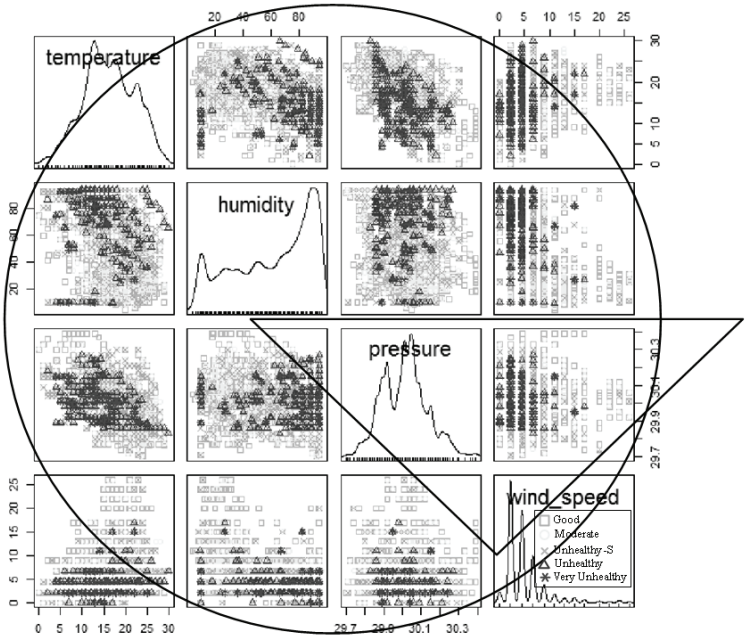


Figure 6. Correlation matrix betweenFwand PM10

3.2 Traffic-Related Features: F_t

It is widely believed that traffic flow is one of the major sources generating air pollutants that could damage air quality [9], though researchers are still exploring the specific correlation. Here, we identify the following three features for each grid. These features are calculated from the spatial trajectories of vehicles traversing the grid in the past hour:

1) Expectation of speeds: $E(V)$. Given a spatial trajectory generated by a vehicle, we retrieve the points that fall in the affecting region of each gird (let us say$p.l \in g.R$). We calculate the distance between any two consecutive points, then compute the speed of each vehicle at each point according to Equation 1. As the sampling rate of each GPS device is different, we calculate the expectation of speed w.r.t. time as Equation 2, which denotes the overall travel speed of vehicles in $g.R$.

$$p_i.v = \frac{Dist(p_i.l, p_{i+1}.l)}{|p_{i+1}.t - p_i.t|}, \quad (1)$$

$$E(v) = \frac{\sum_{p_i.l \in g.R} p_i.v \times |p_{i+1}.t - p_i.t|}{\sum_{p_i.l \in g.R} |p_{i+1}.t - p_i.t|}, \quad (2)$$

2) Standard deviation of speeds: $D(v)$. We calculate the feature according to Equation 3, which reflects how variably different vehicles were traveling in $g.R$ in the past hour. Similar to Equation 2, it is normalized based on time.

$$D(v) = \sqrt{\frac{\sum_{p_i.l \in g.R} [p_i.v - E(v)]^2 \times |p_{i+1}.t - p_i.t|}{\sum_{p_i.l \in g.R} |p_{i+1}.t - p_i.t|}}. \quad (3)$$

3) The distribution of speeds:$P(v)$. We employ a widely-used empirical setting to discretize the speed into three intervals (i.e., $0 \leq v < 20$, $20 \leq v < 40$, and $v \geq 40$), calculating the distribution of speeds over the three intervals in terms of Equation 4.

$$P(v_1 \leq v < v_2) = \frac{\sum_{p_j.l \in g.R \wedge v_1 \leq p_j.v < v_2} |p_{j+1}.t - p_j.t|}{\sum_{p_i.l \in g.R} |p_{i+1}.t - p_i.t|} \quad (4)$$

Figure 7 shows the correlation matrix between the aforementioned traffic features F_t and NO_2, where each row/column still denotes one feature and a plot denotes the AQI of a grid. Here,Ft is extracted from a GPS trajectory dataset generated by over 30,000 taxicabs. As taxis generate about 20% of traffic flow on road surfaces of Beijing [14], the dataset is big enough to represent the traffic patterns there. Additionally, GPS-equipped taxis can be regarded as mobile sensors probing the travel speed of each road. As a result, the features w.r.t. speeds are reliable [13].

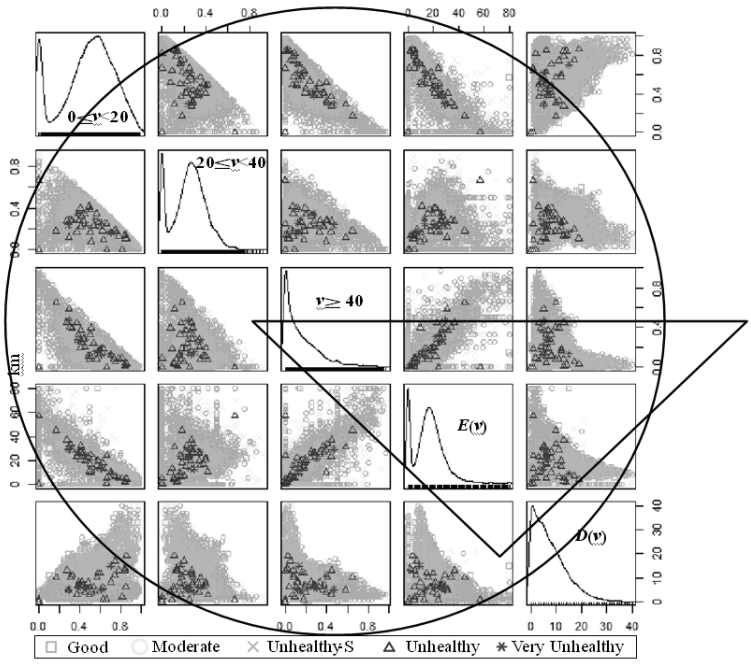


Figure 7. Correlation matrix between traffic features and NO2

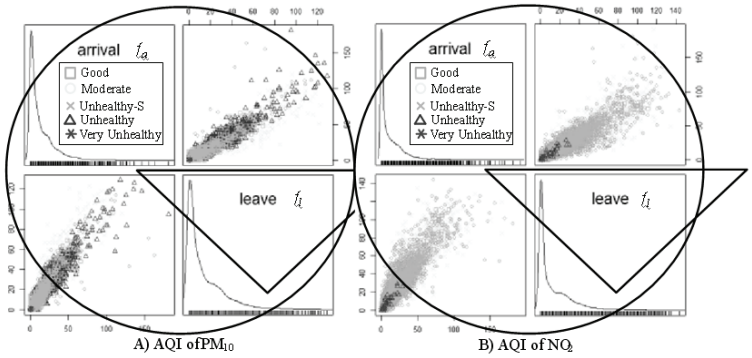
Clearly, the more vehicles traveling with a speed smaller than 20km/h, i.e., when $P(0 \leq v < 20)$ becomes larger, more instances of unhealthy and very unhealthy occurred. On the contrary, the larger $P(v > 40)$ is the better AQI would be (e.g., see the sub chart on the first row and the third column).This is very intuitive to understand given the fact that more air pollutants would be issued by a vehicle when traveling in a traffic jam, i.e., the gasoline would not be burned efficiently. A surprising discovery is that a bigger $D(v)$ indicates a better air quality while a smaller one has a very high probability of resulting in a worse AQI of NO_2, as depicted in the fifth column of Figure 7. It is actually very reasonable if we consider the speed limitation of different road segments. If there is no traffic jam, vehicles should travel with quite different speeds on different roads, e.g., vehicles traveling on highways (with a speed limitation of 120km/h) should move much faster than those on a local street (usually with a speed limitation of 40km/h). As a grid could contain road segments of different speed limitations, $D(v)$ tends to be large when the traffic condition in the grid is not bad. On the contrary, every vehicle has to move very slowly in a traffic jam, leading to a small $D(v)$. The results well matches the commonsense that traffic jams cause much heavier air pollution than normal traffic conditions.

