Heike, Jike, Chuangke: Creativity in Chinese Technology Community

by

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ABSTRACT

This thesis surveys creativity in Chinese technology communities and its implication in China's development mode shift from "Made in China" to "Created in China." It discussed the history of creativity in China and how various types of creativity apply to Chinese technology communities. This thesis investigated Heike, or Chinese hackers, through archival research of Chinese hacker magazines; it explored topics discussed in Jike media, or Chinese geek media, using text mining (a type of data mining) methods including co-occurrence analysis, TF-IDF analysis and topic models (based on LDA); this thesis also includes a field study of Chuangke, seeing how Chinese Chuangke teachers build makerspaces in their schools, engage with the Chuangke education ecosystem, nurture future makers in their makerspaces, and interpret the Maker Movement in Chinese context. This thesis views Chinese hacker culture, geek culture, and maker culture under the lenses of "Ke" cultures, and it examines these cultures' relationships with technology learning, self-expression, innovation, and entrepreneurship in China.

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Contents

Chapter 1 Introduction

The topic "Created in China" has been under the spotlight for a long time. Chinese policymakers hope that by promoting creativity and creative industries, China could move out of the problematic "made in China" development model, which is fiercely criticized for its high pollution, problematic working condition, and unsustainability. At the same time, Chinese policymakers and businessmen are allured by the potentials of the symbolic value associated with creativity, such as an increase in global influence (so-called "soft power") or the value of brand. Chinese policy makers believe that in the global chain of production, the West profits from its competitive advantage in the domain of research and development while China is bogged down by the hard job of manufacturing. The Chinese government and businessmen have long been dreaming about reversing this economic food chain of and moving up to the top of the value pyramid.

While the Chinese are undergoing a soul-searching about their capacity for innovation, the west is keeping a close eye at China's move on creativity. After China became the world factory, industry observers and pundits in the West never stopped wondering whether China would become a creative center in the future. They wonder if the Chinese can only make things but can never be truly creative. Researchers seek clues in Chinese history, talk to Chinese government officials, attend conferences, and listen to Chinese scholars. Every effort is made to answer a same set of questions: is China emulating the west in creativity space? Will the strategies proposed by Chinese government transform China into a creative nation? Will China eventually climb up the value chain of international business – and ultimately drive its profit from successful strategies and technology breakthrough instead of relying on cheap labor?

In the academic sense, China is a test ground for creativity theorists, especially those who study economic and social development as it is associated with culture, creativity and innovation. China is an emerging developing country, so it can be put to test as to whether this "Created in China" movement can be applied to other developing countries. China has a non-western culture, thus if is succeeded in building a creative economy, it gives credence to the idea that development through creativity is universal, not specifically embedded within a particular culture. China is still regarded a non-democratic country, guided for thousands of years by Confucianism (which is considered largely a conservative and restrictive culture) and later by Maoism. It is known to be led by an authoritarian government and notorious for its censorship on mass media and Internet. The view of creative China also provides a challenge the long-held conventional wisdom that creative industries can only appear in a democratic and open society.

Scholars took different approaches to the debate on "created in China.". One school focuses on policy changes and political efforts that can lead to the growth of industrial clusters. In his book "How Creativity is Changing China", Li Wuwei, a senior policy maker, explains why China should plan its shift from a low-end production nation to a "creative nation", and how creativity is changing China by combining different economic and social resources[1]. Michael Keane, who has been involved in his decade long project of studying China's creative industries, wrote a book named "Created in China: The great new leap forward". In this book, he surveyed China's modes of culture-knowledge production and its interaction with foreign culture throughout history. He examines China's governmental policies and the creative clusters set up by Chinese government, and other business practices. Focusing primarily on cultural production such as films, TV, and animation, he concluded that to make the move "from Made in China to

[1] Wuwei, Li. *How Creativity is Changing China*. A&C Black, 2011.

Created in China" a success, "more institution reform, more openness, and more transparency[2]" is required. However, in his later book published in 2011, "China's new Creative Clusters: Governance, human capital and investment", he agrees that "the creative industries discourse in China should not be evaluated through the same ideological lenses as in democratic states where creative expression is a given[3]". However, he also noted that creative industries are facing the pressure of return of investment, and that creative industries in China is still immersed in the debate about whether creativity is harmonious or detrimental to the state ideology[4]. In response to the requirement of "openness and tolerance", Li, a policymaker from Chinese government, reframes "free expression" from a "moral or ethical context" to that of "thinking freely, experimenting freely and conduct business freely[5]", which is achievable via policy incentives and planning. From here we could see, the discussion around the national infrastructure of creative industry goes beyond simple "yes-or-no" questions. It is embedded in a multi-layered debate.

Another approach to the debate over "Created in China" focuses on business practice and consumer mentality. Shaun Rein's book, "The End of Copycat China" is largely based on interviews with business people and average urban consumers. He argues that China has gone through the "copycat" stage and entered a stage of "innovating for China", which will finally lead to "innovation for the rest of the world". Through his research, he concludes that this happened because the "low hanging fruit" – opportunities for making a profit just by copycatting Western products or business models – had disappeared, and that Chinese consumers now demand products and brands to be respectful of "local taste" and local needs. This opportunity

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[2] Keane, Michael. "Created in China." *London and New York: Routledge* (2007), 164.
[3] Ibid.
[4] Keane, Michael. *China's new creative clusters: Governance, human capital and investment.* Routledge, 2013, 178.
[5] Wuwei, Li. *How Creativity is Changing China*, 112.

for consumer-led innovative business development" is also mentioned by Hartley and Montgomery in their research on Chinese creative industries[6].

The third school that debated about "Created in China" looks at creative communities among citizens. One most typical idea came from Richard Florida's theory about the creative class. Although his research is not directly related to China, Florida depicts a creative class who dwells in cities, enjoys higher education, and works in knowledge-based occupations. Florida also includes "Bohemians" – people who live in an unconventional life style – as a part of the creative class, which could possibly point to hackers and geeks. In "Makers: The new industrial revolution", a book penned by Chris Anderson, he foresees a future that enthusiasts and garage tinkerers become driving forces of the economy as digital fabrication technologies such as 3D printing and laser cutting reshape means of production. He also predicts that jobs in manufacturing will come back to United States because he thinks manufacture in new ear choose to locate itself to where market and maker communities are. Many scholars also start looking at makerspaces in China, hoping to find where China is moving towards in the dawn of makers' age. In Anderson's book, he mentions some individual makers setting up makerspaces and contributing to open hardware communities; Silvia Lindtner surveys hackerspaces in south China and contends that Chinese hackerspaces provide a space for both open sharing of knowledge and negotiation of social values and that community members are "actively engaged in political debates[7]". Further more, Lindtner discovers that creativity even exists in "Shanzhai factories" – which is the synonym of copycat productions. Those factories share bill of manufacture (BOM) with each other to gain advantage in competition and they also interact and collaborate with

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[6] Hartley, John, and Lucy Montgomery. "Creative Industries Come to China (MATE)." *Chinese Journal of Communication* 2, no. 1 (March 2009): 1–12.

[7] Lindtner, Silvia. "Remaking Creativity & Innovation: China's nascent DIY maker & hackerspace community." (2012).

hackerspace communities[8]. This provokes further thinking about the potential connections between the business world and creative communities, pointing to a possible creative industry model. But generally speaking, research on Chinese creative communities is limited in quantity and scope. This is an emerging research field, and few studies deal with communities beyond major cities, prominent individuals, and noticeable events.

This thesis project focus on creative communities in the technology field because not only do new concepts and practices (such as hackerspaces) emerge faster in technology, "created in China" has already delivered several case studies in technology domain. Examples range from successful platform-sized corporations such as Tencent and Alibaba to design-based firms such as Xiaomi or Meizu and to grassroot groups such as hackerspaces or open source communities. Among these technology communities that contributed to the success of these technology companies, this thesis studies three cultural phenomenons: Heike (often seen as a translation of Hacker), Jike (translated as geeks), and Chuangke (translated as makers or hackers). I picked these concepts because 1. They are deeply connected to China's historical ideas of creativity; and 2. They jointly have a significant influence in Chinese creative space.

Heike, Jike, Chuangke and concepts of creativity in China

In Robert Weiner's book, "Creativity and Beyond", he surveys the concept of creativity across the history and in different cultures. He proposes that "creativity" or "to create" is an ever-changing concept in the western world. It developed from being seen as the pure attribute of god (only gods can create, humans cannot), to a manifestation of the work of gods through humans in ancient Greek (we create, but the human act of creation is only gods' will passing through our hand). In the Age of Enlightenment, under the influence of "perpetual increase and

[8] Lindtner, S, and D Li. "Created in China: the Makings of China's Hackerspace Community." *Interactions*, 2012.

transformation of the past seemed reasonable, orderly, and good[9]," creativity is seen as creating "something new under the sun" that would eventually change the world[10]. In 18 to 19 century, individualism is valued and inventors are praised, so creativity became the ideal that everybody should be inspired[11]. Weiner says that the word "creativity" came into existence in 1870 and is only widely used after 1950. Academic study on creativity proliferated in 1950s after the discipline of "creativity studies" was introduced into major campuses such as Purdue and Michigan State University[12]. Since then, the modern sense of creativity has been formulated.

