The Development Model and Countermeasures of China's Next Generation AI Industry

Du Chuanzhong, Hu Jun & Chen Weixuan*

Abstract: In the new round of IT revolution, the AI industry has become a new engine driving economic growth. In such a context, major developed countries actively prepare and plan for this industry, and China also attaches great importance to next-generation AI development. At present, the China's next-generation AI industry has distinctive shortcomings in the development of core chips, basic algorithms and corresponding talents. China should make full use of its enormous advantages and favorable conditions in technology and sensibly choose from a development model of business innovation, fast iteration, application layer driving base layer, and self-developed technology standards. By drawing on the experience of developed countries, China can accelerate its building and improvement of government supported mechanisms, upgrade its system of venture capital and services, enhance the advancement of basic research in chips and algorithms, and invest more in the cultivation and introduction of next-generation AI talents in a bid to quickly strengthen the core competitiveness of the China's next-generation AI industry.

Keywords: next-generation AI industry; developed countries; development model

So far, the AI industry has experienced three development tides. At an academic conference held at Dartmouth College in 1956, scientists for the first time ever proposed the concept of artificial intelligence (AI), thus initiating the first development tide. In the 1980s, the emergence of the "Expert System" marked

the start of the second AI development tide. As Apple and IBM continued to improve computer performance their systems eventually outperformed the "Expert System," resulting in the decline of AI development. In 2006 Hinton proposed "fast learning Algorithm" which significantly improved algorithmic efficiency and facilitated breakthroughs in AI voice recognition, image processing, etc. In 2013 deep learning respectively achieved 99% and 95% accuracy of voice and image recognition,[1] which facilitated the commercialization of AI technology. This injected great vigor into the development of the AI industry which fueled by market mechanisms entered a stage of rapid development. With relevant countries including AI into their national strategies Internet industries both in China and abroad accelerated their development giving rise to the third tide. In the new round of the IT revolution, the AI industry is expected to become a new engine driving economic growth and an essential catalyst for the transformation and upgrading of traditional industries. Against this backdrop, China attaches great importance to the development of its AI industry. In July 2017, the State Council issued Development Planning for a New Generation of Artificial Intelligence, officially including the development of the AI industry into China's national strategy. In order to better advance the AI industry, China needs to explore a development model and countermeasures for the next-generation of AI development based on a thorough analysis of its pros and cons in this regard.

1. Major advantages and disadvantages facing China's next-generation AI development

So far, the next-generation AI industry has formed a sound value chain consisting of a base layer, a technology layer and an application layer. The base layer consists of core hardware (CPUs, GPUs, etc.) and algorithms (deep learning, etc.). The technology layer consists of voice recognition, computer vision and other technological R&D aspects. The application layer refers to the specific application of AI technologies and products in a particular domain or scenario. China has already formed favorable conditions and unique advantages in next-generation AI development. Yet, there is no shortage of pressing challenges to be addressed.

1.1 Major advantages facing China's next-generation AI development

1.1.1 Multiple technologies at the technology layer being at world-leading levels

In contrast with the situation in the base layer, Chinese enterprises in the technology layer have already acquired cutting-edge technologies and therefore are freed from dependence on foreign technologies. Take computer vision as an example. In 2015 Baidu announced that its facial recognition error rate had decreased to 0.3%, which was even lower than those of Google and Facebook at that time.[2] This showed that China was already a leading player in computer vision technology worldwide. In terms of voice recognition, judging from domestic market share in 2017, IFLYTEK Co., Ltd. (iFLYTEK) accounted for 44.2%, Baidu 27. 8% and Apple merely 6.9%.[3] That is to say, the domestic voice recognition market was virtually dominated by a few players such as iFLYTEK and Baidu.