3.3 Human Mobility Features: F_h

$F_h$is comprised of two features, denoting the number of people arriving at (f_a) and departing from (f_l) a grid's affecting region $g.R$ in the past hour. In practice, people themselves are not major air-pollutant-generators. Human mobility, however, implies useful information, such as land use of a location, traffic flow, and function of a region (like residential or business areas) [11], which could contribute to air quality inference. In the experiment, we extract the two features from the aforementioned taxi trajectories because the data tell the pickup and drop off points of each trip. The feature can actually be extracted from other data sources or a combination of multiple datasets, like mobile phone signal.

Figure 8 shows the correlation between AQIs and the human mobility features. Apparently, the concentration of PM_{10} in a grid g becomes denser when the number of people arriving at and

departing from $g.R$ increases. When f_a and f_l becomes very small, however, there might be two results. One is a very good AQI; the other is very unhealthy. Both results actually make sense, as these places may have nature parks (good) or factories (unhealthy) with very few people traveling to.



A) AQI ofPM_{10} B) AQI of NO_2

Figure 8. The correlation between AQIs and human mobility

While the traffic-related and human mobility features are calculated online, the feature extraction is very time-consuming.

To address this issue, we build a ST-index between grids and the trajectories [5], as illustrated in Figure 9, where each grid is associated with two first-in-first-out lists respectively storing the taxi IDs traversing a grid and the pickup/drop-off points falling in the grid in the past hour. The two lists are sorted by arriving time and pickup/drop-off time respectively, and the trajectory data of a taxi is connected to the taxi ID by a hash table. Given an affecting region consisting of 9 grids (refer to Figure 4 as an example), we merge the taxi IDs falling in these grids by checking the sorted list.

We can then quickly retrieve the point data falling in the time interval from each trajectory by searching for the hash table.

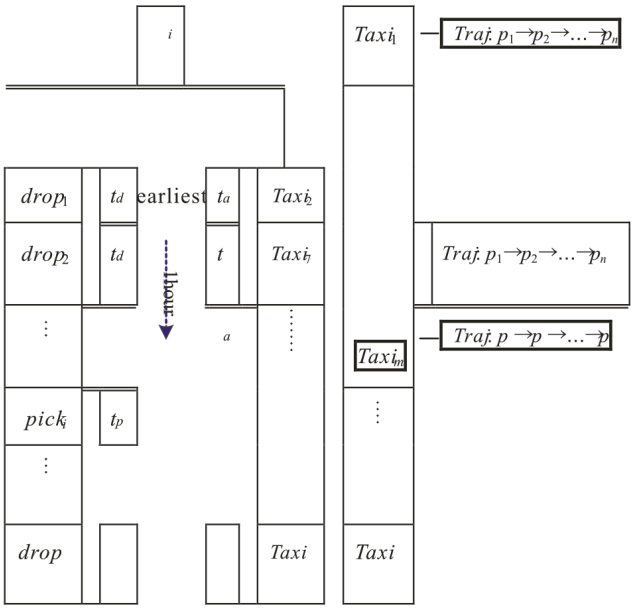


Figure 9. ST-index between grids and trajectories.

3.4 Road-network-related features: F_r

The structure of a road network has a strong correlation with its traffic patterns, therefore providing a good complement to traffic modeling. As demonstrated in Figure 4 A), we identify the following three features for each grid based on a road network database: 1) total length of highwaysf_h, 2) total length of other (low-level) road segmentsf_r, and 3) the number of intersections f_s in the grid's affecting region. Figure 10 presents the portion of instances with different AQI classes (NO_2) changing overf_h and

f_r, by analyzing the data we collected in Beijing. The increase of road segments in a region significantly brings down the portion of *good* instances, enhancing the presence of *U-Sand beyond* instances. We however did not see the phenomenon w.r.t. highways. We could say highways are relatively greener than other road segments in terms of generating air pollutants (as it

does not usually contain traffic lights). This is also the reason why we need to separate f_h from f_r.

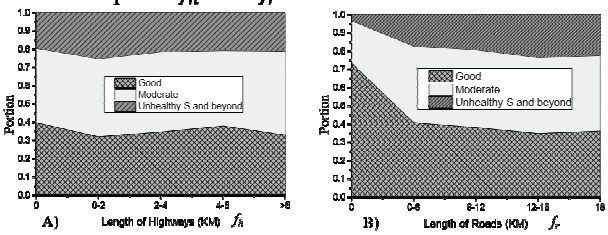


Figure 10. AQI of NO2 changing over f_h and f_r

3.5 POI-related features: F_p

The category of POIs and their density in a region indicate the land use and the function of the region as well as the traffic patterns in the region, therefore contributing to the air quality inference of the region. Some POI category may even have direct causal relation with air quality. For example, if a region has some chemical factories, its air quality tends to be bad. A park, however, usually leads to a good air quality. Accordingly, we identify the following three features for each grid:

1) The number of POIs in some categories in $g.R.f_n$. We count the number of POIs belonging to the categories shown in Table 3.

Table 3. Category of POIs we studied

C_1: Vehicle Services (gas stations, repair)	C_7: Sports
C_2: Transportation spots	C_8: Parks
C_3: Factories	C_9: Culture & education
C_4: Decoration and furniture markets	C_{10}: Entertainment
C_5: Food and beverage	C_{11}:Companies
C_6: Shopping malls and Supermarkets	C_{12}:Hotels and real estates

2) The portion of vacant places in $g.R.f_\rho$. *As illustrated in Figure*

4 C), we further divide a grid into small cells, counting the number of cells without a POI located. In short, the bigger f_ρ the larger vacant places contained in a grid, therefore facilitating the dispersion of air pollutants; e.g., the upper subfigure in Figure 4 C) shows more vacant places than the bottom one due to the presence of a lake.

3) *The change in the number of POIs*:f_c. We compare the POI data of two consecutive quarters, calculating the change in the number of POIs in the following five categories (C_3, C_4, C_6, C_8, and C_{12}) in each grid's affecting region. The change implies the construction in which infrastructure was built or removed from a region. According to [9], construction is one of the major sources of air pollutants, such as PM_{10} and NO_2.

4 LEARNING AND INFERENCE

We propose the model based on the framework of co-training and the philosophy shown in Figure 11, where a circle

denotes a location and a plane means the states of these locations at a

timestamp. We can understand the philosophy of the model from the perspective of the state of air quality. First, air quality has temporal dependency on its current observations and that of its previous state. For example, the AQI of a location tends to be good if the AQI of the past hour is also good. Second, the air quality of a location is also reflected by its spatial neighbors. For instance, the AQI of a location is likely to be bad if the air quality of the places close to the location is bad. We can also understand the model from the perspective of the generation of air pollutants. The AQI of a location is determined by the air pollutants issued in the location and that propagated from other locations.