The western view of creativity in non-western or "traditional" cultures is as its name suggests – "traditional" – within the limits circumscribed by the traditions of these traditional cultures. As Weiner said, "the west has continued until recently to view itself as dynamic and others as static[13]." Recently, scholars in western cultures start to acknowledge that even in the rituals practiced in "traditional" cultures, creativity plays an important part. And at the same time, every culture, including western culture, is embedded in the sophisticated web of traditions, so being "traditional" does not equal to a lack of creativity. Regarding Chinese culture, Weiner believes that although new ideas had emerged in traditional China, "continuity and stability" trumped creative arts "through government order and social custom[14]." In other words, creativity of China is still considered constrained by its reverence to past cultural ideologies such as the pragmatism in Confucianism or nihilism in Taoism. However, a simple search in Chinese dictionary of traditional works[15] shows that there are multiple words in Chinese language related

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[9] Weiner, Robert Paul. *Creativity and beyond: Cultures, values, and change*. SUNY Press, 2012, 72.
[10] Ibid, 73.
[11] Ibid, 79.
[12] Ibid., 6.
[13] Ibid., 144.
[14] Ibid., p177
[15] Handian(汉典) is a index database of Chinese words and traditional Chinese works. See "Handian." *Zdic.Net*. Accessed March 28, 2015. http://www.zdic.net/.

to "create": Chuangzao (创造, create and build), Chuanghuo (创获, create and achieve), Chuangji (创基, create and lay a foundation), Chuangxing (创兴, create and raise), Chuangju (创举, an creative move), Chuangge (创革, create and revolutionize), Chuangkai (创开, create and explore), Chuangxing (创行, create and act), Chuangtu (创图, create and plan), Chuangzuo (创作, create and author), Chuangchui (创垂, create and pass it down to future generations). Seen from the extensive use of those words, we can tell that the Chinese in ancient times already treasured creativity and showed a unique outlook towards creation and imitation: "the making method (of the compass chariot) is lost in Qin and Han dynasty, and Zhangheng in Houhan dynasty created it again[16]"; "the Li writing system was used or not used depending on different states, while Chengmiao saw its advantage and convenience and make a modification. It is not a creation[17]"; "this is a created foundation, different than previous dynasties[18]". The importance of creativity to Chinese intellectuals in the past is also reflected in their concept about immortality: "the highest (form of immortality) is to establish your virtue (as an example), then place your contribution (to the society), then pass your words (to the future generation). These things do not fade with time, thus they are immortal[19]", which is translated by modern scholar Hu Shi as "3Ws": "worth, work, words[20]." To achieve such immortality, obviously "following the path of the past" or simple imitation is not enough. However, the bar of "creating something and passing

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[16] From "The history of Song Dynasty", authored 487 AD.《宋书・礼志五》："至于秦汉，其（指南车）制无闻，后汉张衡始復创造。"

[17] From "Witness of Feng", Tang dynasty (618-907 AD) 唐封演《封氏闻见记・文字》："按此书隶，在春秋之前，但诸国或用或不用。程邈观其省易，有便於时，故脩改而献，非创造也。"

[18] From "The Notes of Jin Dynasty: Introduction", authored in Jin Dynasty (265-420 AD) 晋干宝《晋纪总论》："是其创基立本，异於先代者也。"

[19] From Zuozhuan, written in around 400 BC: "大上有立德，其次有立功，其次有立言，虽久不废，此之谓不朽"

[20] "Immortality, My Religion", written by Hushi in Febrary 1919. see *English Writings of Hu Shih: Literature and Society*, Volume 1 p96

them down through generations" is too high, and what was created are often societal rules, works of calligraphy or literary works, and astronomy or medicine, all of which were inaccessible to ordinary people. n the contrary, Weiner postulates that Chinese culture offers another type of creativity relevant for commoners..

Tricksters appear in myths of many cultures. They often exist in an image of animals, such as coyotes or crows. In trickster myths, they steal power from the god, set up tricks that sometimes trap themselves. With the appearance of a creative idiot, tricksters confuse the boundary of "right or wrong, sacred and profane, clean and dirty, male and female, young and old, living and dead" in "traditional" cultures[21]. Weiner considers tricksters as a factor that "tend to shake up what might seem to be rigid societal rules" and bring creativity to cultures that may be suppressed by traditions normally[22]. A typical trickster in the Chinese context is the Monkey King, who disrupts the order of heaven and slays monsters in his journey to the west. Although tricksters mostly exist in myths and can be hardly seen in the real world, the idea of tricksters implies that there can be a trickster-like social agent that will bring creative change to "traditional" cultures, even if it still faces constraints imposed by cultural traditions.

But tricksters mostly exist in myth and tales; they are not examples set for people to follow. Another copyable cultural archetype in China is Xia ke (侠客, knights, crusaders). This word is made of characters "Xia (侠, heroic, cavalier)" and "Ke (客, visitors, guest, agents). These people behave like knights in the West or cowboys in tales of west America. They are similar to tricksters in terms of their disrespect of rules and the power they wield (such as martial arts), while they differ from the tricksters in that they look just like ordinary human beings and stick to their own set of values instead of playing tricks. Descriptions of Xiake can be found in a

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[21] Hyde, Lewis. *Trickster makes this world: Mischief, myth, and art.* Macmillan, 1997.
[22] Weiner, *Creativity and Beyond*, 152.

Chinese classical work, "*Notes on History*", "Xia offend limits with their power … although their actions are not justifiable, they keep their promise, and they act with determination[23]." Another description comes from Li Bai's poem: "kill one person within ten steps / travel a thousand miles without a trace / dust their cloaks after things done / hide deep their name and existence[24]." Prizing individualism marks Xia Ke's unique place in Chinese culture. Although Xia Ke might not have created things, they exhibit a creative life style actively challenging the boundary of social norms and they are full of imagination (which is called psychological creativity because it bring "surprising, valuable idea that's new to the person who comes up with it[25]."

Xiake were mostly active in chaotic periods such as the Chun Qiu period (770-406 BC). In times of peace, collectivism and family ties were mainstream. However, at the dawn of the digital age, spaces of self-expression opened up and acquiring the abilities needed for creative work or social change is no longer difficult. Suddenly, dozens of contemporary "Ke" tribes appear in China's cyber space. Some of them are:

Heike (黑客): the "black" "Ke", seen as a translation of "Hacker";

Jike (极客): the "extreme" "Ke", as a translation of "Geek". Another name for geek is Qike (奇客) – the "strange" "Ke" (which is seldom used today). By using the character Ji ("extreme"), the negative connotation of the English word "geek (an introvert and anti-social guy)" is removed and a positive trait – pursuing the cutting edge technology – is added to the term.

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[23] From "the Notes of History", "The legends of travelling Xia". By Sima Qian (135BC – 86BC) 《史记》游侠列传"今游侠，其行虽不轨于正义，然其言必信，其行必果。"

[24] From "The Path of Xia Ke", by Li Bai (701-762 AD). 李白《侠客行》"十步杀一人，千里不留行。事了拂衣去，深藏身与名。"

[25] Boden, Margaret A. *The creative mind: Myths and mechanisms*. Psychology Press, 2004.

Chuangke (创客): the "creative (or innovative)" "Ke", denotes makers in hackerspaces or makerspaces.

Haike (骇客): the "terrifying" "Ke", could be an equivalent of "Cracker", often seen as manifesting the "dark side" of hackers;

Shanke (闪客): the "flashing" "Ke", refers to amateur animators who make flash animations.

Weike (威客): the "powerful" "Ke", or "Witkey". This is a specific term referring to those who make money by solving small tasks (such as designing a logo, ghostwriting, building a website) for clients online.

Huanke (换客): the "exchanging" "Ke". They like bartering stuff with other people online.

Shaike (晒客): the "basking" "Ke". They try to post everything and expose every aspect of their lives online, like "basking under the sun."

Paike (拍客): the "shooting" "Ke". They try to take pictures of everything they see, and post them on the Internet.

Hongke (红客): the "red" "Ke", cyber-nationalists. They "fight for their home country" by launching cyber-attacks to computers in other countries.

This list could go on and on. Actually, this phenomenon is called "the Internet 'Ke' cultures" by Chinese scholars. In those accounts by Wang Cuirong, Chen Wenmin, and Huang Danni, "Ke" cultures are seen as "a defeat of cultural absolutism (the original article did not explain these terms. In my understanding, it means there is no longer a central or official cultural discourse), a life style guided by sensational values, a form of identities of certain social sub-

groups[26], a form of decentralized storytelling (it could mean stories are told by individual persons, not a central entity such as media company or government), an expression of individual opinions, a signal of the beginning of civil society, the deconstruction of hegemon culture, and a reconstruction of public space"[27]. At the same time, "Ke" cultures are criticized as a form of Epicureanism, a "multi-cultural carnival and an act of remixing under the influence of electronic heroin[28]", and a phenomenon need to be regulated by laws such as real-name identification over the Internet[29]. With the help of accessible technology, creativity hidden within an individual is (at least seemingly) unleashed. We witness the liberation of, self-expression, and individual cravings taking the shape of self exploration, traits that stayed dormant in Chinese culture for long because they were enmeshed in the fabric of rules and norms. Today, many "Ke" tribes have come and gone, but Heike, Jike, and Chuangke have persisted as the three dominant examples of China's "Ke" culture: this is because they have made a joint impact on the emergence of the creative space in contemporary China.

The joint influence of Heike, Jike, and Chuangke on Chinese creative space

Today, when we say "Creativity", it may refer to one of three distinct meanings. First, it may refer to a natural human capability, the ability that how we produce art works or intellectual products such as literature or films. This type of creativity links to Kant's "artistic genius", a "rule of art" given by nature[30]. It also appears in Marxism as an inherit merit of every human

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[26] Wang, Cuirong. "The Internet 'Ke' Culture's Influence on Modern Life." *Xinwen Aihaozhe*, August 25, 2010, 1–2.
[27] Chen, Wenmin. "An Analysis of the Spread of Internet 'Ke' Culture and Its Meanings." *Lan Zhou Xue Kan*, October 26, 2010, 1–3.
[28] Ibid.
[29] Huang, Danni. "Pondering the Fever of 'Ke' Cultures." *Business Culture*, March 24, 2015, 1–2.
[30] Proulx, Jeremy. "Nature, Judgment and Art: Kant and the Problem of Genius."*Kant Studies Online* (2011): 27-53.

being, which is deprived through alienation through the process of industrialization[31]. This type of creativity is related to judgment, taste, and meaning making process.

