The Developing Process of "Maker" Movement in China and its Future Trends

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Abstract: As a wave of innovation, arising from the post-industrial society in the West, the Maker Movement is showing its unique characteristics in China after being transmitted from the West. The sudden rise of the "Chinese version of Maker Movement" (the Movement) is closely related to the national strategy of "widespread entrepreneurship and innovation". Through festival-making activities and the localization of makerspaces, China has redefined the international maker culture. The impact of the Movement in China has extended extensively and profoundly to the fields of economy, education and culture. In the economic field, the Movement has promoted the popularization of the means of production, changed the relations of production, and created the new economic engine through innovations in economic systems. In the field of education, it has fostered innovative talents through the promotion of deeper learning and educational fairness. In terms of culture, it has enriched the spirit of culture, improved cultural patterns, and innovated cultural concepts. In the coming years, the Movement in China is likely to power the following trends: First, it will develop rapidly as a new economic model and business form; second, it will be more popular in forms of popularization and entertainment; third, the Movement will spread from cities to villages; fourth, even though the Movement may be temporarily halted due to potential failures to break through constraints such as technology, markets, policies, and funds, the Movement in China will generally present a spiraling upward trend.

Keywords: Maker Movement, developing process in China, makerspace

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The Maker Movement originated in the post-industrial society in the West, and is a worldwide innovation movement with the aim of popularizing the idea of open innovation, fostering cultural and technological creativity and promoting the public's creative practice. It craves an adventurous and creative spirit, hands-on practice, opening and sharing, great devotion to technology and an unfaltering pursuit of individuation which are prerequisites for a new wave of innovation. Inspired and motivated by the western maker culture, technologies such as 3D printing which help realize ideas, and the government's supportive policies, Chinese maker and makerspaces have sprung up all over the country and laid the foundation for this competitive industry. Now they are pooling their efforts to propel the "Chinese version of Maker Movement" (the Movement) forward, integrating international practices integrate practices with Chinese characteristics. We analyzed the paths, reasons, means and features of the evolution of the Movement in China and their consequent social effects. During this process, a law regarding the development of the Movement was detected that allows a glimpse of the future trends of the Movement in China.

In China, the Movement is closely related to innovation, entrepreneurship, industrialization and commercialization. The appearance and growth of the Movement coincides with China's aspiration to pursue development through innovation instead of the usual way by relying on factors such as land, resource and labor. China's government has seized the chance, hoping that the bottom-up innovation and entrepreneurship brought by the Movement will promote industrial transformations, an economic boom and social development. At present, the Movement is a tipping point that draws numerous talents, capital and services so that startups launched by makers and makerspaces for incubation can proliferate and idle industrial capacity can be utilized. Against a background of a new economic normal, the Movement beckons social resources for innovation research and demonstrates an intriguing internal logic and a pattern different from the West.

The Developing Process of the Movement in China

Transplants of Makerspaces: German, America and China

The formation of makerspaces, as the primary physical carrier for makers to create new objects independently or cooperatively, marks the rise of the Movement. Derived from the hacker culture and hackerspaces, the earliest makerspace was the Chaos Computer Club (CCC) established by a Germany programmer, Wau Holland, in Hamburg on September 12, 1981. Now it is Europe's largest association of hackers with 5,500 members.[①] Every four years, the Chaos Computer Club would hold an outdoor gathering called the Chaos Communication Camp for world hackers to communicate hacking skills since 1999. In 2007, some American hackers participated in the camp and became

① Entry of Chaos Computer Club, https://en.wikipedia.org/wiki/Chaos_Computer_Club. Retrieved on April 24, 2018.

inspired, so they decided to create American's incubator spaces.

Hence NYC Resistor and HacDC along America's east coast were founded in 2007 and the next year, Noisebridge in San Francisco on the west coast was founded. The earliest makerspace in China remains a controversial issue. In 2009, a group of technology fanciers in Shenzhen built SZDIY, an e-mail software and hardware community with both online discussion and offline gatherings. In 2010, David Li came back to China from Silicon Valley, seeking to establish his own company. He met Ricky Ng-Adam and Min Lin Hsieh who were transferred from Google Headquarters to Shanghai. They hit it off immediately and founded the first offline startup space in China — Xinchejian, with Mountain Dojo, using a maker space near Mountain View, California as their model (Lindtner, 2015). In 2011, FlamingoEDA Open Space moved into a Beijing makerspace. So, from 2009 to 2011, Shenzhen, Shanghai and Beijing successively embraced their own makerspaces which were the first ones to receive the western maker culture and initiate the earliest maker activities in China. Retrieving via HackerspaceWiki, we found 26 registered makerspaces in the Chinese mainland, of which 21 are "active"[①] as shown in Table 1.