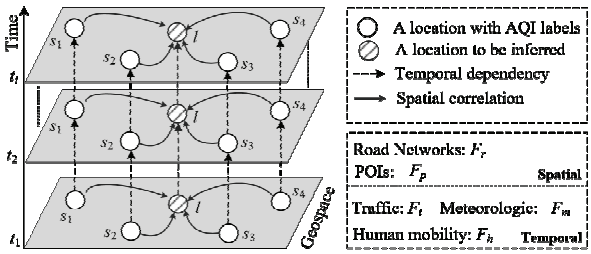


Figure 11. The philosophy of the inference model

4.1 Co-Training

Co-training is a semi-supervised learning technique that requires two *views* of the data. It assumes that each example is described by two different feature sets that provide different and complementary information about an instance. Ideally, the two feature sets of each instance are conditionally independent given the class, and the class of an instance can be accurately predicted from each view alone. Co-training can generate a better inference result as one of the classifiers correctly labels data that the other classifier previously misclassified [8].

Aligning with the co-training framework, we propose a spatial classifier (*SC*) to model the spatial correlation and a temporal classifier (*TC*) to model the temporal dependency of AQI. The two models are integrated into a co-training-based learning framework presented in Algorithm 1. As shown in line 3 and 4,

Algorithm 1: U-AIR Co-Training

Input: A set of features (, , , ,), some labeled grids , and a set of unlabeled grids , a threshold controlling the rounds **Output**: The spatial classifier and temporal classifier *TC*.

1. ;
2. **Do**
3. $SC \leftarrow$*SC*.Learning (F_r, F_p, G_1);
4. *TC*$\leftarrow$*TC*.Learning (F_m, F_t, F_h, G_1);
5. Apply SC to each $g \in G_2$, i for each class$c$, pick n_i grids that SC most confidently classifies as c_i, and add them to G_1.
6. Apply *TC* to each $g \in G_2$, for each class c_i, pick n_i grids that *TC* most confidently classifies as c_i, and add them to G_1.
7. i++;
8. **Until**G_2 is empty or $i > \theta$;
9. **Return**SC and TC;

we first train the two classifiers with two separated sets of features. The trained *SC* and *TC* are then used to infer unlabeled grids $G_z$iteratively, adding the most confidently classified examples into the labeled dataset G_1 for the next round of training, until G_2 becomes empty or a certain roundsθ have been performed. When this algorithm ends, *SC* and *TC* are returned.

At the inference time, we apply SC and TC to the corresponding features separately, determining the AQI of a grid by the product of the two probability scores (P_{SC} and P_{TC}) generated by the two classifiers, defined in Equation 5.

$$c = \arg_{c_i \in C} Max(P_{sc}^{c_i} \times P_{Tc}^{c_i}). \quad (5)$$

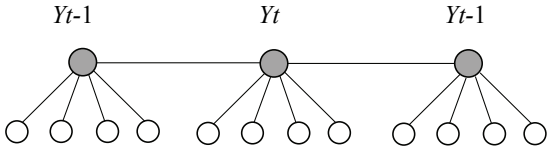
4.2 Temporal Classifier: TC

The temporal classifier infers the air quality of a grid given the temporally-related features consisting ofF_m, F_t, and F_h of the grid, using a linear-chain CRF, which is a discriminative undirected probabilistic graphical model for parsing sequential data like natural language texts [4]. The advantage of CRFs over hidden Markov models is the relaxation of the independence assumptions between features. Additionally, CRFs avoid the label bias problem exhibited by maximum entropy Markov models.

Figure 12 shows the graphical structure $G$of the temporal classifier, which consists of two kinds of nodes $G = (X, Y)$. The gray nodes$\mathbf{Y} = \{Y_1, Y_2, \ldots, Y_n\}$ represent hidden state variables to be inferred given the sequence of observations denoted by white nodes$\mathbf{X} = \{X_1, X_2, \ldots, X_n\}, X_t = \{F_m, F_t, F_h, t\}$ t(is a timestamp by hour, e.g., 8am). The $Y_t \in \mathbf{Y}$ is structured to form a chain with an edge between each Y_{t-1} and Y_t, as well as having an AQI "label" belonging to C. When conditioned on $\mathbf{X}$, the random variables Y_i obey the Markov property with respect to the graph G:

$$P(Y_t|\mathbf{X}, Y_j, i \neq j) = P(Y_t|\mathbf{X}, Y_j, i \sim j),$$

where $i \sim j$ means i and$j$ are neighbors in G.



$F_m(t\text{-}1)$ $F_t(t\text{-}1)$ $F_h(t\text{-}1)$ $t\text{-}1$ $F_m(t)$ $F_t(t)$ $F_h(t)$ t $F_m(t\text{+}1)$$F_t(t\text{+}1)$ $F_h(t\text{+}1)$ $t\text{+}1$

Figure 12. The graphic presentation of the temporal model

The probability of a particular label sequence y given observation sequence x is defined as a normalized product of potential functions as follows:

$$exp(\sum_j \lambda_j t_j(y_{i-1}, y_i, x, i) + \sum_k \mu_k s_k(y_i, x, i)), \quad (6)$$

where$t_j(y_{i-1}, y_i, x, i)$ is a transition feature function of the entire observation sequence and the label at positions i and $i-1$; $s_k(y_i, x, i)$ is a state feature function of the label at position i and the observation sequence; λ_j and μ_k are parameters to be estimated from training data.

Writing $s_k(y_i, x, i) = s_k(y_{i-1}, y_i, x, i)$, we transfer Equation 6 to

$$P(y|x, \lambda) = \frac{1}{Z(x)} exp(\sum_j \lambda_j f_j(y_{t-1}, y_t, x, i)), \quad (7)$$

where $Z(x)$ is a normalized factor [4]. This can be informally thought of as measurements on the input sequence that partially determine the likelihoodhttp://en.wikipedia.org/wiki/Likelihood_functionof each possible value for Y_t. The model assigns each feature a numerical weight and combines them to determine the probability of a certain value for Y_t.

Given k sequences of the training data $\{(x^{(k)}, y^{(k)})\}$, learning the parameters λ is done by maximum likelihood

learning $P(y|x, \lambda)$, which can be solved by gradient descent.

$$L(\lambda) = \sum_k \left[log \frac{1}{Z(x)} + \sum_j \lambda_j f_j(y_{i-1}, y_i, x, i) \right] \quad (8)$$

4.3 Spatial Classifier: SC

The spatial classifier infers the AQI of a grid, using its own geospatial features and that of some grids having a monitor station. As depicted in Figure 13, the *SC* consists of two parts: input generation (in the left box) and an artificial neural network, where

F_p^k, F_r^k, l^k, and c^k denotes the POI features, road network features, location, and the AQI label of grid *k*; x is the grid to be inferred; D_1 is a distance function between features (e.g., we use the Pearson correlation in the experiments) and D_2 calculates the geodistance between the center of two grids, e.g.,

$$\Delta P_{kx} = Pearson\_Cor(F_p^k, F_p^x), \quad (9)$$

$$\Delta R_{kx} = Pearson\_Cor(F_r^k, F_r^x), \quad (10)$$

$$d_{kx} = Geo\_Distance(l^k, l^x). \quad (11)$$

Input generation: In this phase, we randomly choose n grids with labels, $\mathcal{G}_1 = (g_1, g_2, \cdots, g_n)$, $\mathcal{G}_1 \in G_1$, to pair with the grid to be inferred (we found n=3 achieves the best inference accuracy in the experiments). The input of the ANN is then calculated according to Equation 9 to 11. To learn the impact of different scales of distance between grids, we perform this pairwise process m times to formulate a collection of inputs. The labeled grids involved in each round of input formulation should have at least e different grids from existing ones, formally defined as: $\mathbb{Q} = \{\mathcal{G}_1, \mathcal{G}_2 \cdots, \mathcal{G}_m\}$, $\forall \mathcal{G}_i, \mathcal{G}_j \in \mathbb{Q} | \mathcal{G}_i \cap \mathcal{G}_j | \leq e$, e.g.,$e$ =2 and n=3 means at least one out of the three grids is different from those used previously. Another reason for doing so is to vary the input. As the POI and road network features extracted from a grid are static, the input (ΔP_{nx}, d_{nx}, ΔR_{nx}) do not change over c^k if we always select the same three grids. Accordingly, the three inputs will be neglected by the ANN model in the training process.