The second type of creativity is defined by psychologists. It refers to the functionality of adapting to change and solving problems in everyday environment (the little-c creativity), or the ability to make an impact on thoughts and lives of other people like Nobel Prize winners (the big-C creativity)[32]. Educators use this type of creativity as a goal of education: not only pushing pupils to excel in memorizing facts, but also encouraging them to think of new ways in solving problems.

The third type of creativity is one related to economic process and contributing to economic progress. This is why creativity is cherished today and valued across cultures. Joseph Schumpeter used the term "creative destruction" to describe the "long-run developmental dynamism" of capitalism, whereby "new products and processes displace old ones[33]". This leads to Peter Drucker's discussions around innovation, entrepreneurship, and new types of enterprise that embrace change and achieve unexpected success by introducing new element to business[34]. Research and development is the key to nurturing this type of creativity, and thus all types of technology development, scientific discoveries, and inventions are considered "creative". There are also two synonyms for this type of creativity: innovation and entrepreneurship. Innovation is described as 1) the propagation of novel ideas through economic system and 2) setting it up as

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[31] Bottomore, T B, L Harris, V G Kiernan, and R Miliband. *A Dictionary of Marxist Thought*, 1983, 14.
[32] http://www.apa.org/monitor/nov03/creativity.aspx
[33] Schumpeter, Joseph Alois. *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Vol. 55. Transaction publishers, 1934.
[34] Drucker, Peter. *Innovation and entrepreneurship*. Routledge, 2014.

the new normal[35], and entrepreneurship is the traits and deeds of entrepreneurs, who are similar to artists in the artistic creativity.

Interestingly, there is no single word of "creativity" in Chinese language: different words are used to denote different kinds of creativity. chuangyi (创意, "creative ideas") is for artistic creativity; chuangzaoli (创造力, "creative force") is for problem-solving related creativity; and chuangxin (创新, "create something new") is for innovation related creativity. In English we implicitly choose the context for the word creativity: "creative industries" refer to industries related to "generation and exploitation of intellectual property[36]" which links to symbolic values and aesthetic judgment in Creativity I. This is in turn translated into Chinese as chuangyi chanye (创意产业). Keane (2001) considers "chuangzaoli" as "the most widespread translation" of creativity and "chuangyi" as the "non-standard mandarin translation of creativity" while "the etymology was ultimately Western[37]". This is somewhat incorrect because the Chinese word "chuangyi" actually appears in Han dynasty: "Confucius read history materials and wrote *Spring and Autumn* (*chunqiu*); but when he makes meanings, creates ideas (chuangyi), appreciates or criticizes (something), it is no longer following history notes: great ideas flow out of his mind[38]." This account is an example of artistic creativity: it is about applying judgment on historical materials and put it into written form. When Chinese are talking about "chuangyi", there is no English word "creativity" popping out of their mind. However, I agree that problem-solving creativity and innovation related creativity are largely western ideas and they are promoted as a

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[35] Hartley, John, Jason Potts, Terry Flew, Stuart Cunningham, Michael Keane, and John Banks, eds. *Key concepts in creative industries*. Sage, 2012,112.
[36] Ibid., 59.
[37] Keane, *Created in China*, 80.
[38] From Wang Chong (27AD – 97AD), "On Balance": 汉王充 《论衡·超奇》：孔子得史记以作《春秋》，及其立义创意，褒贬赏诛，不复因史记者，眇思自出于胸中也。

universal value with dominant western connotations. Another reason why I spend this much time discussing this matter is because since the term is defined non-uniformly in both cultures, it is necessary to distinguish what type of "creativity" I am talking about; and furthermore, the use of the term "creativity" maps out the territory of the creative space my thesis deals with.

Today, innovation related creativity is the reason why creativity is valued around the globe. After all, no country wants to fall behind in economic development and technology race, and no company wants to lag behind in innovation cycles and loses market share. Moreover, people tend to believe that those three types of creativity are exchangeable and interdependent: those who do well in innovation related creativity must have a superior artistic and problem-solving creativity, which could even mean a superior ideology and a superior culture or race. As Weiner says, there is a debate in "metaphysics of creativity": contenders "speak for one form of creativity and against another[39]". Global competition makes creativity its weapon and currency of success. The reason why people are concerned about whether China will become a "creative nation" is linked to the underlying assumption that China will be able to gain a competitive advantage if it masters its innovation-related creativity.

China's attitude towards creativity could be reflected in the five-year plans engineered by its government. From 1949 till 1996, the "creativity" used in those state documents of five-year plans primarily dealt with creativity as a potential of individuals (we should elicit creativity within our people) or creativity in problem-solving (we should "creatively" solve the problem); innovation related creativity only appeared in the sections of science and technology serving as the synonym of scientific research. In the ninth five-year plan (2001-2005), the term "self-independent innovation (zizhu chuangxin)" first appeared, officially announcing China's joining the "creativity warfare" in competition with the west. In the tenth five-year plan, a whole chapter

[39] Weiner, *Creativity and Beyond*, 111.

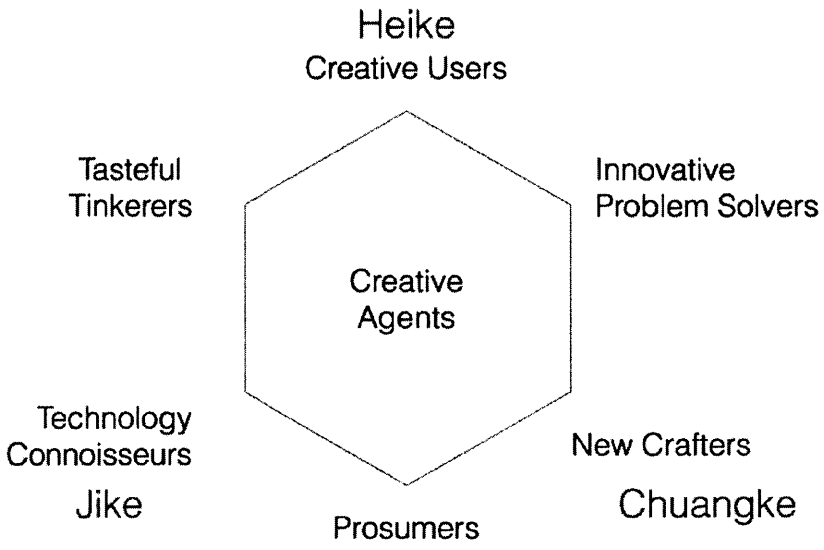
is devoted to innovation, and corporations (instead of public insititutions) are recognized as the primary entities of innovation makers. This plan also stipulated that innovation is the key to an "industrial upgrade" – from manufacture centered industry to innovation centered industries. a savior of the bankrupt traditional industries. In the eleventh five-year plan (2006-2010), the idea of a "creative nation" made its debut, and nurturing creativity became a part of national strategy. Whether these goals set up by the government are achievable, the government recognizes the importance of releashing creativity within individuals and business sectors, which created much leeway for particular practices I will write about. This time frame of national policy making coincided with the rise of Heike, Jike, and Chuangke cultures. In fact, Heike, Jike, and Chuangke are deeply connected with three types of creativity at the very beginning: Heike try to find creative use of existing technology and exploiting their possibilities; Jike enjoy and appreciate technology products in the marketplace; Chuangke create new products with available tools and materials and try to diffuse innovation through the community or the market. If we consider them as a whole, they are addressing different types of creativity inside a single subject: technology. Besides this, there are two other reasons why Heike, Jike, and Chuangke must be discussed together.

First, in contrast to western concepts of hacker, geek and maker, they have a much-blurred boundary. In United States, the first hackers came from 1) heralds of computer evolution working in nuclear science labs[40]; 2) teenagers who break into internal systems of phone companies via devices such as blue boxes. Geeks are the result of counter-culture crusaders from 1950-60s encountering Internet industry in Silicon Valley[41]. And makers are the revival of

[40] Levy, Steven. *Hackers: Heroes of the computer revolution.* Vol. 4. New York: Penguin Books, 2001.
[41] Turner, Fred. *From counterculture to cyberculture: Stewart Brand, the Whole Earth Network, and the rise of digital utopianism.* University Of Chicago Press, 2010.

traditional garage crafters through the ease of making techniques[42]. In my opinion, these historical roots do not exist in China. Activities, skills, and ethic codes of hackers, geeks, and makers are often introduced from the west by people having higher education. Heike, Jike, and Chuangke are constantly seeking creative activities around the technology space. A Heike yesterday may throw away what he did and become a maker tomorrow. For example, Laoying, a Heike deeply involved in Hongke movements, now became a player of smart hardware and drones. Even in western culture, the definition is not that firm: hackers in open source communites are often seen as "makers", while hacking and making are also activities of geeks.

Second, Heike, Jike, and Chuangke show a tendency of convergence. As discussed before, Heike, Jike, and Chuangke occupy different parts of the creative space, thus they can be described as "creative users", "discerning consumers", and "new crafters". When they meet each other, new types of creativity emerge:



Tasteful Tinkerers: Tasteful Tinkerers are what I call the result of Heike meeting with Jike. One example is Xiaomi's fan community: the company Xiaomi increases its sales by adding "hackable" features to their products. The phones they produced made it easy to

[42] Anderson, Chris. *Makers: the new industrial revolution*. Random House, 2012.

reprogram its ROMs so users can try out different operating systems with the phone they purchased. Another example from Xiaomi is its router product. A router is a network device that can share Internet connection with multiple devices (such as computers, phones, and tablets). This type of router is shipped with parts: a plastic shell, a PCB electric board, a hard drive, and a screwdriver with which buyers can assemble the product by themselves. Tasteful tinkerers will buy these products, hack them, and appreciate them by both their external appearances and internal structures. A product targeting tasteful tinkers must be both hackable and with certain design appeal appealed by the Jike community.