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① iResearch, 2015.
② Ng, 2015
③ *2017 Chinese AI industry analysis: IFLYTEK dominates voice recognition market*. Retrieved from http: //www.askci.com/news/chanye/20170630/145315101953. shtml.

iFLYTEK

1.1.2 Enterprises at the application layer are enjoying enormous market potential and data support

Given that the next-generation AI industry remains at the early stage of commercialization and industrialization, no monopoly enterprise with absolute advantage in related areas has yet formed in the international arena. This means there is an opportunity for China to foster leading enterprises in the next-generation AI industry. In terms of world-class AI enterprise cultivation, China enjoys huge advantages and favorable conditions. On the one hand, an enormous market potential creates room for startups in application layers and a broad market for domestic enterprises to grow into world-class players. On the other hand, our huge population base generates mass data which can be used to train AI and subsequently optimize algorithms. AI enterprises, through end-products, will keep accumulating user data and providing feedback. In this way, they will accelerate technological iterations, improve user experiences and eventually increase their market share.

1.2 Major disadvantages facing China's next-generation AI development

1.2.1 Breakthroughs in core hardware, i.e. chips yet to be made

At the base layer of the next-generation AI value chain, core hardware mainly refers to chips. At present, mature AI chips include CPUs and GPUs, of which the design architecture of GPUs is more suitable than that of CPUs to be applied in AI. In 2011, Prof. Andrew Y. Ng for the first time applied GPUs to Google Brain. According to his experiment, 12 Nvidia GPUs can deliver the same deep-learning performance as that of

2,000 CPUs. This was quite an achievement.[①] The global computer chip market today is almost monopolized by the USA. Globally, CPU production is dominated by Intel and AMD while the GPU market is almost monopolized by NVIDIA and AMD. It is worth mentioning that all three companies (Intel, AMD, NVIDIA) are USA-based. When it comes to the global market for smartphone chips, the major suppliers are Qualcomm, Apple, Mediatek, Huawei, etc. In the third quarter of 2017, Qualcomm had 42% of the smartphone chip market share, ranking first worldwide. Apple, with a market share of 20%, was second, followed by Media Tek (14%), Samsung (11%) and HiSilicon of Huawei (8%). The USA-based companies remain leading players in the global smartphone chip market. Thus, the chip industry is a "short slab" for China's next-generation AI development. So far, no world-class chip producer has emerged in China. Chips are the key hardware for the next-generation AI industry. Without a say in chip production, China will always be manipulated by others in AI development.

1.2.2 Insufficient development of basic algorithms

In terms of base-layer algorithms (basic algorithms for short), China lacks AI algorithms of its own and most of its algorithm R&D activities merely strive to optimize existing deep-learning algorithms. That deep-learning algorithms are by far the most feasible algorithms does not mean they are the best. Professor Hinton, the "god father of deep learning," still studies algorithms. He has introduced the Capsule Networks in recent years in an attempt to develop an AI algorithm more advanced than the existing deep learning. China rarely makes breakthroughs in basic algorithms. On the one hand, this should be attributed to its insufficient input in relevant research and development, and on the other hand, this to some extent exposes its relative weakness in the theory and practice of basic algorithms.

1.2.3 Talent shortages facing the next-generation AI industry

In recent years, the rapid development of the next-generation AI industry has prompted a steady increase in corresponding talents. According to relevant statistics, AI talent demand in the first 10 months of 2017 was already twice the number of 2016, and 5.3 times that of 2015. At present, China's AI talent supply falls far short of industry demands. The China's next-generation AI industry is challenged by a severe talent shortage. As of October 2017, China's AI talent shortage had exceeded 1 million.[②] China cannot compare with the USA in the next-generation AI talent reserve. Evidently the AI talent shortage has become a constraint on China's AI development. In terms of China's talent base in the next-generation AI development, there were only 1,300 talents at the base layer, as opposed to 17,900 in the USA. At the technology layer, there were only 12,000 talents as opposed to 29,400 talents in the USA. In terms of AI talent attainment, China also significantly lags the USA. China cannot compare with the USA in the population of veteran AI professionals. China's AI professionals with over 10 years' experience accounts for 38.7% of all its AI professionals. This figure is far below that of the USA (71.5%).[③]