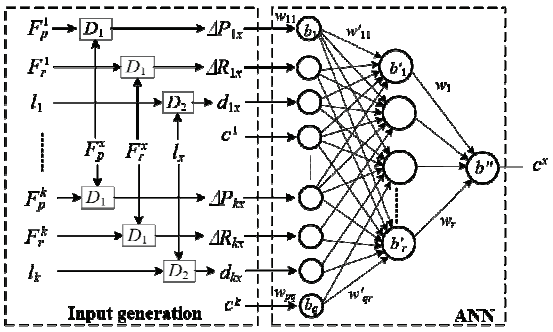


Figure 13. Structure of spatial classifier

Artificial neural network: Though many ANNs can be applied to our framework, we choose the widely-used Back-propagation (BP) neural network with one hidden layer in the experiments for its simplicity and generality. We set a linear function for the neurons (each of which accepts all the features) in the input layer and a sigmoid function $\varphi(x)$ for those in the hidden and output layers, formally defined as follows:

$$c^k = \varphi\left(\sum_r w_r \, \varphi\left(\sum_q w'_{qr} \cdot \left(\sum_p f_p \, w_{pq} + b_q\right) + b'_n\right) + b''\right), \quad (12)$$

where f_p is a feature of input; b_m, b'_n, and b'' are the biases associated with the neuron in different layers; w_{pq}, w'_{qr}, and w_r denote the weight associated with the input of different layers.

In the inference process, we also pair a grid to be inferred with a certain sets of n labeled grids, generating a prediction of AQI label for each set. The frequency of each inferred label is then used as the probability score of the label, and the most frequent label will be selected as the final prediction result. The prediction of the *SC* can actually be regarded as a non-linear interpolation over geo-spaces, considering the road network and POIs of these locations. This classifier is effective as road network and POI data are good supplementary of traffic data.

5 EXPERIMENTS

5.1 Datasets

In the evaluation we use the following five real datasets detailed in Table 4, where the first four sources are available in Beijing and Shanghai.

1) *Meteorological data*: We collect fine-grained meteorological data, consisting of weather, temperature, humidity, barometer pressure, wind strength, from a public website every hour.

2) *Air quality records*: We collect both real valued and labeled AQI of four kinds of air pollutants, consisting of SO_2, NO_2, $PM_{2.5}$, and PM_{10}, reported by ground-based air quality monitor stations in the four cities every hour. As a station may not have reports sometimes, we present the hours of effective records in Table 4.

3) *POIs*: We employ a POI database from Bing Maps to extract F_p for each city. The data of the first and third quarters of 2012 are used to identify the number of POIs changed in the five categories defined in Section 3.4.2. Figure 14 shows the POI distributions of Beijing and Shanghai.

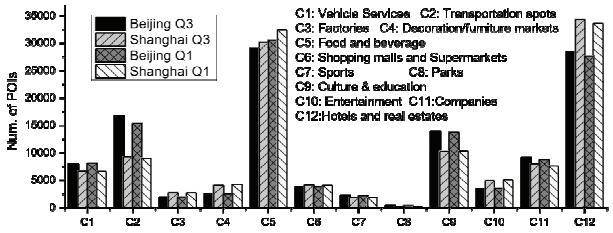


Figure 14. Number of POIs in different categories

4) *Road networks*: The road network data is also from Bing Maps.

5) *Taxi trajectories*: We use a GPS trajectory dataset generated by over 32,000 taxicabs in Beijing from August 21 to Nov. 30, 2012 to calculate F_t and F_h. GPS-equipped taxis can be regarded as mobile sensors probing the travel speed on roads, and the data also tell the pick-up and drop-off points of each trip. The total distance of the dataset is over 495 million kilometers, and the number of points reaches 1.45 billion. We found over 32 million occupied trips. As taxis generate about 20 percent of traffic flow on road surfaces of Beijing [14], the dataset is big enough to represent the traffic patterns there. Of course, the features can be extracted from other data sources or a combination of multiple datasets, like mobile phone signal.

Table 4. Details of the datasets

Data sources		Beijing	Shanghai
POIs	2012 Q1	271,634	321,529
	2012 Q3	272,109	317,829
Roads	#.Segments	162,246	171,191
	Highways	1,497km	1,963km
	Roads	18,525km	25,530km
	#. Intersections	49,981	70,293
AQIs	#. Stations	22	10
	Hours	23,300	8,588
	Time spans	8/24/2012-3/8/2013	1/19/2013-3/8/2013
Urban Sizes (grids)		50× 50km (2500)	50× 50km (2500)

5.2 Baselines and Ground Truth

We compare our method (U-Air) with five baselines:

1) *Linear interpolation (Linear)*: This is a distance-weighted interpolation algorithm using the AQI values reported by existing monitor stations, as shown in Equation 11,

1

$$g_x.\mathrm{AQI} = \sum_i \frac{g_i.AQI \times \frac{1}{d_{xi}}}{\sum_i \frac{1}{d}} \quad , \quad ^{xi} \quad (13)$$

where d_{xi} denotes the geo-distance between the location x and the i-th monitor station.

2) Another interpolation method is based on a Gaussian distribution (*Gaussian*) $X \sim N(0, \sigma)$, where σ is the average distance between any two existing air quality monitor stations in a city. Formally defined as

$$g_x.\mathrm{AQI} = \sum_i g_i.AQI \times {}_z f(d_{xi}), \quad (14)$$

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{x}{\sigma^2}}. \quad (15)$$

We use continuous values in the interpolation and then discretize the aggregated result into AQI labels for evaluation. 3) *Classical Dispersion Model (Classical)*: This is a simple (also well-known) mathematical model that is typically applied to point source emitters, simulating them as point or line emission source propagating as a Gaussian plume. We use a widely-used tool CALPUFF [10] with default values for the parameters (as these parameters, e.g., vehicle emission rates, are difficult to obtain).

4) *Decision tree (DT)*: We choose this baseline to answer people's question why not just use a simple supervised learning model. In this baseline, we feed all the features equally into a decision tree.

5) *CRF-ALL and ANN-ALL*: Instead of dividing the features into two sets, the two baselines feed all features equally into the *SC* and *TC* respectively. We choose them as baselines to justify the features are used effectively in our approach.

Ground Truth: We deliberately *remove* a station from a grid and infer its air quality with the AQIs from other stations. The actual AQI reported by the station is then used as the ground truth to measure the inference. Each grid with a station is tested in this way every hour. For example, Beijing has 22 stations, generating 528 (22×24) test instances per day and 3,696

instances per week. In addition, we separate the training data from the test data by time, guaranteeing they have no overlap. Moreover, we apply the model trained in Beijing to the other cities, further verifying its effectiveness and adaptability to different cities.

5.3 Results

Evaluation on Features: We first justify the effectiveness of the features, using the data shown in Table 5, where a DT model is employed to study the performance of individual features and their combinations. Clearly, adding one feature set into the model brings a significant improvement on both precision and recall.