Innovative Problem Solvers: This group of people refers to Heike as well as Chuangke: they solve problems within existing systems by creating new technology. One example is breaking down the control circuits of a car and installing newly designed parts. Another big subsegment of this category is "civic hackers": they take a problem in society, find hacking opportunities, design a path of change (such as a piece of software, hardware, action, or a new method of doing things), and inject it back into the system. Institute of Public and Environmental Affairs is a registered nonprofit organization in China, and their "Pollution Maps (*wuran ditu*)[43]" is an example of "civic hacking". They took "environmental protection" as a problem to solve; they aimed at bridging the gap pollution data published by the government, underpowered agency (Department of Environment), the corporate practices that generated pollutions, and ineffective public action; they designed an mobile app so that the public could monitor who is polluting the environment and who is not; and finally they deployed their hack back into society by urging general public to interact with government agencies and shift their buying decisions.

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[43] "Institute of Public Environment." *Ipe.org.Cn*. Accessed March 27, 2015. http://www.ipe.org.cn/about/answers.aspx.

Prosumers: prosumers are Jike as consumers and Chuangke as makers. Prosumer often refers to fan communities in creative industries who make remixes based on original content. But this type of creativity applies to technology world as well. This happens when technology products are designed for makers. Examples include communities gathered around products by Adafruit, Sparkfun, and a Chinese company named Seeed. This type of actors combined Jike's attributes such as actively critiquing, appreciating and consuming for symbolic value, and Chuangke's fevor in diffusing works, making contributions, and working in communities. When discussing "produsage," Axel Burns notes that participants in creative communities are interested in "pooling together their individual contributions to form a composite whole" by critiquing, commenting, and beta-reading on each other's works[44] (beta-reading refers to the editing process of community generated literature, and can be changed to beta-testing in technology cases). An earlier account comes from Henry Jenkins. In his words on convergence culture, he proposes a participatory culture where producers and consumers interact with each other according to "a new set of rules", and he defines collective intelligence as a way with which individual consumers collectively affect media space. Jenkins believes that participatory culture and collective intelligence finally lead to "convergence". This "converngence" exist in consumers' mind, and it drives them to search for content scattered across media space, which finally construct a unified experience the consumers need[45]. The Jike-Chuangke prosumer world is much like what Jenkins described: Jike culture provides the "set of rules" that enables different parties to interact with each other, while Chuangke guides collective intelligence and pins down the direction of convergence. One difference between prosumers in media space and those in technology space is that technology space is more democratic. In the latter space, there is no

[44] Bruns, Axel. *Blogs, Wikipedia, Second Life, and beyond: From production to produsage*. Vol. 45. Peter Lang, 2008, 227-257.
[45] Jenkins, Henry. *Convergence culture: Where old and new media collide*. NYU press, 2006, 2-24.

master text provided by media companies such as DC Comics or Disney. In the technology world, Chuangke are the kings of makerspaces, and all the products are designed around the needs of Jike-Chuangke. In this specific point, I disagree with Chris Anderson's idea that brands such as Arduino will become the central brand and draw in all the values created by the community (which in turn guarantees the west's dominance on makerspaces). Jike as discernable consumers will no longer chase after products made by a few companies and Chuangke have the ability to poach content across communities. One example is the RePaper project[46]. This project makes e-paper components, and its main purpose is to provide the affordance of this new technology. It provides interface to all major platforms such as Raspberry Pi and Arduino, but one can certainly port this project to other platforms using their design specifications. I am not saying that China will strike back in the new maker era, but I want to point out the intrinsic decentralized (and cosmopolitan) nature of Jike-Chuangke culture.

Finally, what happens when Heike, Jike, and Chuangke come together? It leads to a new type of citizens – creative agents. Creative agents are masters of all three types of creativity: they creatively engage with the world and tweak the world; they constantly critique and participate in the products they buy. And they create, combine, and remix items they use in their everyday life. Currently, only a few individuals can be marked as practitioners of all three, but we can anticipate more "creative agents" since the boundary of Heike, Jike, and Chuangke are becoming increasingly blurry. At the same time, a new generation of "creative natives" is growing up, adding to the number of creative agents. In contrast to the creative class, creative agents are less determined by economic entitlements and more associated with expertise in media, culture, and education.

[46] http://repaper.org/

Method Notes

It is impossible to capture a comprehensive picture of Heike, Jike, and Chuangke in a thesis project, even if it is limited in the scope of China. However, by continuously reaching out to communities in this space, researchers are able to combine all the information together to achieve a better view of Chinese creativity space. This thesis project will choose three examples that occupy different corners in the creativity space. They are grassroots practices in China and have research as well as societal value. They are hardly seen in other studies.

In Chapter 2, I will study Chinese Heike in the early 21st century. This time the heroes are not those who created much international furor in "cyberwars" between China and foreign countries: They are technology lovers in everyday life. They may be computer experts in universities, or employees in companies, or even high school students who buy an issue of magazine and practice their "dark arts" in their rooms. I reach out to these people through studying a small archive of Heike magazines. This is because they leave the footprints of their activities in the media created by the Heike community. I believe an archival research in this case is better than cherry-picking any prominent individuals or groups since the Heike community is so diverse and much disputed.

In Chapter 3, I will try to summarize the development of Chinese Jike culture through text-mining an online Jike media: Geekpark. Geekpark is an online media promoting Jike related products, introducing ideas, and connecting individual Jikes with industry leaders. It is also a community builder: it hosts many Jike related events; it holds Geekpark innovation conferences regularly, and they organize a group called "innovator alliance[47]". This research will scrape more then 900 articles from Geekpark's website, try to map out the landscape of Chinese Jike culture, and identify the trends of its development.

[47] Chen Chan. "Geekpark: how to shift forward the explosion point." *Business Value* 11 (2013):31-32

In Chapter 4, I will look at an online community of Chuangke education practitioners, mostly high school teachers. There is an online community using QQ group – a Chinese based text chatting service – to exchange information among high school teachers and between teachers and companies who provide Chuangke tools for high school teachers. This project uses participatory observation and interviews to explore the thoughts of those educators. This will add a different perspective to my study other than looking at hackerspaces in major cities.

Chapter 2 Heike, the Chinese Hackers

The last chapter discussed the cultural origin of Chinese technology communities such as Heike, Jike, and Chuangke, as well as how these three communities relate to each other and how they jointly contribute to the rise of a new creative culture in China. This chapter looks into Heike as creators. "Heike" is the Chinese translation of "hacker", and "hacker" itself is an interesting term difficult to pin down. Scholars studying the meaning of "hacker" tend to look back to how the word was first used (as in The Tech Model Railroad Club, TMRC at MIT) or how it is discussed in written work (as in the early works by Steven Levy)[48]. However, the meaning of a word kept evolving and it may depart from its early usages. For example, what hackers do in the 21st century is certainly different from that of 1960s in TMRC, and people who refer to "hackers" today seldom remember those ethical standards Levy talked about. Furthermore, "hacker" is a contestable term. People manipulate its definition to enforce moral standards for the purpose of distinguishing themselves from unwanted members of the community. I can identify four "linguistic wars" in the world of hackers to illustrate that why this space is a debated zone and how people have different opinions about different hacker sub-groups:

"Hacker" vs. "cracker" I: Those who do not use their knowledge to further the field of computer science but break into others' computer systems should not be named "hackers", but "crackers";

[48] Steven, LEVY. "Hackers: Heroes of the Computer Revolution," 1984.

"Hacker" vs. "script kiddies": Those who only use ready-made tools to break into others' computer systems instead of building their own tools should not be named "hackers", but "script kiddies".

"Hacker" vs. "cracker" II: Those who break down copyright protection means and release proprietary software for illegal downloads should not be named "hackers", but "crackers".

"Hacker" vs. "maker": Those who only write software but do not break into existing systems should not be named "hackers", but just "makers"[49].

The reason for such confusion came from the attractiveness of the term "hacker": it is an embodiment of ideas such as "free access to information", "pursuing hands-on experience", and "defying authority[50]". Besides, a hacker will seldom (if not never) call himself/herself a hacker, but it is acceptable to call someone else a hacker or the whole community "hackers". Thus "hacker" is a complimentary title given to somebody. The fact that this word could only be used as an object rather than a subject makes it an excellent vehicle for debates and wordplay since the word "hacker" does not denote any specific group of people.

When the term "hacker" is translated into Chinese "Heike"(黑客), it became even more interesting. Two things happen when the word "hacker" is translated into Chinese "Heike": First, it may incorporate additional meanings along with the translation; second, the Chinese may interpret this word according to the literal meaning of the Chinese characters. Certain connotations in the original expression may be lost in the process, such as its origin from the word "hack". Although many Chinese Heike researchers considers the English term ("hacker")

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[49] Coleman, Gabriella. *Hacker, Hoaxer, Whistleblower, Spy: The Many Faces of Anonymous*. Verso Books, 2014.
[50] Raymond, E S. "How to Become a Hacker." *Database and Network Journal*, 2003.

along with the Chinese word, the change of the word's meaning is still significant because the word "Heike" is what Chinese hackers used to describe themselves and their activities.

