AROUND THE WORLD OF IOT

In this column we plan to take a tour around different physical locations in the world with the objective of highlighting the peculiarities of the trendiest IoT-related applications in selected regions. Thus, the "IoT World" will certainly be physical, but traveling around it shall also expose to the readers how different application domains have been addressed, with particular attention to business sustainability.

IoT in China: What Does the Future Hold?

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At the beginning of 2011 I had the pleasure of coordinating a big collaborative project where a Chinese company from the Wuxi area was involved. I was surprised to see through their eyes how quickly, within a couple of years, entire cities were built out of bare land and, while we were researching how to embed cognitive technologies into IoT, how those new cities would become technologically equipped at a much faster pace. The lesson from that project was that when duly supported, things can happen very quickly indeed in this part of the world.

In this issue we take a trip to the Land of the Dragon and give an overview of what IoT currently looks like in China, focusing at first on a tech sector that recently slumped, due to over-investing in startups, which is making uncertain the future of consumer based IoT. We then briefly talk about the Chinese government's plans to fuel growth with substantial investments in industrial IoT applications. We then conclude with an interview with Professor Bo Ai from Beijing Jiao Tong University, who further reinforces our findings.

The Chinese Economy and the Tech Sector

China's economy has experienced exponential growth in the past 20 years, driven by the tech sector. On the other hand, the last couple of years have seen a slight slowdown in such a phenomenal growth. Figure 1 illustrates China's GDP (black) compared to a fitted exponential curve (grey).

Similar considerations can be made about China's tech sector (often referred to as its "new economy"), for which the growth and the recent slump are more pronounced. What can we say about the causes of this and how does it all relate to IoT? Are we witnessing a tech bubble that is about to burst or is it a natural deflation due to a tech sector becoming increasingly saturated?

Looking more deeply at what happened in the Chinese tech sector in the last few years, we have experienced a sort of "gold rush" that started about 2012, bringing a substantial flow of capital that enabled the creation of many startups, culminating in the staggering figure of one unicorn (company reaching the $1B valuation target) every three to four days in 2018 (there were 100 tech groups that reached the unicorn status that same year[1]). Those days seem long gone and one example among all, related to sharing economy services, seems to be significant and representative of what happened.

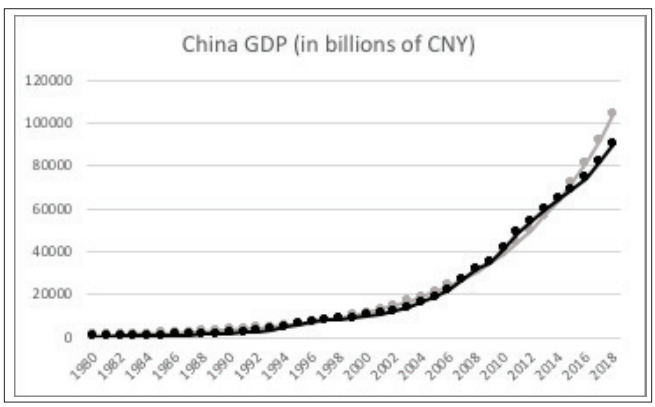

FIGURE 1. China's GDP (black) compared to a fitted exponential curve (grey).

The Slump in Chinese Sharing Economy

Before delving deeper, it must be noted that sharing economy and IoT go together like a horse and carriage. Repeatedly sharing one object among continuously changing users requires both a) the ability to uniquely identify the object, and b) the ability to locate it. Combining these "hardware-related" aspects with adequate software for billing and easy to use apps, is what produces sharing economy solutions. This is a very straightforward business model ("I rent what I cannot afford to buy/own"), which has existed for centuries if one thinks about real estate as an example. And it has been easy to implement and useful for renting out bulky objects that do not easily move (e.g., houses) or that are difficult to hide away (e.g., cars). Extending similar business models to sharing smaller size and portable objects has never been a viable option until recent years, thanks to technological advances. The IoT or, to be more precise, the Internet of connected objects, has enabled user-object short-lived associations to be easily tracked and efficiently billed for.

Zooming back into our "IoT in China" thread, we analyze here the bike sharing use case. Mobike and Ofo are two bike-sharing companies (the most popular among hundreds existing in China) that fell victim to their own success and lack of due diligence in managing endless growth versus aiming for positive cash-flow. They (together with 60 other competing companies in China[2]) rode the "easy money" wave of sharing economy popularity coupled with availability of money to invest. In fact, besides bicycles and cars, in China one can today easily find shared offices and homes, as well as power banks, umbrellas and even basketballs.

Like in the early years of this decade, when the development of new smart city projects was favourably supported by the government, Chinese rapid economy growth has created a consistent capital availability which, coupled with IoT technology advances, has paved the way for the creation of many startups. In many cases, new actors have entered the same sector (see bike sharing) at the same time, favored by a lack of regulation, resulting in much competition and unforeseen saturation risks. This saturation slowed demand, which started hitting those who ignored due diligence in their business plans. Reduced revenues and aggressive pricing resulted in unpaid supplier bills, which eventually led these companies to the brink of bankruptcy after a rollercoaster ride that has seen them reach the top of their value as unicorns and plummet in the span of not more than five years. The results are now visible in many big Chinese cities, with piles and piles of unused bikes littering the streets[3].

At the time of this writing, it is unclear whether this use case has taught a lesson and whether or not the sharing economy will continue to grow. What is certain is that investors have become a little bit more cautious about inflating potentially dangerous bubbles and hopefully are more aware of the negative consequences of an unregulated goldrush, be it generated by private or government investments.

What Does the Future Hold for IoT in China?