Table 5. Results related to features

	PM10		NO2	
Features	**Precision**	**Recall**	**Precision**	**Recall**
F_m	0.572	0.514	0.477	0.454
F_t	0.341	0.36	0.371	0.35
F_h	0.327	0.364	0.411	0.483
F_p+F_r	0.441	0.443	0.307	0.354
F_m+F_t	0.664	0.675	0.634	0.635
F_m+F_t +F_p +F_r	0.731	0.734	0.701	0.691
F_m+F_t +F_p +F_r +F_h	0.773	0.754	0.723	0.704

Overall Results: Figure 15 shows the performance of U-Air and the five aforementioned baselines, where U-Air outperforms other methods in terms of the mean precision and mean recall over time of day. The results demonstrate the advantage of our method over linear and Gaussian interpolations, and classical air pollutant dispersion models (though the latter may have a better performance with all the parameters accurately obtained, getting such parameters could be even difficult than building the model).

Additionally, simply using some supervised machine learning models (like DT and CRF) or ANN is less effective than the cotraining-based approach.

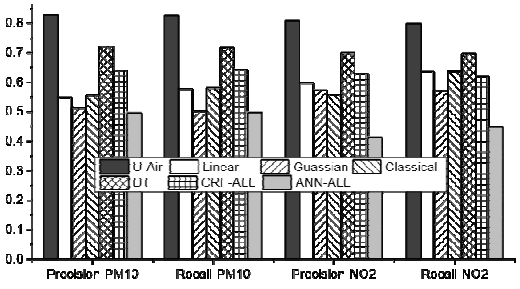


Figure 15. Overall results of different methods for PM10 and NO2

Results of Co-Training: Figure 16 further reveals the co-training progress of our approach, where we add an instance into the training data if *SC* or *TC* predicts it as a class with a probability score over 0.85 (i.e., very confidently inferred). The unlabeled data gradually improves the inference performance, justifying the ability of the co-training framework in dealing with data sparsity.

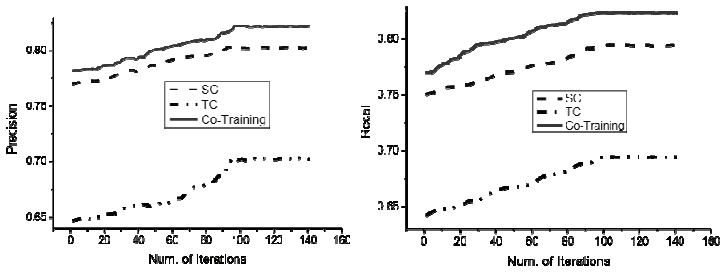


Figure 16. Learning progress of Co-training

Table 6 shows the confusion matrix of U-Air in inferring PM_{10} in Beijing (we do not show other pollutants given the limited spaces).

Table 6. Confusion matrix of U-Air on PM10

Ground Truth	**Predictions**					
	G	**M**	**S**	**U**		
G	3789	402	102	0	0.883	**Recall**
M	602	3614	204	0	0.818	
S	41	200	532	50	0.646	
U	0	22	70	219	0.704	
	0.855	0.853	0.586	0.814	0.828	
	Precision					

Results of SC: To further study the ability of our approach in differentiating between more AQI labels, we solely test the spatial classifier (no traffic-related features needed). Note that this is the result of SC rather than co-training. We use a half of the data for training and the rest for testing, ensuring both parts of data have a relatively balanced distribution over different AQI labels. Unbalanced data will result in impractically high accuracy in the test. We also apply the spatial classifier (trained based on Beijing data) to Shanghai data. As depicted in Figure 17 A), our SC has almost the same performance as that of Beijing, justifying its ability adapting to different urban environments. As shown in Figure 17 B), pairing a location with three stations in the SC generates a better result than using other number of stations (e.g., 2 or 4).

Table 7 Confusion matrix of the Spatial Classifier

Ground Truth	**Predictions**					
	G	**M**	**U-S**	**U**	**V-U&H**	
G	656	141	3	0	0	0.820
M	81	594	114	11	0	0.743
U-S	1	90	278	183	23	0.483
U	0	0	41	488	43	0.853
V-U & H	0	0	0	2	190	0.989
	0.889	0.720	0.638	0.713	0.742	0.751
	99		**Precision**			

Recall

Results of TC: Figure 18 presents the performance of our TC respectively using temporally-related features and all features to infer PM_{10} in Beijing, showing two discoveries. First, feeding all features into the TC does not help, in most cases, becoming even worse than only using temporal features. Second, the performances of two times slots (around 8am and 6pm) are higher than others. The two time slots actually correspond to the morning and evening rush hours of Beijing, in which traffic flows would be the major cause of air pollutants. Another reason is we also have enough number of taxi trajectories representing the traffic flow in the two slots (i.e., people travel a lot by taxis).

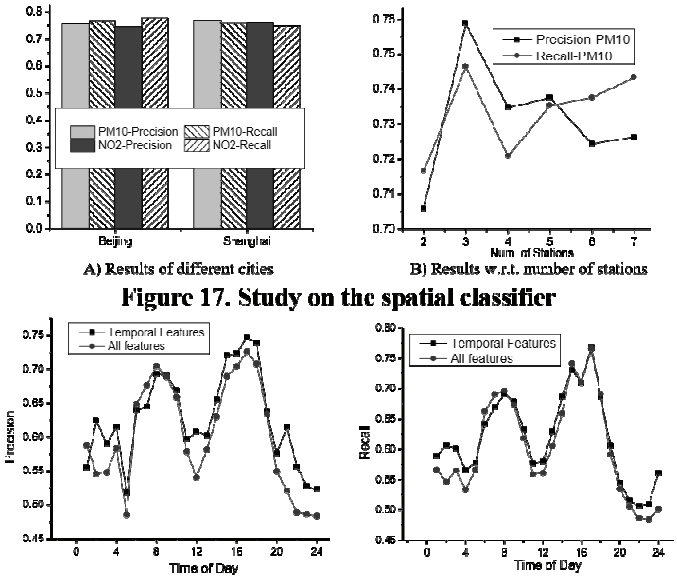


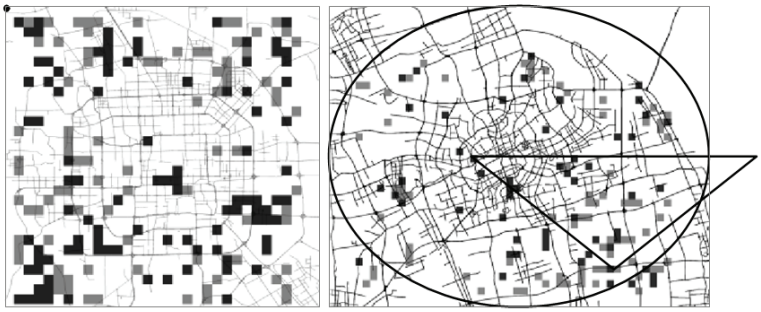
Figure 18. Study on TC using Beijing data (PM10)

Efficiency: Table 8 presents the online efficiency of our approach, which was tested on a 64-bit server with a Quad-Core 2.67G CPU and 16GB RAM. On average, we can infer the air quality of a grid in 131ms, generating the AQIs for entire Beijing in 5 minutes.

Table 8. Efficiency study

Procedures		**Time(ms)**	**Procedures**		**Time(ms)**
Feature extraction (per grid)	F_t&F_h	53.2	Inference (per grid)	SC	21.5
	F_p	28.8		TC	13.1
	F_r	14.4	Total		131

Visualization: We infer the AQI of each location in the urban areas of Beijing and Shanghai by using our approach, coming up with two visualizations shown in Figure 19 A) and B), where green and red grids respectively denote the top 100 locations that could have the best and worst AQIs in the two cities during the corresponding periods. The visualization can benefit air pollution analytics by identifying the locations always having a bad AQI.