The Chinese word for hacker is made up of two characters: "Hei" (黑) and "Ke" (客, reads like "ker"). Most scholars noticed that Hei means "black" or "dark" while Ke means "visitor" or "guest[51]". It is tempting to conclude that the Chinese word Heike means a dark visitor who breaks into your computer and steals or destroys your information. Even Chinese scholars rarely recognize the hidden meaning of the words. Wu Zhijie and Ping Ke's article on "translation of computer terms" suggests that "The translation of 'hacker' and 'cracker' in Chinese is chaotic and raises confusion among readers, thus need to be regulated[52]." However, the word "Hei" also appears in the Chinese word for "night" (as in the title of a Chinese song "the days cannot understand the darkness of the nights[53]"; the character "Ke" is links to the "Ke" culture which is discussed in the previous chapter, "Ke" answers to nobody and lives as proud individuals[54]. One type of Chinese literature is "Wuxia xiaoshuo (Wuxia novels, 武侠小说)", in which "Xia Ke" use their kung fu skills and the power of Chi (similar to magic in western tales) to help the weaklings and punish the ones who abuse their (political, martial, or Kung fu) power. This adds a romantic color and even social responsibility to the notion of hacker in Chinese. As the editor's note of a Chinese hacker magazine says:

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[51] Hvistendahl, Mara. "China's hacker army." *Foreign Policy* (2010).
[52] See (in Chinese) Zhijie, Wu, and Ke Ping. "Five Steps of Term Translation: a Discussion From "Hacker", "Cracker", "Guaike", and 'Honker'." *Foreign Languages Research*, December 9, 2011, 1–9.. This article also suggests that "these terms are orderly used outside China", which does not reflect the reality and the nature of the linguistic war – manipulating words to get a discursive advantage.
[53] It is a song by Na Ying, a popular Chinese singer, with lyric written by Huang Guilan. Parts of the lyric is translated as: "days and nights only alternate but do not exchange / we can't imagine the world of each other / we persist and wait in the original points separately / stand [sic] into two different words".
[54] There are also Xiakes who fight for the country, but they are self motivated and not organized by the state. For example, in Jinyong's novel "The Legend of Condor Heroes (Shediaoyingxiongzhuan)", Xiakes fight to protect the Song dynasty and at the same time fight against the corrupted government.

"Heike masters must also be Wuxia lovers, travelling invincibly in two worlds[55] with the same unreality and beauty ... sitting in front of a computer alone, watching thousands lines of data flowing on the screen like waterfalls, like shooting stars ... every break-ins is like performing the most wonderful music sung in the rivers and lakes[56]."

Another example is the description of hacking skills:

"Hacking skills are double-edged swords ... it is like a man with Kung fu, s/he can use it to serve the country and its people, eradicate the evil and bring peace to the good as a Xiake. Or s/he can rob the people, seek for personal interests as a criminal."[57]

When describing what is a Heike and how to become a Heike, it says:

"Heike is a sacred name. It represents a spirit of freedom and progression. Beside excellent computer technology, you should be a knight in the cyber world who exhibits moral values, keeps justice, defeats evil and brings peace to (lawful) citizens. By then you could earn the respect from other people; by then you will be called a Heike[58]."

In a technical article which describes how the author disabled a website which distributes Trojan horses[59], the author says:

"I found that these Trojan horses are set up by a gambling website, which strengthens my determination to break down such deceptive, illegal websites."[60]

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[55] the cyber world and the real world.
[56] "Xiaoaojianghu 笑傲江湖" literally translates as "laughing proudly through rivers and lakes", where "rivers and lakes" connote the place where Xiake(knights) stories happen. "Xiaoaojianghu" refers to a status where Xiakes triumph over all his/her opponents and reach self-fulfillment via mastering battle skills and realizing their moral values. From Hacker-X-files, 2007 Vol. 10, editor's note
[57] From Hacker-X-files, 2010 Vol. 5, editor's note
[58] From Hacker-X-files, 2007 Vol. 5, editor's note
[59] Trojan horses are a kind of malicious computer program which controls somebody else's computer, to steal information from or use as a proxy of further cyber attacks.
[60] From Hacker-X-files, 2010 Vol. 5

This is an example that the nature of the target (illegally or immoral) can justify activities such as taking down a website with hacking techniques.

When Heike wage a war of words, they need the translations of the evil counterparts: "Cracker" is often translated into "Haike" (the "Ke" of terror) or "Guaike" (the strange/weird "Ke")[61]. "Hong Ke" (Red "Ke") is invented for those Heikes who display patriotism, although sometimes it is also used to separate "good Heike" from the "bad ones". Just as debates over the term "hacker" in English, the attempts to add nuance were fruitless and the only prevalent term used to name a hacker is just "Heike".

Chinese Heike have long been misunderstood. One major scholarly account of Chinese Heike in the English language is "The Dark Visitor: Inside the World of Chinese Hackers[62]," written by Scott Henderson[63]. This book comes with a cover designed by Mr. Charles A. Martinson III, which is a blend of "an ancient Chinese copper helmet; the opera mask of Jiang Wei; and computer circuitry[64]". These graphic elements are overlaid upon a photo of a Chinese male, resembling a typical image of a Chinese solider. The scary and alienated picture, combined with a exotic typography for the title as well as a dragon and a Chinese national flag, tells a compelling story about a team of dark invaders threatening the peace of the world.

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[61] In an Chinese academic article: "Some people who insist on traditional Heike values, works hard on distinguishing Heike from various kinds of computer criminals, Haike, and Guaike. 'Haike' and 'Guaike' are translations of English word 'Cracker', meaning destroyer. They do more things such as cracking proprietary software, maliciously breaking into other people's networks and cause damage." Please note that it is a combination of linguistic wars "Hacker vs. Cracker I" and "Hacker vs. Cracker II". It tries to put all the "evil" elements in a single basket – "Haike" and "Guaike" – through language use.

[62] Available in Lulu, http://www.lulu.com/shop/scott-henderson/the-dark-visitor-ebook/ebook/product-2420426.html, webpage retrieved in 12/17/2014

[63] Henderson is, as he said, "Retired from the US Army after 20 years of service in the intelligence community as a Chinese linguist." http://www.thedarkvisitor.com/about/ , retrieved in 12/17/2014

[64]Henderson, Scott J. *The dark visitor: Inside the world of chinese hackers*. Lulu.com, 2007., page vi

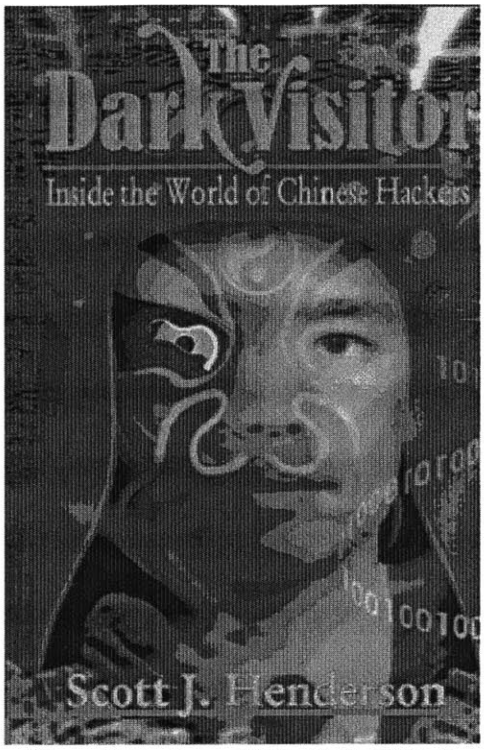

Figure 1 The cover of "The Dark Visitor"

In this book, the author argues, "One of the unique aspects of the Chinese hacker organization is their nationalism, which is in stark contrast to the loner/anarchist culture many associate with the stereotypical western hacker", and "(they) until very recently have maintained a strict code of never hacking inside China[65]." By somewhat mixing the idea of "Chinese hackers" and "Chinese hacker organizations that practice nationalism"[66], this remark is widely understood to present a general picture of Chinese hackers. In *The Johns Hopkins Encyclopedia of Digital Textuality*[67] Coleman[68] cites this book and concludes that "Chinese hackers are quite nationalistic in their aims and aspirations." However, when we examine the behaviors of Heike and their

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[65] Henderson, *The Dark Visitor*.

[66] As can be seen in the title of the book "The Dark Visitor" and the subtitle "Inside the world of Chinese hackers", also in the website for the book, http://www.thedarkvisitor.com/ with Chinese words "Chinese Heike" in the title.

[67] I have to note that this is a forthcoming work. You can find it here: Coleman, Gabriella. "Hacker". Forthcoming, *The Johns Hopkins Encyclopedia of Digital Textuality* http://gabriellacoleman.org/wp-content/uploads/2013/04/Coleman-Hacker-John-Hopkins-2013-Final.pdf , accessed in 12/17/2014, 2013

[68] E. Gabriella Coleman is a renowned researcher in hacker culture for her research in the Debian developers and the Anonymous communities.

connection with Xiake, Heike in fact aligns perfectly with the "loner/anarchist" part of Chinese culture[69]. And from the discussion in the later part of this chapter we will see that the primary targets of Heike are the net cafes in their neighborhood, the computer rooms in their schools, their roommates and boyfriends/girlfriends, and domestic websites, rather than international targets such as foreign governments.

The connection between hacking activities and the Chinese government is also doubtful. I want to argue that trying to compare hacking activities among citizens to wars between nations are unfounded. First, skilled needed for amateur hacking and cyber warfare are different. If the Chinese government needs to recruit security experts for military purpose, the government can find them in the network security departments of the universities. Subjects such as cryptography, which are essential to cyber warfare, require profound mathematical knowledge and extensive study in computer science. Second, technologies used in the military space are dramatically different from those for civil use. Hackers spend a lot of time studying common technologies in every life such as personal computers, Windows operating system, and personal websites; while the subject of military research are topics such as battleground control systems, which are often beyond the reach of common citizens. Besides, key departments of governments often have different technology for their network systems: one example is that those who "hacked into the Pentagon" are often only defacing their public website, not the Pentagon's internal systems related to military operations.