Table 1 "Active" Makerspaces in the Chinese Mainland

City	Incubator spaces
Shenzhen	X. factory, Chaihuo, SZDIY, Opensource Makerspace, Trouble Maker, TechSpace
Beijing	Tsinghua i. Center, FlamingoEDA Open Space, YFF, Qspace, Largo City Hackerspace
Shanghai	Xinchejian, Coderbunker, 88 Spaces
Chengdu	IChengdu, Tinymake, SWJTU Makerspace
Wuhan	Wukong Club
Guangzhou	HackerSpace@GZ
Dongguan	DongguanMaker
Nanjing	Nanjing Makerspace

The latest update of the website, though, was March 9, 2014, so the data reflects only the early development of China's makerspaces. In comparison, there are 444 "active" and 99 under-preparation makerspaces in the US at the same time. China's makerspaces are frequently guided by European and American pioneers. For example, Mitch Altman, the founder of Noisebridge, has visited China many times as a "global Movement ambassador".

① Wiki website of makerspace, https://wiki.hackerspaces.org/China. Retrieved on May 7, 2018. Note: makerspaces registered in the website do not include enterprise incubators and accelerators.

Spread of Ideas: Popularization with Festivals, Exhibitions and Competitions

Maker festivals, exhibitions and competitions are an important impetus for the popularization of the maker culture. Dale Dougherty, the co-founder of O'Reilly Media, launched the *Make* magazine in 2005 and, inspired by Chaos Communication Camp, held the first Maker Faire in the San Francisco Bay Area in 2006. The Makers Faire dispensed with the rigorous and insipid technology-orientation and integrated the form of the traditional fair in American agricultural society into the gathering.① It is almost like farmers exhibiting their harvests — in this event, makers show off their works and compete with others. It is a platform for exhibition and communication. Successfully, Dale Dougherty disneyfied Germany's Chaos Communication Camp. As a result, the Faire is much more open and entertaining and rapidly became a great party ("The Greatest Show-and-Tell on Earth") for makers all over the world (Dougherty, 2017). The strong appeal and effective advertising ignited the exponential explosion of maker populations in the world. In 2017 alone, as many as 1,580,000 people from 44 countries participated in 221 maker fairs.②

In China, the maker culture is also popularized through various large events, including Maker Fairs and China-US Young Makers Competitions. In 2012, the Chaihuo Makerspace was authorized by *Make* magazine to introduce a maker Faire in China. The first station was Shenzhen. By now, Maker Faire Shenzhen has been held for six consecutive years and has grown from a mini to a featured festival. Meanwhile, Maker Fairs also blossomed in Beijing, Chengdu, Xi'an and Hangzhou. In October 2015, China's government initiated the program of National Mass Innovation and Entrepreneurship Week (NMIEW) in eight cities. There were more than 100 thousand visits in Chengdu alone. The Week has been held for four years in succession. During the NMIEW 2016, 700 enterprises and 1 million visitors were involved in more than 400 sessions of Enlightening China.③ In 2017, NMIEW was first held overseas, including Silicon Valley, Berlin and Sydney. There are also city and community-level activities, such as the K12 Teenage Marathon, the Tianjin College Student Maker Marathon, and the Guangzhou Maker Marathon. Events at all levels (see Table 2), as an important driving force, provide a platform for communication and cooperation between makers, promote the popularization of the maker culture and energize the innovation atmosphere throughout China.

① The information comes from an interview with Dale Dougherty, the founder of Maker Faire, by Huang Yurong, one of the authors of the article, on March 4, 2016. According to Dale Dougherty, "e" in "Faire" is to balance the number of letters with "Maker", and the maker movement is in the Electronic Age, so he added an "e" after "Fair".

② Statistics from Maker Faire, https://Maker Faire.com/media-center/#fast-facts. Retrieved on April 24, 2018.

③ Organizing Committee of NMIEW: 2016 National Mass Entrepreneurship and Innovation Week Successfully Ended. http://business.sohu.com /20161020/n470784567.shtml. Retrieved on April 15, 2017.