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① *A detailed contrastive analysis of AI chips: CPU, GPU & FPGA.* Retrieved from http://www.sohu.com/a/131606094_470053.
② Tencent Research Institute, 2017a
③ Tencent Research Institute, 2017b

2. Major foreign approaches for promoting the next-generation AI development

Given that the next-generation AI industry is still in its early development stage, major developed countries are busy laying down blueprints and enabling the rapid development of the next-generation AI industry through a variety of policies and measures.

2.1 Taking the initiative to formulate strategies for the next-generation AI development

As AI technology is more and more commercialized and industrialized, the next-generation AI industry will gradually emerge as a new driver of national economic development and can significantly increase productivity. Given that, major developed countries attach great importance to next-generation AI development, and are accelerating and guiding their industrial development by formulating corresponding development strategies. For example, the USA successively issued two strategies for next-generation AI development, i.e. National Artificial Intelligence Research and Development Strategic Plan and Preparing for the Future of Artificial Intelligence in October 2016 and later issued a white paper entitled Artificial Intelligence, Automation, and the Economy in November 2016. Japan launched the Fifth Science and Technology Basic Plan (2016-2020) in January 2016, focusing on the development of IT, AI and robotics. In 2017, Japan unveiled a road-map for the industrialization of next-generation AI, intending to advance the utilization of AI technology in three stages to improve the efficiency of manufacturing, logistics and medical treatment. At the 10th meeting of the Council on Economic and Fiscal Policy held in 2017, the Japanese cabinet proposed the Investments for the Future Strategy 2017, calling for the application of latest technologies such as AI and the Internet of Things (IoT). In 2016 South Korea launched nine major national strategic programs (including the strategic program for the next-generation AI industry), intending to boost economic growth and improve South Korean livelihood.

2.2 Financial input to boost the next-generation AI development

Although developed countries have already established sound and complete risk-incentive mechanisms and market application systems, they still hold that it is the government's due responsibility to make up for the market deficiency by providing long-term sustained capital support and application encouragement.[①] Major developed countries are also supporting the next-generation AI development by increasing financial inputs. For example, in January 2017, the UK published a modern Industrial Strategy intending to increase GBP 4.7 billion to the R&D fund to promote the development of AI, robotics, 5G, etc. Another example is South Korea, which published the Robot Furture Strategy 2022 in October 2012. According to this strategy, South Korea plans to invest KRW 350 billion in the converged application of robots and other domains, and aims to usher in an "all-robot" era by 2022. Moreover, the programme of SPARC, planning to invest Euro 2.8 billion to promote the extensive application of robots in extensive areas ranging from factory, midair, land factories, in the air, on land, under water, for agricaltare, health and resecue services and in many other applications, to enhance its industrial and service competitiveness.

2.3 Advancing basic research in the next-generation AI industry

AI technology attempts to simulate the human brain's cognitive functions. Consequently, the exploration

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① He, 2016

of the human brain is a key basic research for the AI industry and enables AI technology to better simulate the brain's cognitive functions and boost AI development. In April 2013, the Obama administration of the USA announced the BRAIN Initiative, with the goal of supporting the long-term development and application of innovative technologies that can create a dynamic understanding of brain functions. In January 2013, the European Union launched the Human Brain Project (HBP) and identified it as a European Commission Future and Emerging Technologies Flagship. Through their respective brain research programs, both the USA and Europe strive to explore the working mechanisms of the human brain to discover how the human brain records, processes, uses, stores and retrieves data and to have a deeper understanding of brain function. Such explorations of brain structure and function will enable them to grasp IT development trends, create more opportunities for IT, AI and other related industries, and subsequently form an edge in industry competitions.