Among some Chinese scholars such as La Mu Si, Heike activities are often seen disruptions to social order that needs to be prevented[70], a misbehavior of youth that needs to be

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[69] If not more idealistic then its western counterpart.

[70] La Mu Si, A. "'Red and Black': Six Views on the Recent Chinese-American Hacker War." *China E-Commerce*, December 9, 2001, 1–3.

corrected[71], and an unlawful act that needs to be punished[72]. I think these misconceptions come from over-emphasizing eye-catching events (such as the "cyber war[73]") and prominent individuals (such as the leader of some "hacker union"). I agree that such stories and figures have great journalistic value because they are sensational and easy to catch attention of a large audience; they are less important in understanding the nature of the hacker groups and their social implications. I believe the answer to their culture lies in the everyday practices of hackers.[74]

A question arises: how can we find grassroot hacking practices in China? Imagine you are a high school student from a small city in China. You spend most of your time preparing for college entrance examination[75], and you have limited access to Internet, or even to computers. How can you get exposed to hacking techniques? The answer is their access to magazines on the newsstands in street corners. Although they are not the most circulated computer-related magazines, but one can somehow find them somewhere through the book stands[76]. By paying a little more then $1, one can get lessons starting from the beginner level, stories about and interviews of famous Heike, and a CD-ROM that includes all the software one needs to start a Heike's adventure. Those magazines are important text materials for understanding what Heike

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[71] Yuhua, Li, and Ma Li. "Qualitative Analysis on Internet Hacker Behavior and the Public Governance." *Guangxi Social Sciences*, December 9, 2007, 1–5.

[72] Huaisheng, Li. "Thinking From Perspective of Criminal Law on Passing on Hacker Technique Through Cyber." *Chinese Criminal Science*, December 9, 2009, 1–10.

[73] Or the China-US Cyber War. In this so-called cyberwar, Chinese and American hackers compete in defacing websites from each other's country.

[74] A similar story appears in the work of Molly Sauter, "The Coming Swarm: DDOS Actions, Hacktivism, and Civil Disobedience on the Internet", in which she describes how DDOS attacks are turn into virtual sit-ins, and how Low Orbit Ion Cannon (LOIC) gives a normal computer user the possibility to become a hacktivist.

[75] College Entrance Examination, or GaoKao, is a annual national exam for Chinese high school students. Unlike SAT in US which only serves as a reference, GaoKao is almost the only accepted way for Chinese colleges to sift its applicants; thus it largely determines whether a student may continue his/her education, which links to the quality of jobs s/he can have from the job market.

[76] Some mainstream Chinese magazines about computer technology are: *Popular Computer Weekly*, *Popular Software*, and *The Computer World.*

do, how Heike learn, and most importantly, how a media environment is created to support and spread its influence. Learning hacker knowledge through magazines is not the only choice for wannabe Chinese hackers. *2600: The Hacker Quarterly* is a US based magazine started from 1984[77]. It serves a similar purpose as the Chinese magazines I am going to discuss. I will make comparisons when necessary.

HackerXFiles

My analysis focuses different Chinese hacker magazines I have been able to identify. They are: "*HackerXFiles*[78]", "*NoHack*[79]", and "*Hacker Defense*[80]". The first thing interests me is the mottos printed on the covers because these mottos give clues to how the magazines position themselves, and how they justify distributing disruptive knowledge. There is no consistent motto in "*NoHack*", but it puts a warning on its every front cover as (literarily) "China computer security law reminds you: intruding into others' computer illegally [sic] is an illegal activity." I would like to consider this as a disclaimer that this magazine is merely a vehicle of information and takes no responsibility for what you use them for. *HackerXFiles* used the motto "public, popular science, interaction[81]" in its first issue, but it later changed into "freedom, equality,

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[77] I will call it *The 2600* in the rest of this chapter.

[78] "HackerXFiles(黑客 X 档案)", starts from 2001. I will use Hacker instead of Heike because it is the official English name of this magazine. The same applies to the following two cases.

[79] "NoHack(非安全黑客手册)" is translated literarily as "Non-security Heike Handbook". It starts from 2005.

[80] "Hacker Defence(黑客防线)" translates literarily as "Defense (Front)line of Heike". It starts from 2000. In some web blogs, they are called "three major hacker magazines".
http://blog.sina.com.cn/s/blog_5f8c677f0100jlx8.html retrieved 12/17/2014

[81] "DaZhong, Kepu, Hudong(大众、科普、互动)". The "public"(Dazhong) has the meaning of "mass audience", meaning the magazine is designed for a mass audience. "popular science"(Kepu) could be used as a noun, verb or an adjective in Chinese, means popular science (as a whole), to spread scientific knowledge or popularizing science, or related to popular science. "interaction" (Hudong) here means interacting with people, it further means the content of the magazine is contributed by its readers.

leisure, breakthrough[82]". This shows the fact that the editors tried to frame the magazine as a form of "popular science", which is highly encouraged in China and even included in the state's five-year plans because of its potential to increase the science literacy of the nation[83]. More importantly, "The Law of Publicizing Science in People's Republic of China" says: "Publication and distribution administrative agencies of books and magazines should support publishing and distributing popular science books and magazines.[84]" By appealing to the needs of the nation's craving for science and technology advancement, writings about hacker knowledge, which is often considered destructive and disrupting, became legitimated and even encouraged to be distributed in newsstands. At the same time, the magazines needed to attract its readers and find their market niche. They highlight the attractiveness of "the hacker spirit" (freedom, equality) and the leisure nature in this magazine.

"*Hacker Defense*" has a single slogan in its cover and website: "Seek breakthrough through the contradictory propositions of attack and defense." This utilizes a thesis-antithesis-synthesis similar to Hegelian Dialectics taught and understood by Chinese people[85]: through learning about hacking technologies for attack (thesis) and defense (antithesis), we can reach a

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[82] "Ziyou, Pingdeng, Suiyi, Tupo(自由、平等、随意、突破)". "Casualness"(Suiyi) here has a similar meaning with "freedom"(Ziyou). But instead of "freedom" (for mind or speech), it is more focused on "act without an aim". This also serves as a counter-argument to the misconception that Chinese hackers are nationalists.

[83] In the tenth five-year plan (2001-2005), it says in Chapter 20: "advancing advocating, education and popularization of scientific knowledge, ideas, methods and spirit"; In the eleventh five-year plan (2006-2010), Chapter 27, article 2: "Deploying 'everybody's science literacy action' plan". From people.com (the website for People's daily): http://theory.people.com.cn/GB/40557/54239/54243/3783806.html, http://theory.people.com.cn/GB/41038/4210925.html, retrieved 12/07/2014.

[84] "The Law of Publicizing Science in P.R. China" (《科普法》) is a law passed by 28th Standing Committee of the National People's Congress in 2002, signed by then president Jiang Zemin. From Ministry of Science and Technology of P.R. China. http://www.most.gov.cn/fggw/fl/200601/t20060106_53394.htm, retrieved 12/07/2014.

[85] This is actually taught as a part of the Marxism Materialism Dialectics in China. But since it is often ascribed to Hegel, I will use this notion here. See Mueller, Gustav E. "The Hegel Legend of" Thesis-Antithesis-Synthesis"."*Journal of the History of Ideas* (1958): 411-414.

higher level of "technology innovation and breakthrough (synthesis)[86]". In this way, the magazine justifies itself for teaching people to break into other people's computers on the premise that if everyone starts battling against each other in the cyber space, computer users in China overall will have a better knowledge of information technology, which is useful for the economic development of the country. As a result, Chinese government likely does not consider those magazines a threat. I have not found any record indicating that any Heike magazine was taken down by censors. Any magazines legally published in China must have an ISBN number issued to a state owned publishing house. Most of the hacking magazines are published by self-financed provincial level publishing houses that care more about their revenue and market share than political goals. In this case, publishing houses would like to publish any materials welcomed by the public and tolerated by the government. An interesting fact is one of the three Heike magazines, Hacker Defense, is honored as the "key publishing project of the eleventh five-year plan[87]." That means the publisher has acquired support from the government and that the publication of this book matches the development needs of the state. It is unclear how the publisher applied for funding support, but seen from the announcement of the government, the state called for books that "build skills and abilities for youth", "focus on popular science", and "attract young people to form reading habits[88]." The publisher may have framed their narrative in this way to gain tolerance or even support from the government.

The 2600 in United States also faces the same problems of justifying the distribution of harmful or illegal knowledge. When replying a reader who was concerned about the potential

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[86] From the website of Hacker Defense, http://www.hacker.com.cn/list-2-1.html, retrieved 12/07/2014
[87] Came from the Amazon.cn page for the book (Chinese): http://www.amazon.cn/%E9%BB%91%E5%AE%A2%E9%98%B2%E7%BA%BF-2010%E5%90%88%E8%AE%A2%E6%9C%AC/dp/B004P3VBAG, retrieved 12/07/2014
[88] "414 Additional Items for National Key Publishing Projects for Eleventh Five-Year Plan." *Gapp.Gov.Cn.* Accessed April 8, 2015. http://www.gapp.gov.cn/cbgls/oldcbgls/contents/2997/137701.shtml.

evil use of techniques discussed in the magazine, the editor says, "there is no defense for evil senseless destruction and we don't defend any form of it[89]". The editor also compares hacking with graffiti: the practices could either be destructive or artistic. In another correspondence between a reader and the editors about the legal status of its publication, the editor states, "As long as the First Amendment exists, we're completely within the law", although the editor also mentioned a shut down of a similar magazine in California in the 1970s. All those examples indicate that magazines in China and America share the similar strategy of depicting technology as neutral, justifying the spreading of knowledge by trusting the ethical judgment of its readers. The two magazines differ in their ways of justifying distributing hacking related knowledge. *The 2600* draws on American traditions of freedom of speech, whereas Chinese magazines secured their freedom by creative maneuvering of laws, policies and Hegelian Dialectics. The "weapon" used by Chinese Heike magazines is their proclamation of taking the responsibility of education and technology development, which is also reflected in their content structure and their step-by-step tutorial writing style.