Table 2 List of Major Maker Events in China

Name	Organizer	Form	Function and Influence
Maker Faire	*Make* magazine and Seeed Studio (Shenzhen)	Innovation Fair, Maker Show, Maker Workshop, Maker Forum, etc.	A platform for makers to show their ideas and a link between makers and the public. Great appeal and advertising
China-US Young Maker Competition	Ministry of Education	Consists of Division Competition and Final Competition. In the Division Competition, teams are required to prototype the products and service systems according to the theme of the event; in the final, teams are required to prototype an idea in 48 hours.	Encourage young makers to innovate new products and applications with social and economic benefits. Promote cultural exchange between China and the US.
National Mass Innovation and Entrepreneurship Week	The State Council	Achievement exhibitions, conferences, forums, cultural communication, project roadshow, public competition, service provision, achievement transformation, etc.	An exhibition, promotion and resource-sharing platform for innovators and entrepreneurs. Promote the balance between supply and demand and the integration of traditional and emerging industries.
K12 Teenage Marathon	Zhongguancun Innoway	Teenage makers are required to convert their ideas into products with open-source hardware and 3D printing within the prescribed time.	Arouse teenager's interest in scientific theories and develop enthusiasm in innovation and hands-on practice.
Community Maker Carnival	Nanshan District Committee of the Communist Youth League of China and Nipisi Maker Technology Services Co., Ltd	Technology and handicraft classes (such as DIY laser engraving, AI, shadow puppet handicrafts and paper flower handicrafts) are provided in the Maker Workshop in communities.	One of the projects to improve people's living standards in Nanshan, Shenzhen in 2017. Nearly 20,000 residents were involved in the event. Promote the popularization of maker culture in communities.

Innovation of Institution: Localization of Makerspace

The form of existence of western makerspace mainly includes makerspace, hackerspace and fabrication laboratories (or fab labs). Makerspace is not demanding on a maker's technology level while hackerspace is "black technology"-oriented. A fab lab is operated by a core organization with a unified equipment configuration, which sets it apart from the other two. By May 2018, 22 Chinese fab labs were authorized.[①] However, difficult courses, language barriers, time differences for teaching and tools impeded the operation. Hence some maker training organizations are trying to localize the fab labs. Makerspace and hacker space have also been reformed and reconstructed to some extent

① Official website of Fabrication Laboratory: China, https://www.fablabs.io/labs?country=cn. Retrieved on May 7, 2018.

with the basic configuration being reserved to accommodate China's conditions.

"Mass Innovation Space" is one of the evolutionary results of makerspace in China. It is "redefining the international maker culture", as Wen Wen (2017) said. In 2015, China defined Mass Innovation Space as "a collection of new entrepreneurship service platforms that are characterized by low-cost, convenience, all-factor and open and built via market mechanism, professional services and capitalized approaches to conform to the features and demands of innovative startups in the internet era" (Yang & Shen, 2016). Since then, Mass Innovation Space has become common knowledge to Chinese people. Mass Innovation Space has a broader intension and extension than makerspace and is integrated with more Chinese characteristics. Mass Innovation Space is more of an incubator for new projects and a cradle for commercialization than an ordinary workplace or social place. According to statistics from the National Development and Reform Commission, there are more than 4,200 Mass Innovation Spaces in China,[①] which is greatly different from the number of makerspaces we have found in wiki. The reasons for this are that, for one thing, wiki's data has not been updated for years; for another, it is due to the different statistical calibers — wiki only collects registered makerspaces that strictly comply with the international standards, while the Mass Innovation Space includes incubator spaces, start-up cafes, innovation works, etc., and NDRC also takes into consideration the spatial carriers in the start-up incubation chain, such as workplace, cyberspace, social space and resource sharing space for innovators as well as incubators, accelerators and industrial parks for start-up enterprises.

Since 2015, with the concerted efforts of people from all walks of life, incubation-oriented makerspaces have mushroomed in China with various players involved in the construction — the government, enterprises, voluntary sector, startups and makers. The functional orientation and the spatial forms have become clear and diversified (see Table 3) — pure interest groups, platforms for the popularization of the maker culture, platforms for skill training, incubators, accelerators, startup social spaces and university incubator spaces, etc. Hence a complete service system was born, which enables a maker to start from scratch and provides it with skill training, communication platforms, hands-on practice, commercial incubation and tutor guidance.

Table 3 Orientations, Functions and Main Bodies of Mass Innovation Spaces in China

Orientation	Function	Representative	Main Body of Construction
Interest group	Based on interest, individuals raise funds to establish a group in the startup space.	SZDIY	Makers
Skill training	A platform for skill training and popularization of maker culture. Help people know and master certain skills.	Chaihuo Makerspaces	S&T enterprises

① Policy Research Office of NDRC, "Innovation and Improvement of Macroeconomic Regulation Going On, Economy Shows Steady Growth," http://www.ndrc.gov.cn/gzdt/201708/ t20170808_857190.html. Retrieved on April 24, 2018.