2.4 Accelerating the formulation of technology standards for the next-generation AI development

On the one hand, the formulation of these standards can ensure the fulfillment of interoperability, a key target of AI technology. On the other hand, it helps improve AI technology's reliability and security, enhance confidence in this technology and enable relevant enterprises to increase market share. Accordingly, major developed countries are accelerating their formulation of technology standards for the next-generation AI development. Take the National Artificial Intelligence Research and Development Strategic Plan issued by the USA in 2016 as an example. A key part of this plan is about accelerating the formulation of technology standards for the next-generation AI development. The European Union also attaches great importance to this work, actively advancing legislation for industry standardization. In January 2017, the European Commission's Legal Service passed a resolution calling for the European Commission to put forward legislative proposals on the development of robotics and AI. One proposal concerns advancing the formulation of the next-generation AI development and avoiding standard difference-resulted market divisions within the European Union.

2.5 Enhancing infrastructure construction of public databases

The AI industry needs mass data with high quality for training to ensure constant improvement of algorithms and performance. Developed countries such as the USA actively promote open access to government data to enable the general public to acquire needed government data more conveniently. This move provides abundant data sets for AI algorithm training. Early in 2009, the US government opened its data to the US public via data portal "data.gov." In Preparing for the Future of Artificial Intelligence published in 2016, the US government proposed to implement an "Open Data for AI" initiative with the objective of releasing a significant number of government data sets to accelerate AI research. In 2013 the UK government introduced its G8 Open Data Charter: UK Action Plan 2013, promising to have the government data publicized step by step on its national data portal "data.gov.uk," hoping to rely on this data portal to build a state-level information infrastructure.

2.6 Enhancing talent cultivation for the next-generation AI industry

The development of the AI industry will create a huge demand for AI talents. Conforming to this trend, the USA has included digital technology as a "new basic technique" into its education system to support the cultivation of a diversity of talents with technical expertise. The USA government plans to reform its existing education system by taking the following specific measures. First, it will introduce digital technology courses in elementary and secondary school curriculums to improve national digital knowledge and prepare students for more advanced courses. Second, it will provide financial support for relevant training in the form of seed

funds, career development subsidies, internships, scholarships, summer research programs, etc. Third, it will encourage higher vocational colleges to offer necessary skills training to help workers improve vocational skills and prepare veterans and the unemployed for re-employment. Fourth, it will enhance digital technology education in US universities in a bid to cultivate top digital scientists.[1] In order to accelerate its cultivation of digital talents, Japan proposed the following points in its Investments for the Future Strategy 2017. Including programming into the elementary and secondary compulsory curriculum from 2020 on, selecting outstanding managerial personnel from private enterprises to lecture elementary, secondary school & college students to promote industry-school-institute cooperation, increasing tuition subsidies to in-service employees receiving external vocational training, and strengthening digital technology education at higher-education levels to cultivate top digital talents, etc.

3. Major models for China's next-generation AI development

China's support for next-generation AI development models should be based on two targets. First, the development models should help foster enterprises with influence and competitiveness. Emerging industries can usually give rise to new business formats whose needs can hardly be satisfied by traditional business models. Under such circumstances the development model for business innovation becomes a new option. In addition, the rapid supply of end-products to markets is conducive to the formation of a first-mover advantage. Only AI products satisfying market needs can truly realize industrialization. In this sense, a development model for fast iteration is preferred. Second, the development models should help China's next-generation AI industry have a say in the global value chain. As an emerging industry, the AI industry offers a historical opportunity for China to acquire a say in this regard. To achieve this, China needs to make breakthroughs in its core AI hardware and standards. It should adopt the development model of "application layer driving base layer," and establish the development model of self-developed technology standards.