A) Beijing B) Shanghai

Figure 19. Top 100 locations with the best and worst AQIs

6 RELATED WORK

6.1 Classical Bottom-up Emission Models

There are two major ways calculating the air quality of a location using the emission observed at ground surfaces, called "bottom-up" methods. One is interpolation using the reports from nearby air quality monitor stations. The method is usually employed by public websites releasing AQIs. As air quality varies in locations non-linearly, the inference accuracy is quite low (see Figure 15).

The other is classical dispersion models, such as Gaussian Plume models, Operational Street Canyon models, and Computational Fluid Dynamics. These models are in most cases a function of meteorology, street geometry, receptor locations, traffic volumes, and emission factors (e.g., g/km per single vehicle), based on a number of empirical assumptions and parameters that might not be applicable to all urban environments [9]. For example, Gaussian Plume model requires vehicle emission rates (e.g., g/km per hour) as input and assumes that the concentration is dispersed in the vertical and horizontal directions in a Gaussian manner. Some models may even require the height, length, and orientation of a street canyon, the gaps between buildings, as well as the roughness coefficient of the urban surface. As these parameters are difficult to obtain precisely, the results generated by such kinds of models may not be very accurate either. Compared with these models, our approach does not need empirical assumptions and parameters. Therefore, it is easy to conduct and applicable to different city environments.

6.2 Satellite Remote Sensing

Satellite remote sensing of surface air quality has been studied intensively in past decades [7], which can be regarded as topdown methods. For example, [1] compared $PM_{2.5}$ inferred from the moderate resolution imaging spectroradiameter (MODIS) with surface $PM_{2.5}$ measurements in Canada and the United States. Likewise, [6] estimated surface NO_2 concentrations by applying local scaling factors from a global three-dimensional model to tropospheric NO_2 columns retrieved from the Ozone Monitoring Instrument onboard the Aura satellite. However, this category of methods is extremely influenced by clouds and would be sensitive to other factors, such as humidity, temperature, and location [1]. In addition, the results inferred from Satellite images only reflect the air quality of atmosphere rather than the ground air quality that people care more about.

6.3 Crowd Sensing

Crowdsourcing or participatory sensing [2][3] may be a potential solution solving this problem in the future, if every person can carry a gas-sensor-equipped smart phone to probe the air quality around them. While this approach is feasible for some gasses like CO_2, it is not practical for other air pollutants like $PM_{2.5}$ and NO_2 so far as the devices for sensing such kinds of air pollutants are not easily portable (refer to Figure 1). In addition, the devices need a long period of sensing time (e.g., 1 hour) before generating accurate results.

6.4 Urban Computing

A series of research on urban computing has been done recently, using big data to tackle the big challenges in big cities. For instance, Jing et al. inferred the functional regions in a city using human mobility data and POIs [11]. Zheng et al. detected the underlying problems in a city's transportation network using taxi trajectories [14]. Zhang et al. sense the urban refueling behavior based on GPS-equipped vehicles [15]. The research reported in this paper is also a step towards urban computing.

7 CONCLUSION

In this paper, from the perspective of big data, we infer the finegranularity air quality in a city based on the AQIs reported by a few air quality monitor stations and four datasets (meteorological data, taxi trajectories, road networks, and POIs) observed in the city. We identify five sets of features (F_m , F_t, F_h, F_r , and F_p) based on the datasets and propose a co-training-based semisupervised learning approach consisting of a spatial classifier and a temporal classifier. We first evaluated our co-training-based approach using the data obtained in Beijing, resulting in an overall (Precision=0.828, Recall=0.826) for PM_{10} and (Precision=0.808, Recall=0.798) for NO_2. The results outperform that of linear interpolation, a classical dispersion model, and some well-known supervised learning models like Decision Tree and CRF. Solely applying all features to the *SC* or *TC* is worse than our cotraining-based approach. We applied the *SC* learnt from Beijing data to Shanghai, obtaining a result as good as that generated in Beijing (about 0.76). These results demonstrate our approach is applicable to different city environments and seasons.

The key experiences we learned from the research lies in three aspects. First, features should be selected carefully from the data and used properly in the inference models. Second, the design of *SC* and *TC* is helpful as they respectively model the temporal dependency of air quality in a location and the spatial correlation between locations. Third, the co-training-based framework does a good job of addressing the data sparsity problem by leveraging the unlabeled data and the mutual reinforcement relationship between the two feature sets (e.g., POIs and road networks are good complementary of traffic-related features). In the future, we would like to apply our approach to more cities and study the root causes of air pollution.

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From Regional China to Leading Global Business Hub

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INTRODUCTION

Over the past ten years Chongqing has become one of the most successful case studies for China's Western Development policy. Coordinated infrastructure development, a sound manufacturing industry base, and collaborative partnership models across government and large global enterprises, have made Chongqing municipality one of the highest growth regions measured by GDP, and a strategic cornerstone for the national regional development model.

For HP, its establishment in the city and partnership with the Chongqing government has been of critical importance. As a foundational partner in establishing the manufacturing base in 2009, this has grown to become one of HP's most significant hubs. Last month HP produced its 100 millionth notebook PC made in Chongqing, to be delivered all over the world. As the Chinese economy transforms from a manufacturing giant, to a consumption and services led economy, we see Chongqing playing a greater role in that evolution and enabling HP and other organisations to better serve the greater China with leading technology.

Looking forward, with the right effort and focus, Chongqing should be able to evolve beyond being a model for regional development and grow into a global business hub, setting a new benchmark for its development. This growth, in alignment with key national initiatives including One Belt, One Road and Made in China 2025 will establish the foundation for continued economic development for years to come.

As a long term partner to the municipality, HP is committed to supporting its development. In sharing meaningful advice on practical steps towards the industrial advancement of Chongqing, HP will continue to support the growth of the municipality as a leading economic zone. Chongqing is uniquely positioned to become a highly competitive global business hub, and to fully realize its potential, Chongqing can prioritize efforts to advance the skillsets of its workforce and its technological capabilities to focus on high value manufacturing.

The following pages seek to provide context and practical guidelines regarding three key areas to:

1) Develop core services and infrastructure to transform Chongqing's production-oriented manufacturing base to a leading service-oriented manufacturing powerhouse.

2) Leverage its geographical advantage to expand global integration by enabling synergies across export oriented and import oriented activities.

3) Sponsor the acceleration of technology upgrades that will enable the development of new businesses and higher industry value add through next generation technologies in the areas of digitization, automation and manufacturing.

We also believe Chongqing's forward looking approach and ability to partner with leading international organisations over many years makes it uniquely ready to seize these opportunities.

TRANSFORMING CHONGQING'S PRODUCTION-ORIENTED MANUFACTURING BASE

At the start of the millennium, manufacturing offshoring to China became a trend, with most manufacturing and assembly plants located on the East Coast of China. After a decade, issues such as port congestion, labor cost increases and environmental pollution began to constrain development. Labor shortages also meant that migratory labor flows were driving the labor force.

When you look at manufacturing operations in coastal China during the last 15 years, this was the typical footprint of the workforce. Most of the workforce was migrating from their distant home provinces. Shanghai and its surroundings provide an example, but this trend can be seen across any of the major cities along coastal China. Only one third of workers are from Anhui or East China. This means that two thirds of the workforce are migrants.

Due to these issues, the Go West strategy was born, motivating coastal manufacturing to shift westward to the inland, closer to the workforce's hometowns. Now HP's workforce footprint for Chongqing looks completely different than that of its previous costal facilities, with 83% of the workforce coming from their home provinces of Chongqing or Sichuan. Today, instead of putting people on trains, HP puts its products on trains.

HP's strategy was aligned with that of the government, recognizing societal changes and increasing urbanization. It was executed in the west with high tech jobs and skills, creating new modern campuses incorporating natural environments. HP was able to create functional environments with more open spaces, green spaces, amenities, updated facilities and initiatives focused on employee health and well-being.