Orientation	Function	Representative	Main Body of Construction
Project incubation and acceleration	Provide support including product development sites, prototype production conditions, supply chain or mass production consulting, business tutors, etc. to motivate enterprise innovation.	Haire Makerspace	S&T enterprises
Social space	Mostly cafes, restaurants, and bookstores that serve as an exchange platform to organize theme activities where investment and technical experts are invited. Some also serve as an incubator.	3W Coffee	Financial institutes
Co-working space	Provide meeting rooms, leisure areas, WiFi, coffee, etc. A shared office for individuals and teams without interfering each other. A place to share ideas, information and resources. Some co-working spaces also participate in new projects as an inventor or financer.	SOHO 3Q	Real estate companies
University Maker space	With open resources of universities, it provides student makers featured project-oriented and task-based courses that are combined with hands-on practice. Sometimes these are a convergence point for high-end innovation resources from scientific research institutions, supplying effective original technical innovations.	Tsinghua University X-Lab	Colleges and universities

The institutional innovation and improvement of makerspace in China shows the same trajectory as the 40 years of opening up and industrial evolution. In the Movement, the government grafts the innovation functions of makerspaces and the incubation functions of incubator spaces onto the Mass Innovation Spaces, making it a comprehensive training and service platform with fewer barriers and more functions to accumulate resources, information, talents and services to better serve innovation and entrepreneurship.

Social Impacts from the Developing Process of the Movement in China

The Movement empowers individuals with development creativity and stimulates their creative mentality to solve new challenges, produce new tools, develop new thinking and create new opportunities through hands-on practice. The development of the Movement has extensively and profoundly impacted the economy, education and culture of China. "Society" designated in this article refers to the interrelated human community based on certain activities in material production, such as Western society, Chinese society and other concepts, rather than "society" in the sense of "social formations" such as social political, economic and cultural structures.

Economic Impact of the Developing Process of the Movement in China

From an economic perspective, the Movement has had an overall impact on the means of production, relations of production and productivity in the era of "post-Fordism". From the beginning

of reform and opening up to the Global Financial Crisis in 2008, China's manufacturing industry basically ran in the track of "Fordism" characterized by mass production, vertical organization and standardized production. However, since the new century, as the market for mass production has gradually become saturated, consumers have become increasingly tired of standardized products and presented more and more unpredictable demands. Meanwhile as technological developments, driven by the third industrial revolution, enabled increasingly easy development of new products, "Fordism" was hard to sustain. The Movement characterized by putting emphasis on meeting the individual demands of consumers appeared to mitigate this problem to a certain extent and had omni-bearing impacts on the economy as follows:

Promoting the popularization of the means of production

The widespread entrepreneurship and innovation must keep a grasp on the means of production as the Movement accelerates the progress of the popularization of the means of production. With the development of internet technologies, popularization of information technology resources from e-commerce platforms such as Jingdong and Taobao is disorganizing the former vested interest chains developed based on information resource monopolies to propel tremendous changes to social economic operations. The free flow of information technology resources expands the means of production open to the general population providing more possibilities for individualized production and consumption. Meanwhile, the application of individual desktop manufacturing tools also promotes the popularization of manufacturing technology resources. Such production and manufacturing resources as laser cutting machines, 3D printers and 3D scanners originally belonging to factories and laboratories are now being utilized by the individuals.

Changing the relations of production

The Movement promotes change to the relations of production. As the acceleration of iterative innovation of products, a single enterprise cannot meet the users' diversified demands, therefore enterprise outsourcing services have appeared; the relationships between labor and capital, between producer and consumer and between supplier and retailer have moved from confrontation to cooperation. R&D, production and sales departments in the enterprises establish closer relations to form a cooperative and shared network and these new relationships of production remodel the production management pattern. In the traditional era, theoretical innovation and technological innovation were mostly undertaken by research personnel and scholars and had little information and resource exchanges with the outside world. In the maker era, users having ideas and creativity can also become a force to drive industrial innovation, expanding the innovative groups and increasing the sources of innovation. Furthermore, the makers are keeping an open mind regarding the exchange of resources and information with the outside world, so they can grab dominant and recessive market demands in a timely way, reduce mismatch of goods and meet the users' diversified demands.

Creating a new economic engine

The Movement has created a new economy engine by energizing enterprise innovation. The "Long Tail Theory" proposed by Chris Anderson, the leader of the Movement, considers that according to the Pareto Principle, the 20% popular products occupy 80% of the market, while the 80% less popular products occupy only 20% of the market, forming a long fine tail. Although it is difficult for maker production to replace mass production, it can give play to advantages in multiple varieties, small-lots, individualization and customization to meet the demand of the 20% niche market. Makers' innovative behaviors in startups will perfect the hierarchical structures of enterprises, rejuvenate the market atmosphere, help enterprise growth and create more job opportunities and become a cornerstone of economic development. Paul Graham, known as "The godfather of entrepreneurship in Silicon Valley", the founder of Y Combinator (YC for short) as the best-known top incubator in Silicon Valley, also considers that startups constitute a revolutionary economic force, equal in significance to the advent of agriculture, the rise of cities, and the emergence of industrialization (Stross, 2014).