3.1 Development model of business innovation

The transformation of technological innovation to economic value can only be achieved via a certain business model. The business model serves as a bridge during this transformation.[2] This explains why a new technology's commercialization and industrialization is usually accompanied with the emergence of a new business model. For example, in the IT era Tencent provides users with free instant messaging service, giving rise to a new business model. Thus, it can be seen that the development model of business innovation, emphasizing the commercialization of AI technology, is likely to advance the AI industry and help form a competitive edge. The industrialization of AI technology can be enabled through two approaches of business innovation, i.e. optimizing resource integration and formulating more effective transaction means.[3] Enterprises usually need to acquire various resources to support their commercial activities. In this sense, enterprises' re-arrangement of resources can trigger business model transformations, which involve re-integrating, coordinating and distributing both internal and external resources to achieve a synergy effect and

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① Office of Science and Technology Policy, 2016
② Chesbrough& Rosenbloom, 2002
③ Guo & Shen, 2014

create new value for clients. Take Alibaba's e-commerce platform model as an example. It keeps extending its business scope to logistics, finance and other peripheral industries thus developing a vast e-commerce eco-system to constantly improve customer experiences. In fact, formulating low-cost transaction means can also help innovate business models. For example, Xiaomi Corporation adopts an online direct sales model, which cuts costs by eliminating middlemen and rapidly expanding its user base by providing consumers with low-priced smartphones with high configurations.

3.2 Development model of fast iteration

Fast iteration refers to the constant iterative optimization of products according to market feedback. The fast iteration-based development model features three major advantages. First, it is conducive to cultivating user habits to seize more market share and expand the user base. In the Internet era, users are the strategic resource for industrial development. When the user base reaches a certain scale, network externality can give rise to the Matthew Effect. Second, the introduction of a new product with certain core functions to the market can effectively test whether that product satisfies market needs. If a product fails to succeed, its producer can flexibly adjust its strategy for cost saving purposes. If a product satisfies market needs, its producer can continue to develop new functions for that initial product version to meet ever-changing customer demands. Third, after a new product is introduced to the market, its producer (enterprise) will keep tracking user experience-related feedback, according to which the product will be constantly improved and optimized. The utilization of user experience-related feedback in nature engages users in the process of product development and thus effectively cuts product development costs. In the development of AI-related end products, the development model of fast iteration is preferred. By increasing the speed of responses to market and user experiences, the China's next-generation AI industry can enhance its competitiveness in the international arena.

3.3 Development model of the application layer driving the base layer

The application of AI technology to a certain scenario does not automatically bring along commercialization and industrialization until it is recognized and well received among users. Currently, China enjoys more advantages in the middle and downstream of the next-generation AI value chain, and it is relatively weak in hardware areas (base-layer chips, etc.). Considering this, the China's next-generation AI industry can prioritize its development of the middle and downstream value chain, keep expanding its market share to become a major producer of AI end products, make use of its advantages in the middle and downstream value chain to drive development in the AI upstream value chain, and gradually strengthen China's feeble hardware area (base-layer chips, etc.). There are two possible approaches for the producers of AI-related end products to make use of middle and downstream advantages to drive the development of the upstream (chip) sector. First, producers should build brand image and increase brand popularity among consumers and quickly achieve profitability to provide funds for hardware (chips, etc.) development. Second, Chinese producers of AI-related end products should give priority to independent Chinese brands when procuring chips. This is to support the development of the Chinese chip sector.

3.4 Establishing a development model of self-developed technology standards

Competition in standard formulations has become a commanding issue in global industrial competitions. This is particularly true for information and communications technology (ICT). On the one hand, the ICT industry features a strong network effect. With the improvement of a technology's standard installation

base its network effects will be increased which will eventually lead to a well-known feature expectation and newcomers to the technology will be forced to follow the leader's process. By then, related emerging industries will gradually conform to such a technology standard and thus give play to the technology standard in developing a state-dominated approach to industrial technology. On the other hand, those standards concern substantial proprietary technology, which means standard setters (countries) can gain high returns through technology licensing and secure a first-mover advantage in technology and development. By contrast, the "outsiders," affected by adaptation costs and limited absorption, will be faced with huge disadvantages when they apply new technology standards to industrial development.[1] The establishment of technology standards in an industry means that enterprises mastering those standards will lead the industry and that the competitive landscape of the industry is formed. At present, the next-generation AI industry remains at the early stage of development, with corresponding technology standards yet to be formed. This creates an opportunity for China to race to control the commanding point in this industry. By adopting a development model of self-developed technology standards, China should enhance its competitiveness in the next-generation AI industry and end its adverse situation of "being locked in the low-end of the global value chain."