Logistics and infrastructure are drivers of economic growth. Singapore, Dubai, Kazakhstan, Germany and the Netherlands are excellent examples of the infrastructure oriented approach. In the World Bank's Logistics Performance Index (LPI) these countries have consistently been in the top 10 or have been the fastest growing in LPI scoring. In the Netherlands, production and logistics accounts for 5-10% of its annual GDP. Chongqing is central to the One Belt, One Road supply chain hub, and this hub now needs to be upgraded with state of the art logistics, and a wide range of production based services to continue expanding the industrial manufacturing ecosystem.

While Chongqing production has traditionally focused on export oriented capabilities, there are now major opportunities to expand production based services. Due to its large-scale multi-modal logistics infrastructure and geographic location, Chongqing has the potential to grow as a key supply chain hub for e-commerce, attracting both logistics and multinational companies to Chongqing.

E-commerce is rapidly growing within China and worldwide. However, due to the changing buying habits, e-commerce models are now increasingly cross border, with global markets being available to Chinese companies and the China market representing a large potential for global products. Due to the ongoing international growth of e-commerce platforms like Alibaba and JD, reliable and fast shipping services are needed for further expansion. To execute this, key priorities for Chongqing should include:

1) Providing rapid logistic services to enable E-commerce capabilities for large and medium size companies.

a. Enable 7/24 operating time at rail terminals, airport and customs operations

b. Attract international airlines and small parcel express integrators.

2) Continue improving regional transportation infrastructure.

a. Improve surrounding road infrastructure, reducing/eliminating traffic congestion within and around Chongqing municipality;

b. Invest in alternative fuel support, i.e. biofuel supply, electricity charging terminals, etc.

EXPANDING CHONGQING'S GLOBAL INTEGRATION

The newly established rail connection known as the New Silk Road has enabled China to lead the One Belt, One Road initiative, now considered as one of the most important initiatives as a driver of economic growth. The total addressable market along the One Belt, One Road trade and logistics corridor is estimated to be between three and four billion people. Chongqing, being central to the One Belt One Road initiative, has a unique opportunity to drive economic inclusion, create jobs and industries all along the trade and logistics corridor, from Chongqing through Central Asia to Europe.

Historically, and logically, factories were on the coast for a very important reason. China's eastern seaboard provides better access to ocean freight transportation. However, with the new western landlocked manufacturing ecosystem, logistics infrastructure had to be developed to support new export lanes that had previously never existed in Chongqing. This included new airport infrastructure to enable large aircraft in and out of Chongqing, and a new rail link to the East Coast to connect ocean freight. Without this critical logistics infrastructure, manufacturing in Chongqing would not have been as successful as it is today.

Due to economic slowdown, the ocean freight industry implemented "super slow steaming" services. With transit times becoming longer due to moving inland, "super slow steaming" had an even bigger impact to transit times, especially to the European market. Therefore, land-based transportation was looking more and more appealing.

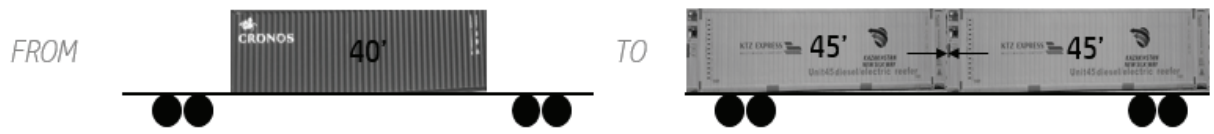
In cooperation with the Chongqing municipally, HP pioneered the development of a totally new intercontinental rail link across central Asia into Europe. Due to the success of the rail corridor between Chongqing and Duisburg, Germany, more and more connections have been established between China and Europe. Today, Chongqing is still the largest volume lane segment, with almost daily departures and a door-to-door transit time of approximately 17 days, which is twice as fast of the ocean freight door-to-door transit time.

While Chongqing to Europe has become the largest volume on the Trans Eurasia Rail lane segment, the challenge and focus is now to further optimize this rail solution. There are several opportunities to reduce overall operating costs, which should further improve the competiveness with regard to other modes of transport, and simultaneously contribute to the overall China and Chongqing sustainability targets.

With HP's rail container volume growing to approximately 10,000-12,000 TEUs (5,000-6,000 FEUs) next year, HP has actively supported Chongqing in identifying rail container volumes from Europe to China. This has resulted in a balance ratio of roughly 50% presently with an opportunity to narrow this gap close to 100% within the next two years. Presently, volumes from Europe to Chongqing are coming from mainly automotive, healthcare, luxury and project related goods. While within the next two years, significant volumes are expected from the pharmaceutical and agricultural industries. More time will be needed for chemical products, which are also in high demand for rail transportation.

The big opportunity for container rail transportation to and from Chongqing will be to implement 45' pallet-wide containers as standard. This size container is not compatible with ocean freight, and has the advantage of loading an additional 5 pallets versus a standard 40' container. The result will be that the cost per pallet will go down by default when implementing 45' containers across the board, assuming that the operating cost and related price point remain the same for a 40' and 45' container. These 45' containers have already been successfully implemented in Europe and CIS countries, resulting in lower overall operating costs per container.

Another big opportunity for rail transportation is the implementation of 90' platforms to support the above mentioned 45' containers. Presently, China Rail (CRCT/CRIMT) only operates 40' or 60' platforms. The advantage will be that 2 x 45' containers can be loaded per platform, while the number of containers per train will also be increased. Rail segments from Chongqing to Altynkol/Khorgos have the opportunity to be the first in China operating such platforms. As with the longer 45' containers, 90' platforms have already been successfully deployed in Europe and CIS countries.



Imports to China are increasing rapidly. While initially industrial and luxury goods were driving imports, especially to the East Coast of China, there is now a trend of significant import growth in inland China. Meanwhile, agricultural and food products are becoming increasingly popular import items. The latter especially will be a growth area for Chongqing, and China on the whole, as cold chain logistics is expected to grow 25% per year, according to market research by Roland Berger.

China is importing significant volumes of raw materials, such as plastics, glass and cardboard. A lot of these materials are being imported as fractions, being the output of recycling in especially the United States and Europe. Given the large

volumes of materials being processed, Chongqing has the potential to grow as a key import recycling hub for China, enabled by the implementation of a professional recycling control mechanism in line with international legislation such as the Waste Electrical and Electronic Equipment Directive (WEEE Directive). An added benefit of developing professional recycling capabilities is to mitigate environmental degradation and curb pollution.

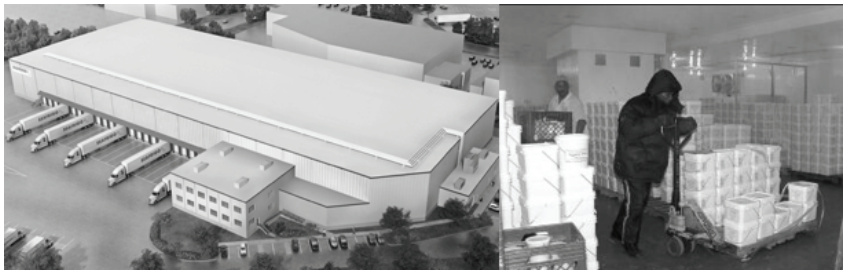
Chongqing has the potential to grow as a key import hub, enabling import oriented models, attracting logistics and multinational companies to Chongqing. To drive this attraction, key priorities for Chongqing to pursue should include:

1) Streamline and automate import customs and inspection processes to prevent any delay from import to final delivery.

2) Create standardized logistics warehouses and cross-dock infrastructure to support deconsolidation and onward transport distribution within China.