Paulo Blikstein and other scholars think the fact that China fosters more engineers and computer talents to meet the demands for industrial development is one of the reasons that the Movement has arisen (Blikstein & Worsley, 2016). China's market economy system is improving and the current Movement has greater business value and potential of sustainable profitability than the "fever of invention" in the 1980s and is thus considered to be a new economic engine. In the tide of entrepreneurship raised by the Movement, a rush of high-tech enterprises and internet entrepreneurship elites has emerged, digging potential consumer demand and producing many new products, experiences, industrial structures, business models and even social development forms representing the future direction of development. Although at present the maker economy only accounts for a small portion of the national economy, public focus and concerns and development prospects have exceeded any traditional economic activities.

Educational Impact of the Developing Process of the Movement in China

Innovative and creative talents are the main force for the construction of an innovation-oriented society and the intrinsic request of the information society. The Movement places creativity above efficiency and encourages people to emancipate instinct, improve well-being and become innovative talents through creation. Cultivation of innovative talents requires good education. Progress of the Movement has forced education reform, after which the objective to cultivate innovative talents was set and the idea of deeper learning and educational democracy and fairness were further disseminated.

Promoting deeper learning

Deeper learning includes higher level and active cognitive processing. Guided by the principle of fostering students' creativity and critical thinking it respects the individual interest and emphasizes action, sharing and cooperation as well as open and independent "project-based learning". In

the face of existing problems in life, students are required to make use of internal and external resources such as independent research, expert consultation and teamwork to solve problems and complete projects. In this process, the teacher will guide the students to "think and solve problems like experts" to improve their comprehensive abilities. Digital tools in the maker education such as 3D printers and numerically controlled machines enable students to realize their ideas, achieving technological "democratization" and "mass amateurization". Students are encouraged to make, share and show their creations during which "dormant" knowledge in their brains will be aroused to solve the problems they are facing. Then, with suggestions from other people, they may develop an idea of how to deal with similar situations in the future. In response to disappearing industrial boundaries and increasing trans-boundary integration, the Movement backs interdisciplinary teaching to improve students' problem-solving ability in simulated scenarios. Through deeper learning and "cooperative creation", individual creativity of Chinese students that was once disesteemed is being stimulated. And as a result, the educational world has entered a period of serious introspection and reform.

Promoting educational fairness

The Movement, with the internet as a major intermediary, keeps education out of the restrictions of time, location and living standards, "everyone can learn everything everywhere." Meanwhile, long-term unbalanced development and uneven educational resource distribution have been remitted to a certain extent. For example, NetEase Open Course has built a network sharing knowledge by virtue of the internet and broken through the temporal and spatial limits of a traditional class, enabling the freer spread of knowledge and better resource allocations. Since the release of NetEase Open Course in 2010, NetEase has selected thousands of open course videos taped by foreign and domestic prestigious institutions of higher learning including Harvard, Oxford, Peking and Tsinghua universities. In addition, it also cooperates with Khan Academy, TED and Coursera to update and push course videos that meet Chinese users' requirements. By now, NetEase Open Course has accumulated nearly 100,000 online educational video resources covering technology, culture, architecture, mentality, history, etc. and has become the largest course video platform nationwide.

"Since 2012, educational institutions across the globe have invested massive human, material and financial resources in massive open online courses (MOOC). One may join a discussion with other MOOC learners in an adjacent makerspace or other public learning space" (Gu & Wang, 2015). Based on the internet, MOOC breaks the monopoly on high-quality educational resources owned by the minority and closes the sense of distance between ordinary and world-famous universities. Tuition fees are not an obstacle to obtaining knowledge anymore and no one will be the monopolist of educational resources any longer. Anyone can find the resources they need if she/he is eager for new knowledge. The Movement promotes educational fairness through sharing educational resources, and in return educational fairness guarantees the equal right to receive high quality education and as well stimulates the creative potential to the utmost extent, thus improving the creativity of the whole nation.

Cultural Impact of the Developing Process of the Movement in China

With the expansion of the Movement, maker spirit and culture are reaching more people and affecting their values, behaviors and choices. The developing process of the Movement enriches the intensions, patterns and values of Chinese culture, forming more open, inclusive and diversified cultural features.

Enriching the intension of Chinese culture

The Movement is an economic change and a cultural transformation which endorses frugal innovation and opposes excessive consumption. After "a sinicization process from mutual understanding to mutual trust and appreciation" (Han, 2013), this trend of thought is contesting the luxury consumption now pervasive in Chinese society and is converging with the traditional Chinese culture of frugality and the low carbon economy advocated in recent years. At the level of regional culture, the largest maker cultural circles in North China, the Yangtze River Delta and Pearl River Delta are interacting and integrating with local cultural resources in the process of development, showing growing influence, acculturation and creativity. The developing process of the Movement in China enriches the Chinese culture and enhances innovative vitality.