It is noteworthy that one focus of technology standards competitions lies in installation base.[2] Besides, the improvement of AI algorithm performance requires massive amounts of industry data for training purposes. Only by continuously expanding the installation base can we acquire massive amounts of industry data, which further highlights the importance of the installation base. In order to establish its self-developed technology standards, the China's next generation AI industry should make full use of local enterprises' outstanding capacity of targeting user demands to create better user experiences, keep expanding the installation base, and boost the appeal of self-developed technology standards.

4. Countermeasures for the China's next-generation AI development

Given the development status of the China's next-generation AI industry, by referencing to developed countries' policies and measures, China should accelerate the perfection of its external environment for industrial development and focus on addressing "short slabs" such as weak AI chips and algorithm development, the inadequate base-layer layout, AI talent shortages, etc.

4.1 Building and improving the government supported and ensured mechanisms

The development of emerging industries usually creates new demands for infrastructure construction, i.e. infrastructure replacement and upgrading (railway construction in the steam engine-led First Industrial Revolution; power grid construction in the electrical power-enabled Second Industrial Revolution; information superhighway construction in the IT-driven Third Industrial Revolution; etc.). AI development cannot proceed without corresponding infrastructure construction. The next-generation AI industry is an emerging industry that integrates digital technology with information technology and its development relies primarily on ICT infrastructure construction. When it comes to infrastructure construction, however, market mechanisms fail to work properly which requires government intervention. More financial input should be made in the

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[1] Deng, 2014
[2] Yang, Wang & Feng, 2014

construction of strategic infrastructure needed by the next-generation AI development. The formulation of infrastructure construction plans should be prioritized. China should also introduce feasible preferential policies concerning taxation, etc. to support the next-generation AI development and implement pre-tax deductions for R&D expenses and award technological innovation. It should improve public services, streamline administrative review and approval procedures and shorten the review and approval process. It should formulate a plan to open the data of government authorities in a bid to gradually enable the public to access government data, provide data for next-generation AI training and reduce innovation and start-up costs in this area. Moreover, China should empower enterprises, universities and colleges and R&D institutes to establish state-level centers for chip technological innovation and independently develop cutting-edge chip technology for the next-generation AI development. It should also enact administrative measures on procuring domestically produced chips to help increase the market share of domestic chip brands.

4.2 Improving the venture capital and service systems

As an emerging industry, the next-generation AI industry features high uncertainty and high information asymmetry in its transformation of technological achievements. Consequently, out of security considerations, financial institutions such as banks tend to remain cautious about relevant corporate lending. Under such circumstances, venture capital becomes an effective approach for high-tech enterprises to ease the constraints of innovation liquidity. China should give play to venture capital's important supporting role in technological achievements, commercialization, and industrialization and focus on addressing problems such as unsound mechanisms of venture capital withdrawal, further improve its venture investment systems, and provide incubation services for AI innovation and entrepreneurship. Meanwhile, China should also cultivate and introduce high-end talents who have a deep and accurate understanding of industrial dynamics and market demands, rich experience in enterprise management, as well as an extensive social network.[1] These high-end talents can offer professional value-added services to relevant enterprises and boost technological achievement transformations.