3) Create temperature controlled warehouses and cross-dock infrastructure to better support distribution of pharmaceutical and agricultural products in which professional cold chain logistics is required. This also requires adherence to protocols such as Hazard Analysis Critical Control Point (HACCP) and Good Distribution Practice (GDP).

4) Create production capabilities for value-add production and logistics such as repackaging, labeling, localization, food processing and sampling.



5) Establish a leading recycling hub for China to support more sustainable manufacturing.

ACCELERATING INDUSTRIAL BASE TECHNOLOGY UPGRADES

To meet the demands of rapidly changing market dynamics and combat rising costs of capital and labor, companies all over the globe are looking to technology to improve their competitive position. Manufacturing 4.0 and China 2025 provide companies with a framework to enable more flexible, digital and automated enterprises. The shift from analog to digital underpins much of this transformation, however, many companies are struggling to implement best practices and build their own roadmaps to deploy the right technologically driven process and business models.

Chongqing must foster the acceleration of technology upgrades that will enable the development and higher industry value add. The Chongqing municipality has the potential to grow as an industrial hub, attracting multinationals, and developing its own homegrown initiatives, but to do so will require close attention to current weaknesses hindering the transformation the industrial base.

Research from McKinsey shows that over the past 20 years, manufacturing has plateaued with labor productivity stagnating in many global markets. However, a few key economies including the US, Germany and Japan have gone against this trend achieving high-levels of per capita labor productivity. While China has made serious progress in respect to improving productivity levels since the 1990s, its manufacturing productivity is still just 15-20% of leading manufacturing powers, with Chinese per capital manufacturing productivity being roughly seven times less than that of the United States. Nevertheless, Chinese manufacturing has huge potential, and the key to unlocking that potential is enacting strategies that leverage digital tools and through the adoption of disruptive technology. Data management and analytics, advanced sensors and object tagging, automation and robotics, and additive manufacturing are all technologies that offer great possibilities for enhancing the productivity of Chongqing and the development value added services.

China’s Go Global policy plays a major role in this transition toward higher value manufacturing and technology. President Xi Jinping and Premier Li Keqiang are revamping this strategy, shifting expansion toward a more focused approach around exporting higher value goods and services. Higher industry value add through technologies in the areas of digitization, automation and manufacturing are key elements to future growth.

HP is making huge strides to transform the manufacturing sector through innovations in additive manufacturing with 3D industrial printing. Innovations in 3D printing will radically change manufacturing across sectors globally and here in China. 3D printing technology enables rapid prototyping at hugely reduced costs and customized production. This cost saving helps to lower barriers to 3D adoption across automotive, aerospace, medical and consumer goods industries. Embracing 3D and other technologies will allow for Chongqing to remain competitive and drive new business models, creating jobs and sustaining development in key industrial sectors.

The 3D printer market in China is projected to achieve a high rate of growth as it has been identified as a major aspect of the Made in China 2025 industrial transformation initiative. Adoption of this technology in key sectors outlined above will help drive the market in size and scale as they are well aligned to national goals, but to truly capitalize on this growth, service providers, suppliers and manufacturers must evolve to meet the demands of corporates and consumers. Part of this evolution will be shifting from a purely mass production model to a model that prioritizes customization.

Many digital technologies are still in their infancy, and this is the case with 3D. Designing for additive print manufacturing demands a whole new skillset. Software and design practices are just now beginning to evolve around this new technology, meaning that Chongqing is well positioned to come in as an early adopter and lead the charge on initiatives and partnerships focused on developing talent and digital production capabilities. HP is currently working with industry-leading partners including Siemens PLM Software, Materialise and Autodesk Netfabb to make the design-to-print process easier and more intuitive. As Chongqing further enhances its manufacturing and logistics capabilities, it will be essential that the municipality partners with leading global companies to leverage technology as an enabler of progress, but more importantly, to train a new generation of workers that will need both soft and hard skills to thrive in a new economy. It will most certainly be a challenge to prepare these workers for a new wave of digitally oriented jobs, but in time the investment will pay off as a better equipped digitally savvy workforces learn to meet the needs of a rapidly changing domestic and international landscape.

To achieve an environment in which firms thrive, the labor force is adequately educated, and industrial aims are aligned with national goals, it will be necessary to foster the development of a digital ecosystem. In building this ecosystem, HP recommends a joint approach in which policy makers, academia and industry players collaborate to accelerate this process. Government bodies can provide regulatory guidance and support on industry development, while academic and corporate partnerships can assist in the advancement of theoretical and practical skills. Here there is an opportunity for Chongqing universities to extend international university relationships and exchanges, and share best practices, knowledge and experience.

Industry partnerships with universities are also an excellent means of bridging academic and practical skillsets. HP has a track record of collaboration here in China with partnerships with Xi'an University of Technology, Sichuan University of Media and Communications, and the Communication University of China. These initiatives saw the development of training centers for engineers, flexible curriculum development and the founding of centers of excellence to cultivate talent in emerging fields.

Establishing a digital transition strategy and building capacities for talent development will allow for local government, academic institutions and the private sector to act as the agents of change required to accelerate technological upgrades and the adoption of new growth models. To achieve this, key priorities for Chongqing are:

1) Establish a technology center focused on understanding and deploying digital tools/technology that leads to productivity gains and development of new business models.

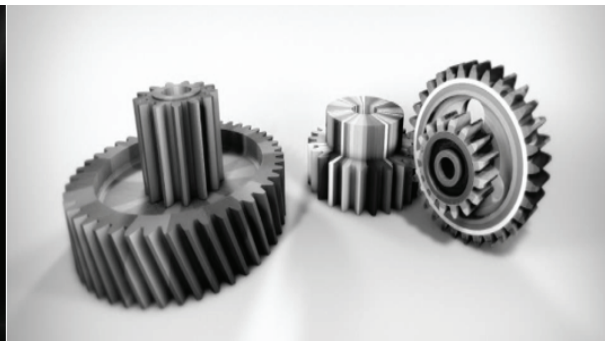
a. Key focal areas may include data management and analytics, advanced sensors and object tagging, automation and robotics and additive manufacturing processes

2) Partner with global market leaders, capitalizing on new technologies, and provide a basis for skills transfer and skills development.

3) University partnerships and education models to support the development of the skills necessary to drive the future growth of production based services.

a. Key focal areas may include foreign language development via exchanges, international business, economics, digital marketing, engineering and technological skills development

4) Collaboration among industry, academia and government to foster a sustainable ecosystem for digital development and the enhancement of Chongqing's industrial base.



CONCLUSION

The Chongqing-HP partnership began in 2008 and since establishing production in the municipality, HP now produces a wide range of PC and printing products and related accessories. Chongqing production represents 60% of our global supply base, using the large ecosystem in and around Chongqing, all of which has been developed in close collaboration and partnership.

The logistics infrastructure we jointly developed in support of this ecosystem has been an enormous success, nowadays being a large contributor to the One Belt, One Road initiative. We can conclude that there is now a very solid foundation to further expand the opportunities for Chongqing to transform itself from a regional player to a leading global business hub, expanding the established ecosystem and logistics infrastructure to other industries, including automotive, pharmaceutical, agriculture and potentially chemical industries. This will drive economic progress beyond Chongqing and even beyond the Chinese border, extending all along the trade and logistics corridor.

Looking to the future, Chongqing should prepare and focus on developing for next generation supply chain requirements. To remain competitive, not only within in China, but worldwide, it is essential that there be an ongoing focus on boosting productivity via the adoption of digital tools and disruptive technologies, and ensuring workforces are educated and prepared to compete in a dynamic global marketplace.