Enriching the patterns of Chinese culture

As the first massive scientific creation and popularization movement in China in the new century, driven by technology, the Movement alters social practices and afterward shapes new cultural patterns. It emphasizes informal, networked, peer-coaching and shared learning (Fleming, 2015). When joining maker competitions becomes a common pursuit of young students, participating in maker carnivals becomes a recreation for families, and holding maker exhibitions, fairs, marathons and weekends becomes one of the options for the government, enterprises and the third sector, unprecedented culture patterns will sprout out of these intervals of loose social structures.

Enriching the values of Chinese culture

The Movement uses new technologies and concepts to breed new cultural values, enabling people to realize freedom of expression, creation and spirit in more diversified ways. It abandons narrow cultural conservatism and instrumental rationality and upholds value rationality, inclusion and coordination, opening and sharing and other new concepts. It drives the marginal group originally excluded from the innovative subjects to join the innovative army to form a mass culture where everyone wants to be an innovator and innovation can be made everywhere and constructing innovations can be a game that people enjoy because it is full of infinite possibilities. It breaks the cultures of monopoly, chain stores and consumerism prevailing in China while it reconstructs the cultures of cooperation, sharing, environmental protection, creation and community.

The Movement in China leverages the driving force of the widespread entrepreneurship and innovation to embed itself into the value network of mainstream society, rapidly realizing overall diffusion of value ideas and innovative actions, having a profound impact on such fields as economy,

education and culture, and its developing process in China has received wide attention from the international Maker circle. It is undeniable that as the present world is highly mobile, the Movement also has a dynamic process of development. With the bankruptcy① of Techshop known as one of the largest and most successful chain makerspaces in commercialization in the US, exploring the business model of makerspace becomes the keynote of development. The future trends of the Movement in China become the focal point for maker circles across the globe.

The Future Trends of the Movement in China

Cultural Dimension: Nationwide Popularization and Entertainment

Maker culture originated from the counterculture in the west and developed into a subculture. However, cultural heterogeneity emerged during its development process in China, shaping the pattern where dominant culture, high culture and mass culture have been interwoven. Widespread entrepreneurship and innovation means that everyone can get involved in creation, innovation and

Maker Marathon

① "USA Large Chain Makerspace TechShop Goes Bankrupt, with Proprietary Stores Closed", http://tech.sina.com.cn/roll/2017-11-20/doc-ifynwnty5542225.shtml. Retrieved on April, 27, 2018.

starting a business. The generalization of the maker concept reflects the nation-wide popularization of the Movement in China. Not only technical makers treat creation as a way of entertainment and spiritual enjoyment after work, but also ordinary blue-collar and white-collar workers who are fed up with dreary and repetitive tasks in front of a computer all day — they prefer to achieve the dream of innovation in the process of making things as well as learn new knowledge and new skills. As a result, maker culture has become a high-grade entertainment.

Large-scale maker activities at all levels sponsored by the government or industry associations have promoted the popularization of the maker culture in society, such as the International Widespread Entrepreneurship and Innovation Week, China Innovation and Entrepreneurship Competition, China Robot and Artificial Intelligence Competition, and China Mobile Internet Maker Marathon. In the community, a variety of maker activities are welcomed by people. In pioneer cities of the Movement, activities such as Maker workshops, fairs, carnivals, and spaces have appeared and developed rapidly. Integrated with folk handicrafts, community maker activities encourage hands-on creation to satisfy residents' creational desires, provide more choices of entertainment, and enrich the forms of cultural recreation.

On March 5, 2015, Premier Li Keqiang proposed in the meeting of NPC and CPPCC, "…our society needs to nurture a culture of entrepreneurship and innovation. In this way, while creating wealth, people will be able to meet their cultural and intellectual needs and realize their full potential in life."① With the support of the Premier and the incentive policies and the popularization of all kinds of innovation and maker activities, the Movement in China will be more entertaining and popular and appeal to a larger portion of the population.

Industrial Dimension: New Economic Model and New Types of Business

The new economic model, partly generated by the Movement, has captured the most important factor in productivity, the people. With the greatest exertion of individual potential and group resources, the Movement is now serving as a new engine of economic growth. This new economic model can well satisfy people's emerging consumer demands for personal customization and the sense of accomplishment brought on by invention. It can also promote a balance between production and demand. For example, a maker can raise resources such as technology, capital and channels needed in the research and production process by crowdfunding. Producers can determine the individual requirements of consumers through crowdfunding such as pre-sale before production, to reduce production costs and risks and maximize benefits. These new economic models have optimized the allocation of social resources to the greatest extent, created jobs, innovated the way of distribution, and effectively promoted social equity.