4.3 Accelerating basic research in chips, algorithms and other key areas

First, great importance needs to be attached to basic research, particularly those for chips, algorithms and other key areas. China should adjust investment structures, increase input in basic research, and significantly increase the proportion of R&D funds for basic research. Relying on a batch of national centers for AI chip and algorithm innovation, China should initiate a round of basic research for the next-generation AI chip and algorithm technologies. It should encourage school-run enterprises to carry out in-depth cooperation, establish a collaborative innovation mechanism, and independently develop chip technology and algorithms that can support the development of the AI industry. Second, a favorable atmosphere needs to be created. Basic research often features a long cycle, high risk and a profound accumulation of data for which it often takes a long time before positive results are achieved. The fickle pursuit of quick success and instant benefits should be guarded against in basic research. Also, scientific research personnel (young researchers in particular) should be provided with a relaxed environment for working and living. Third, basic research for chips, algorithms, etc. should be supported with favorable policies. China should introduce preferential policies concerning taxation, etc. to support the development of chip technologies and algorithms in the next generation

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[1] Huang, Wang & Zhu, 2016

AI industry and implement pre-tax deductions for R&D expenses and award technological innovation.

4.4 Enhancing talent cultivation and introduction for the next generation AI industry

In AI competitions talent reserve is the key. The cultivation of AI talents along with the formulation of corresponding talent acquisition strategies is of crucial importance for China to "catch up with and surpass" other players in the new round of the IT revolution. First, China should urge universities and colleges to offer AI programs. Currently, AI related courses are provided by college departments such as computer science and automation but no independent AI-centered program has been established. For that reason China should accelerate the building of a first-level AI program, improve AI layout in a scientific way, and incorporate AI literacy enhancement into the entire educational and vocational training system. It should reform the existing educational system, and appropriately increase enrollments for AI related programs. The launch of AI research programs can prepare top Chinese universities to set up AI related national key disciplines and R&D bases. Second, China should encourage universities and colleges to cooperate with the Internet giants. Relevant enterprises can work with universities and colleges to develop AI related courses and programs, participate in building school laboratories and supporting environments, integrate industry experience and cases into school teaching in an organic way, and create channels and opportunities to industrialize innovations developed by the schools. Third, China should develop an interdisciplinary academic system and build quality AI based ecosystems in key academic areas. For example, cities with many universities, colleges and academic programs should forge AI disciplinary clusters and cultivate tech talents with interdisciplinary technical backgrounds. Moreover, China should introduce a quality migrant admission scheme tailored to global AI tech talents and make full use of existing talent programs such as the Thousand Youth Talents Plan in a bid to attract overseas talents and boost AI talent accumulation.

REFERENCES

iResearch. (2015). *Report on the Chinese AI application market*.

Tencent Research Institute. (2017a). *2017 global AI talent white paper*.

Tencent Research Institute. (2017b). *China vs US: Battling to become world's first AI superpower*.

He Zhe. (2016). Towards AI era—on the US AI strategic direction and its referential significance to the Chinese AI strategy. *E-Government*. (12) .

Office of Science and Technology Policy. (2016). *Preparing for the future of artificial intelligence*.

Chesbrough, H. & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin off companies. *Industrial and Corporate Change*, (3) .

Guo Hai & Shen Rui. (2014). How to transform entrepreneurial opportunity to enterprise performance-Business model innovation as an intermediary & market environment's regulating effect. *Economic Theory and Business Management*, (3) .

Deng Zhou. (2014). The introduction of technology standards and the development of strategic emerging industries. *Economic Management*, (7).

Yang Huixin, Wang Shuo & Feng Wenna. (2014). Competitive diffusion of technology standards from a perspective of network effect—An empirical study on the competition between iOS and Android. *China Industrial Economics.* (9).

Huang Fuguang; Wang Jianye & Zhu Guilong. (2016). The influence of venture capital specialization on the investees' technological innovation. *Studies in Science of Science*, (12) .

Ng Andrew. (2015, Mar 22). *AI to bring about an industrial revolution-like reform*. NetEase Tech. Retrieved from http://tech.163.com/15/0322/10/ALA85CEE000915BD.html.

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