To sustain its growth in the tech sector, a few years ago the government launched the Made in China 2025 plan, for which many draw similarities of intent to the German Industrie 4.0 plan. Here the Chinese government, local authorities and banks have pledged 300 billion USD to transform and improve the competitiveness of the nation's manufacturing industry. The ability to achieve data-driven, more intelligent and higher quality manufacturing cannot be done without Internet connected objects, which are the main source of data underpinning such a plan. Technology is already there: these years of "new economy" boom have positioned China in the front seat for global IoT market share. A Berg Insight report[4] highlights that the global number of licensed IoT connections has reached 1.2 billion in 2018, with 63 percent of those registered in China (grown exponentially from under 100 million in 2014).

With its intense history, ambitious goals and technology base (with operators such as China Mobile, Asia Pacific Telecom Group, China Telecom, and China Unicom driving blanket coverage), there is no doubt that China offers huge opportunities ahead for IoT solutions producers. In this column we shed some light as to why the consumer market might not be the most promising one for the imminent future, given what happened in the shared economy sector.

Given this context and the recent history and facts about rapid growth in government backed sectors, the best bet for IoT in China remains on smart solutions for intelligent manufacturing. The Made in China 2025[5] program aims to meet 70 percen of domestic demand with national products (up from 40 percent), to reduce dependence on foreign suppliers and to target higher value manufacturing products and services to sustain growth in the tech sector.

The Expert's View

While the current trade war with the U.S. might have been putting a break on these plans, we sought the opinion of experts working in the field and report here our exchange with Professor Bo Ai, Deputy Executive Director of the State Key Lab on "High-Speed Rail Train and Services Technology" at Beijing Jiao Tong University. He confirmed that the industrial IoT is now being given great attention by the Chinese government. Additionally, the IoT in China will be widely used in many areas such as robotics, maritime equipment, forest and farmland monitoring, irrigation, autonomous and energy efficient cars, and the rail traffic area.

Among the foreseen problems that are still hindering IoT adoption in China, Prof. Bo Ai sees the maturity of the related technology and equipment as well as the remote management of billions of IoT devices posing important challenges. Moreover, IoT implementation in some special areas also need substantial electric energy supply, limiting the scope of usability for current solutions.

As far as the application domains where IoT has already found adoption away from the above-reported consumer market, Prof. Bo Ai mentioned the current use in forest-fire monitoring and automatic irrigation for agriculture, especially in the regions with luxuriant forests and vast tracts of farmland such as the Jilin Province with large forests, and the Heilongjiang Province and Xinjiang Province with large farmland. Besides infrastructure and working condition monitoring, Prof. Bo Ai thinks that rail traffic communication will increase its IoT adoption to improve related management and services. Railway transport is also among the targets of the Made in China 2025 program, where the aim is to have overseas business worth 40 percent of the total[6] in this category. In this domain Prof. Bo Ai reported that there is already a vast use of RFID, which has been widely adopted in many railway lines for the registration and tracking of train carriages and cargo. Now, there are thousands of sensors equipped on the train, train track, or electric power lines along the railways. The near future will see IoT used in high-speed railways (HSR), which are developing very fast in China. For the next 15 years, China Railway has plans to develop intelligent railway solutions increasing automation of its services. IoT for Railway (IoT-R) has been a hot topic and it will provide an improved customer experience for passengers, and also ensure the safe operation of the high-speed trains. This will be highly relevant where there are many high-speed railway lines as in Beijing, Shanghai, Guangdong, Harbin, Zhejiang, Xi'an etc., where IoT-R will be widely used.

When asked his views about the recent apparent cooling of the Chinese tech sector[7] and discussing the future for IoT, Prof. Bo Ai is confident that despite current glitches, the future outlook is positive: the development of IoT in China is part of the next 15-year plan, especially the industrial IoT. It is still a National strategy. The Chinese government is still putting a lot of research and development funds into IoT. The future of IoT in China is bright not only in B2C, but in more and more B2B areas of the industrial context.

Conclusions

Looking outside the Chinese context, Prof. Bo Ai's analysis resonates well with current challenges faced by the IoT research community around the world. Industrial IoT encompasses Robotics, AI and Edge Computing, which are trends that, on the one hand will substantially contribute to the billions of data sources we will deal with, while on the other will add features that will increase the capacity to "simmer down" data, increasing in turn the flexibility of our future IoT networks and their ability to scale up. On this front we should definitely expect an important role for Chinese technology, also in light of recent news for imminent 5G launch[8] and considering that 36 percent of all 5G patents worldwide are owned by Chinese firms, according to the *Wall Street Journal*.

Despite the recent cooling off of the tech sector, the outlook seems to be positive and perhaps less volatile, given the recent lessons learned, given the sustained investments as well as the potential new technologies being unlocked, especially in the industrial domain.

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FOOTNOTES

[1] https://www.ft.com/content/12de9fde-22dd-11e9-8ce6-5db4543da632
[2] https://time.com/5218323/china-bicycles-sharing-economy/
[3] https://www.theatlantic.com/photo/2018/03/bike-share-oversupply-in-china-huge-piles-of-abandoned-and-broken-bicycles/556268/
[4] https://techblog.comsoc.org/2019/05/20/berg-insight-china-driving-global-cellular-iot-adoption-via-nb-iot-5g-iot-coming-in-late-2020/
[5] https://en.wikipedia.org/wiki/Made_in_China_2025
[6] https://www.scmp.com/economy/china-economy/article/2183188/chinas-plans-dominate-hi-tech-sector-hit-stumbling-block-us
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[8] https://www.reuters.com/article/us-china-telco-5g/chinas-state-telecoms-to-launch-5g-services-on-friday-idUSKBN1XA0JC