In addition, as a new business model, the maker industry will develop rapidly. Both training

① Li Keqiang: Meet People's Cultural and Intellectual Needs and Realize Their Full Potential in Life. http://news.ifeng.com/a/20150305/43275250_0.shtml. Retrieved on April 24, 2018.

institutes and commercial complexes hope to achieve upgrades and transformations of traditional operational modes with the help of the Movement. For one thing, commercial maker training has developed rapidly. With the popularization of the concept of "Innovative Science and Technology Education" and the promulgation of the *Standard for Science Curriculum in Primary School of Compulsory Education by the Ministry of Education*, innovation and maker education in primary and secondary schools has ushered in important opportunities for development. Training institutions related to unmanned aerial vehicle (UAV) and artificial intelligence programming have gained strong momentum. For another, some maker workshops can be seen in large commercial complexes. As an example, Rainbow Department Store, a famous retailer in Shenzhen, provides half of the total area of its Junshang 3019 Store, one of its high-end shopping centers, for workshops where consumers can design and produce a product by themselves. This new type of business broke the retailing record in Shenzhen against a backdrop of contracting traditional retailing. The same type also appeared in other commercial complexes such as Yifang city. The Movement is going through further cross-border integration with traditional industries, which will give rise to more types of business.

Spatial Dimension: from Urban to Rural Areas

If we open the map of Chinese makers, we will find that "The west is not as bright as the east and the rural is not as bright as the urban." According to research results published in March 2016 by the National Endowment for Science, Technology and the Arts (Nesta), one of the UK's innovation agencies, 75% of the Chinese makerspaces are in southeast coastal cities and 54% of the makers are college students (Saunders & Kingsley, 2016). Obviously, college students are mainly engaged in making activities in cities. In the initial stage of the Movement, the developed cities along the southeast coast led the country due to their advantages in the talent pools and capital. However, with the further development of the Movement, rural areas will become the power source and resource pool of development in the next stage. Regarding the development of China's Movement, Premier Li Keqiang once said, "Widespread entrepreneurship and innovation have broad space in rural areas."[①] At present, the Movement is spreading to second, third and fourth-tier cities and villages, which enables people, especially children in rural areas, to have access to advanced technologies as the children in big cities do, as a way of narrowing the disparities, bridging the technology gap among different areas and sharing the benefits of technology together. "Rural makers and startups have become a bottom-up driving force to explore the value of rural areas. In Guizhou, Zhejiang and other places, rural makers have started a new wave of working in the countryside, promoting the development of homestay facilities, cultural and creative tourism, and ecological agriculture" (Wang & Hou, 2017). In the countryside around Chengdu, Hangzhou and other big cities, it is common for urban makers to return home or go to the countryside to set up maker workshops, which

① "Li Tao: Li Keqiang: Mass Entrepreneurship and Innovation in Rural Areas", http://jjckb.xinhuanet.com/2017-07/12/c_136436674.htm. Retrieved on April 24, 2018.

reflects the spillover effect of the urban movement and the application of urban resources moving to the countryside, and the strategy of city assisting the countryside in the maker circle. Some folk handicraftsmen are displaying and selling their homemade characteristic handicrafts to the outside world through KWai, Taobao, Vigo Video and other channels, which have created both economic and social benefits.

The promotion of the Movement in grassroots and rural areas drives the creative use of local resources, which will greatly activate the idle resources that have not been valued or developed in the vast rural areas and integrate the rural area into the era of rural revitalization strategy. And farmers as well as children in the village can make the best use of their inborn creative skills, which is an important characteristic of a maker, and their intelligence to gain the opportunity to improve their social positions and create wealth. Regardless of who you are or where you come from, the Movement is narrowing the distance between cities and villages and technology and wealth. For instance, the appearance of Taobao has not only made it possible for numerous citizens to become owners of online shops but benefits a broad mass of farmers. Wantou Village in Hubin Town, Boxing County, Binzhou City, Shandong province sold RMB100 million of its local traditional handicraft of straw and willow weaving in 2014, and Zaomei Village, Shangqing Town, Anxi County, Fujian province sold RMB150 million of its famous local rattan iron crafts in 2014 (Qiu, Zhang, Liu & Xu Yingkang). Also, there are many folk craftsmen who have become internet celebrities via Taobao for their exquisite workmanship. According to the Research Report on China Taobao Villages (2017), there are 2,118 Taobao villages in 24 provinces across the country, and online sales have amounted to RMB120 billion[①].