[89] The 2600, *Dear Hacker*.

Figure 2 The cover of a "HackerXFiles" issue with a cartoon figure. I place it side-by-side with "The Dark Visitor": which is the true face of Chinese Heike?

I will more concentrate on "*HackerXFiles*" as my key source to discuss what may appear in a Chinese Heike magazine. Compared to the other two magazines, *HackerXFiles* has more diverse content and its writing style reflects more personality – possibly come from its "leisure" positioning.

Chicken Tales

Chicken Run is a section in *HackerXFiles*. This section shows how to control a compromised computer ("chicken") – either by infiltrating one or putting an existing one (which may be already infected by a virus, or belong to another hacker) under a Heike's control. Compromised computers can be used as proxies for further actions (to prevent the hacker's

identity from being revealed), or as botnets in DDOS attacks[90], or sold in the black market, or may simply serve as a demonstration of the Heike's technical expertise (in terms of how many compromised computer he had under his control). Calling compromised computers "chickens" reflects the victimized status of those computers: no one wants his/her computer under the total control of another person. The language of "chickens" has become a dark humor to it. "Meat chickens (肉鸡)" is a synonym of "chickens" except for its emphasis on the fact that chickens are at full disposal of the hackers. To "catch a chicken (抓鸡)" means to secure a victim computer under one's control, "Chicken flies away (飞鸡)" means the victim computer is no longer under one's control, "Protect a chicken" means stopping a chicken from "flying away" – either the owner of the victim machine finding a way to close the back door or the machine being captured by another hacker. "Farming chickens" means managing the chickens one owns to increase their number and to control them effectively. In an issue released at the dawn of Chinese New Year[91], the editor wrote, "I hope our readers have more and more chickens in the Year of Chicken[92]." In another issue it says, "I hope in the New Year, our readers could make more achievements in work, study, and (learning) technology. Of course, we should raise more chickens, and you won't be worried about that with our magazines in your hand[93]." Editorial encouragement to "catch chickens" is ethically troubling. How could it be discussed in a magazine like this? One possible reason is that editors want their readers to enjoy the potential power granted by hacking techniques. At the same time, knowing how to "catch a chicken" does not mean one actually

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[90] DDOS attacks aim to bring a target website down by commencing too many requests for the server(s) to handle. A botnet made of compromised computers is used to create the flood required to take a server down. The larger the botnet, the easier for the hacker to bring down a target website.
[91] Chinese New Year is the New Year's Day in the lunar calendar of China. It is disputably the most important holiday in China and in tradition an animal is assigned for each year.
[92] *HackerXFiles*, 2007 Vol. 2, p3
[93] From *HackerXFiles*

need to catch a chicken by himself/herself: the fear of having one's computer turned into a chicken is a good motivation for keeping one's computers safe, and how they can be cracked by other people at the same time informs how they can be protected[94]. However, this does not ease the fact that "catching chickens" are both legally forbidden and ethically troubling: this particular section was cancelled after May 2006.

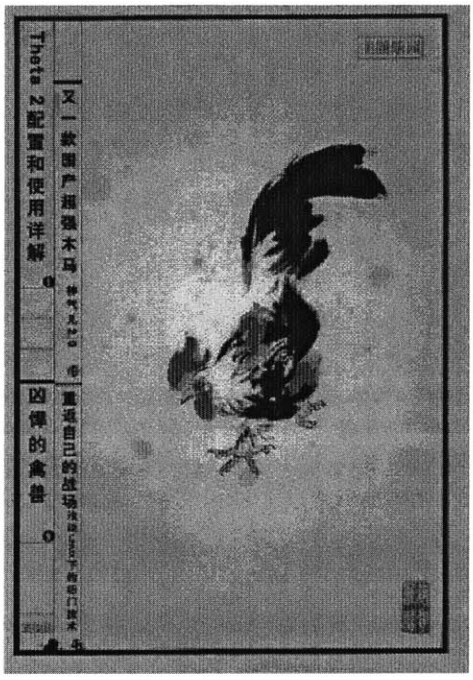

Figure 3 The cover of a special issue for HackerXFiles depicts a chicken. Note that it mimics the layout of an ancient book: XiaKe in WuXia novels often learn powerful Kung fu skills from ancient books.

What is the relationship between "catching a chicken" and creativity? The story of "catching a chicken" is a way that Heike tell stories around the technology they are working with. In this story, Heike are able to associate themselves with the broad "Ke" culture: when they are sitting in front of a computer, they are no longer individuals wrangling with all the frustration of the daily life; they are "Ke" travelling in the cyberspace, controlling the environment with their

[94] This is the moment how Hegelian Dialectics works in the hacker sphere: by learning how to attack, defense techniques are thus improved, and a better security environment can be now achieved.

superpower. But experimenting with superpower is only one part of Heike's life. Another major part of Heike's activities is playing with software used in everyday life.

Everyday Hacking

QQ is an instant messaging software very popular in China. Aside from its ICQ[95] style interface where users can add other users as "buddies" and start chatting, it also includes a Facebook-like service (QQ Space) and a chat-room-like group chatting service (QQ Groups). It is widely used by primary and high school students for after-school chatting. In HackerXFiles, there is a section called *QQ Bible*, which tells readers not only how to steal other's QQ accounts and protect their own QQ accounts, but it also demonstrates how to decorate their QQ spaces, how to use new QQ functions[96], how to probe into other people's privacy, and how to protect one's own privacy. From here we can tell that the magazine goes beyond security issues: it also discusses general software use. Students can pick up a magazine and it will instantly open their eyes to a larger information world. A reader of HackerXFiles reports his/her first experience with the magazine: "I was in the tenth grade and 'lost myself in QQ'; when I was browsing magazines from a book stand and the magazine (HackerXFiles) was recommended by the shop owner. I thought hacking is a mysterious thing, seemingly related to computers; and I don't know what it has to do with QQ. But there happened to be an article about QQ in that issue, which invited me into the world of hacking[97]."

Internet Cafes are an important part of Chinese Internet culture. Anybody can enter a Net Cafe and enjoy computer and Internet access for about $0.25 per hour[98]. This is especially useful

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[95] ICQ is a software with which users can add other users as friends, see whether users' "friends" are online, and chat with the online friends.
[96] Such as video chatting and QQ pets
[97] *HackerXFiles*, 2008 vol. 4
[98] Legally speaking, persons under age 18 are not allowed to enter a Net Cafe; however this law has never been strictly executed. The typical price for net cafes is 2-3 yuan per hour, that is about $0.25 US Dollars.

for school children and migrate workers[99], who do not have computers available otherwise. Computers in net cafes are usually installed with some management software, which can track how much time computers has been used. The software will ask the user to pay extra money for additional hours when the user's usage quota runs out. The management software also restricts usage of certain programs. So hackers cannot do whatever they want on the computers of the net cafés. The café took measure to prevent users from closing or uninstalling its management software by resorting to protection method such as hiding itself from the running program list[100] or disabling some functions in the computer. Some techniques used by management software are exactly the same techniques of remote control tools such as viruses or Trojan Horses for "chicken catching[101]". Management software is also used in schools or offices, to control which software one can use and which website one can visit, and to control an individual user's computer directly when necessary from the manager's computer. It is not surprising that attacks and defenses around management software became a battleground for hackers. *HackerXFiles* has a section called *Net Cafe Heike* which hosts articles around this issue. In the beginning of one article, the author writes: "Net cafes in Tianjin[102] often install some software; it is actually spy software to monitor whether there is illegal information[103] in the webpages users are browsing. It will close all the opening windows when illegal information is being displayed. I found out it

[99] Migrate workers refer to ones whose resident is registered in the countryside while living in cities temporarily to find a better-paid job. For Chinese residence regulation put constraints on migration within the country, these workers are often unable to enjoy the social welfare of city dwellers.
[100] An operation system (such as Windows) usually has a "running process list", where users can find which program is currently running and terminate it if necessary.
[101] An example is the "dark pidgin", which was intended to use for employers to manage their employees, but it soon became a infamous Trojan horse for "chicken catching". *Dark Pidgin*, http://www.hgzvip.net/benzhanshengming/ retrieved 12/17/2014
[102] Tianjin is a city in north China, located beside the capital Beijing.
[103] "Illegal information" often refers to "the information the government does not the people to see".

starts to place more restrictions than before, so I decided to shut it down[104]." Benefits of hacking a net cafe include taking free Internet surfing (since the timer is broken); installing custom software, especially hacking software; or planting Trojan horses to steal user accounts or prying into the privacy of other net surfers. Techniques of breaking Net Cafe imposed constraints are popular because they are both a demonstration of defiance towards constraints and control and an entry point for hacking – anybody can find a Net Cafe and experiment with these techniques with a minimal risk and consequence. Sometimes there are warnings at the end of these articles: "I hope this article will free everybody's mind, but I do not encourage you to take a free ride in net cafes. Don't blame me if you get caught in a net cafe[105]." "Jumping over walls" – bypassing the obstacles placed by the government (firewall)[106] – is also discussed in the magazine. In an article named "Adding Smartness to Wall-Jumping: Jump over the Wall Whenever You Want", the author says "Hope this article will help everybody jump over walls better, utilize the Internet better.[107]" However, "wall jumping" is not the main focus of this magazine, potentially because it is not a major part of hacking and it may attract attention from the government. An opening remark by the editors says, "Hope those novice hackers hanging inside the Local Area Network[108] (LAN) could break out the LAN and enjoys Internet resources from the world." In this case, the author is referring to the Chinese Internet as a LAN, a local network used to connect the computers in an office. Referring to Internet censorship this way allows the author to talk indirectly about the national firewall.