The advance of the Movement at the grassroots level and in the countryside will promote a significant change in the makerspaces in China. For one thing, thousands of the Mass Innovation Spaces that have popped up in the big cities in the past few years will be selected by the market. Those that have strong abilities in resource integration and professional service systems will become bigger and bigger in scale and eventually serve as real effective service chains for widespread entrepreneurship and innovation strategy. However, those "sub-lessors" who rely on policies and subsidies and those who have failed to become competitive will gradually be driven out of the market. For another, Mass Innovation Spaces that are close to the grassroots and serve the public will show up. They may be in cities or village communities and will integrate with local public cultural service providers, such as community cultural centers, libraries, cultural activity centers, etc. They may explore new space in the way of maker convenience stores and maker cultural centers. Besides, makerspaces in libraries, museums, science and technology museums are showing familiar characteristics with cultural spaces, and some cultural spaces and institutes are taking in projects with maker spirit to enrich their activities. The trends of culturalization of makerspace and makerization of

① Taobao Village: The Pioneer of Rural Revitalization to The Research Report on China Taobao Village (2017), http://i.aliresearch.com/img/20171211/20171211101359.pdf. Retrieved on April 24, 2018.

cultural space are rising.

The advance of the Movement at the grassroots level and in the countryside will make up for the natural shortcoming of the Chinese Maker Movement driven by top-down policies and further consolidate the foundation of grassroots and mass innovation, nurture the soil for innovation and creativity, and fully activate and free the vigor of innovation of the public.

Directional Dimension: Spiral-up Trend

From the perspective of a number of media reports, the current Movement gains less attention than that in 2015. After the strong drive of the policy and the spike effect, many capitals stepped out the Movement, including some funded by the government. Some makerspaces went bankrupt, and some financial and real estate elites who once turned to makers in the boom of the Movement abandoned the maker community. Thus, some people claim that the Movement is fading in China. Also, the public's attention on the Movement might gradually decrease in the future but the groups with real maker spirit and that stick to maker concepts will carry on the exploration of the developing direction and breakthrough of the Movement in China. Even though the business model has not become mature enough and the short-term economic benefit is not optimistic, makers' exploration has improved the popularization of the Movement. It's hard to predict whether a startup will achieve success. Some might disappear because they cannot find a sustainable developing business model, and some might be successful in the market.

Looking at the technology history of the recent century, the personalization of complex technology is a trend and a necessity for historical evolution. When the application of 3D printing and artificial intelligence is mature enough, the Movement will break through the bottleneck and obtain substantial development. But if the development of 3D printing technology is slow and can hardly break the constraints of speed, quality, and cost, the Movement will have a hard time in the short-term. Also, the popularization of the means of production is still the fundamental problem restricting the Movement, especially the status quo of the popularization of technological resources which can hardly meet the urgent need of widespread entrepreneurship and innovation, and the public vitality and resources need to be further released and activated. To a certain degree, crowdfunding and crowdsourcing platforms are still platforms to "raise money" or "hire temporary workers", and some of them are merely advertising platforms for off-the-shelf products. Most of these platforms do not "raise process resources" or "provide free two-way selection and cooperation" that should have been performed by a crowdfunding or a crowdsourcing platform, and they remain to be further developed to truly serving widespread entrepreneurship and innovation strategy. Despite the potential for the Movement in China to become stuck, or fall into a ditch because it cannot break through the restraining factors, it will eventually proceed in the way of a wave, just like the upward spiral trend of development. It is hard to predict how long the period will last because it depends on the process of technology development. This is not a problem faced only by China, it is a common problem for the world Maker Movement. The policy signal released by the 19th National Congress of the Communist

Party of China shows that our country will continue supporting the Movement. Premier Li Keqiang emphasized again in the *Report on the Work of the Government* on March 5, 2018, that, "We need to take the nationwide business startup and innovation initiative to the next level… If myriad intellects are brought together and all energies are pooled, we can be sure to see China break into a sprint in innovation."① Even if the Movement in China cannot rise from within this new wave of innovation right now, the popularization of the maker culture, the cultivation of the innovative spirit and the storage of the innovative talents will lay a foundation for a comeback of the Movement in the future.

Conclusion

Looking around the globe, we will find that innovation is not an optional condition, but a necessary one for all countries, societies, organizations and individuals, and it is a common product of the human spirit. However, it is not something that people are born with, it cannot be transplanted or stolen, and the only way to possess it is to activate it from within and nurture it with proper motivation. The great thing about the Movement is that it can form a bottom-up inner innovation mechanism, develop the creativity of the public and activate the innovative power of a whole society. This all-round revolution happens not only in the research institutes, campuses and companies, but in thousands of ordinary families and village communities. The popularization of a maker culture with a maker spirit, the cultivation of a maker ecology, and the construction of an innovative society will be the main trend in this age and in the future.

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