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[104] From HackerXFiles, 2006 Vol. 8
[105] From HackerXFiles
[106] Often indented for censorship. The "wall" refers to the "Great Firewall".
[107] From HackerXFiles, 2010 Vol. 5, p43
[108] LAN refers to the internal network of a company, here is a satire of access constraints placed by the government

Another section of the magazine is called *A One-man's War*. In this section, authors post their personal hacking stories. A story could start like this: "Today, I visited the "Group Policy Settings" of my Windows machine and accidentally discovered there is a 'network access' setting ...[109]" or "I works in a bank, and one day my manager asked me to remove the virus that infected his computer.[110]" One article teaching users how to make a SMS (Short Message Service) bomb has the following remark at the end: "Please try it out, it is quite satisfying." This writing style serves two purposes: these articles sound like stories happened in readers' real life, which invite readers to try out the tools or skills discussed; and they invite readers to submit their own stories, since most articles in this section do not involve advanced technologies.

This idea of sharing and participation is important to the culture of the magazine. In an article, the author told us why s/he decided to write for the magazine:

"I just entered my college, and had not started working on my specialized classes. So I went to the electronic reading rooms (computer rooms) everyday. After 2 months, I read few books but created some small disturbance in the campus computer room. Since keeping information for oneself is against Heike ethics, I decided to share what I did here (to creating this disturbance)[111]."

Moving Up the Ladder

Hackers establish their conceptual hierarchy by ranking the complexity of the knowledge involved in the activities. The "script kiddies" are the lowest-ranking hackers, then the ones who know how to program, then the ones discovering vulnerabilities or making popular hacker tools. There are hacker gurus who rank above all these and there are non-hackers: everyday computer

[109] From HackerXFiles, 2005 vol.1
[110] From HackerXFiles, 2006 vol. 8
[111] From HackerXFiles, 2009 vol. 1

users. However, the distinction between these ranks is not always clear. For example, social engineering[112] is hard to classify – it is appreciated by both expert and novice hackers. Within the ranks of skilled hackers, it is hard to tell whether open-software software engineers, security hackers, or software crackers are the highest ranking hackers.

Magazines often have a vague attitude toward these hierarchies. In one opening essay, the editor says: "Heike are classified in two categories: Heike and pseudo-Heike (骇客, Haike[113])[114]." In another issue, the editor offers this: "Attack and defense: which belongs to Heike (Hacker) and which belong to Haike (Cracker)? For me, Heike build and Haikes destroy ... However, there is a similarity in Heike and Haike, which is transcending oneself and challenging the limits (of one's ability)". The editor goes on to encourage the reader to "be a brave and true self in the cyber space[115]."

These debates take place in English-language hacking magazines as well. In *2600*, the editor offered this reply when a reader wrote about "the linguistic war" and talked about the "correct" meaning of hackers:

"We knew this was going to come up eventually. Over the years, there has been a movement to create a new word that basically means 'evil hackers.' ... The word they came up with, after much debate, was 'cracker'. Brilliant[116]. ... The main problem with creating such a word is that it basically transfers whatever problems existed with the first word over to the

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[112] Social engineering means gathering information in ways of asking or cheating. It often involves making a phone call, write a letter, or drop a physical visit.
[113] Which is a translation of Cracker.
[114] From HeikeXFiles, 2010 Vol. 4
[115] From HeikeXFiles, 2009 Vol. 2
[116] In the parenthesis: (Previous attempts at this same thing included such words as "worm," "phracker," and "hackerphreak.")

second one ... 'Cracker' denotes a criminal without defining the crime[117]." The editor continues, "Manipulation of the language is a very insidious way of controlling the masses." Unwillingness to take a stand on "hacker" versus "cracker" is consistent with 2600's editorial stance: they have decided to publish information of all kinds and leave use of that information to the discretion of the readers.

The same goes to for Chinese hacker magazines: their content varies all the way from setting up a anti-virus software, to customizing the mail client Microsoft Outlook, to building websites, using Linux, to much more involved topics like programming in assembly language, modifying Trojan horses to evade anti-virus software's detection, analyzing encryption algorithms and working with newly discovered exploits and vulnerabilities in operating systems. The companion CD-ROM has a similar editorial policy. It ships a dizzying range of content, from ready-to-go hacker software for intruding into systems, firewalls to protect your own computer, system management tools, to music videos, as well as games and cartoon animations.

Sometimes more advanced topics are discussed in special issues given for free along with the magazine. For example, the February issue of 2005 focused on honeypots - decoy computers deployed to attract attacks from hackers to allow security researchers to analyze attacks. This issue not only discusses how to set up a honeypot and how to gather information about attackers, but also examines the legal status of honeypots. Is it a crime to set up a honeypot, since the user is encouraging other people to commit a crime by hacking into the honeypot? Is it ethical to break into others' honeypots? The author concluded that "building a honeypot without promoting it is legal (since you are not actively soliciting, but only experimenting with technology),

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[117] Goldstein, Emmanuel. *Dear Hacker: Letters to the Editor of 2600.* John Wiley & Sons, 2010. 311-312

whereas intruding into a honeypot without authorization (from the owner) is illegal, which means that readers should proceed with extra caution. Attacking honeypots is more likely to attract attention from law enforcement, the authors note, since attacking honeypots are easier to get caught because honeypots are intentionally built to trap attackers. Issues like this demonstrate that Heike magazines can introduce and discuss new technologies before they are covered by the mainstream media.

Script kiddies and other types of low-end Heike are not only tolerated by the authors and editors of these magazines, but actively supported and encouraged to move onto higher levels of hacking. *HackerXFiles* has sections like as *Heike Academy*, *Heike Programming*, and *Heike for Dummies* to provide learning materials for novice Heike. When introducing a tool, the magazine tries to explain the terms and jargon that surround the tool. For example, network terminology such as "active" and "passive connections" are explained when introducing how to "catch chicken" with a Trojan horse[118]. The magazine also publishes books on specific hacking topics, so Heike who want to improve themselves can find ways to learn. We can consider these books as a special genre of publication: "Heike books" .

[118] From HackerXFiles, 2005 vol. 1

Figure 4 The book promotion page of HackerXFiles, 2006 vol. 02. Most of the books are under $2.

Readers appreciated the educational aspects of the magazine. One reader wrote, "(In my first computer class) I startled my teacher by telling her what I've learnt from X (*HackerXFiles*): ASP, PHP, assembly language, VB, C++. And the teacher wants to discuss the C programming language with me, although I do not even fully understand it[119]."

Heike magazines also contributed to the hacking culture and they also provide guidance to the wannabe hackers. One reader wrote to the editor about how the magazine taught him about hacking ethics: "My big brother lent me an issue of *HackerXFiles* ... and I stole my first QQ account (from somebody else). Then my big brother gave me another (issue). After I read it carefully and bought some other Heike books, I found that Heike don't hack like that." Not all readers were satisfied. In a discussion thread, a forum user posted, "I don't feel good about these magazines. They only talk about stuff on the surface, tell you to download some software, use

[119] From *HackerXFiles*, 2010 vol. 2, "The little story between me and X", by Yu Bin

them in this or that way. They don't talk about the core stuff[120]." Even though not everybody agrees that these magazines are beneficial to the technology community, the magazines succeed in keeping an open, friendly, and inviting atmosphere. It does not try to destroy the emergent technological hierarchy, but focuses on providing a way for novice participants to move up the ladder.

The Wild West and the Taming of the Frontier

China connected to the Internet in the year of 1994; A Trojan horse named "Back Orifice[121]" appeared in 1998, and it inspired many Chinese Heike in making pre-packaged hacking tools. Multiple global events happened in 1998-2001, including the Kosovo War, during which a Chinese embassy was destroyed by an American airstrike; the racial conflicts in Indonesia, during which many Chinese immigrants were killed; and the deterioration of China-Japan relationship. Pre-packaged hacking tools made some Internet users think that they can express their opinion on international affairs through hacking activities. Some self-claimed "alliances" such as "Green Beret", "China Hacker Alliance", and "China Red Hacker Alliance" were established, and several so-called "cyber wars" happened between Chinese Heike and hackers in other countries[122].

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[120] "[Help] Why HackerXFiles Discontinued?", http://bbs.pediy.com/archive/index.php , retrieved 12/06/2014

[121] Although it is designed as a "remote system administration" tool. See Cultdeadcow.com,. 2015. 'Worst Case Scenario'. Accessed April 29 2015. http://www.cultdeadcow.com/tools/bo.html.

[122] Anonymous. "A Review of Chinese Hacker History." *Software* 6 (2005): 63-66. The description of this period is filled with rumors and unverified information, and existing materials often exaggerates what happened in the "great hacker wars". Therefore this thesis project will not go through these events by scavenging information online as some other research did. In my opinion, only with ethnographers actually spent time with those Heike can we have a better understanding of the "hackers at war", and nonetheless it is insignificant compared to the magazine period since magazines can reach a much larger population of Chinese technology enthusiasts.

Hacker Defense, one of Chinese Heike magazines, published an interview[123] with pr0phet, an American hacker, on his/her opinions on US-China "cyber war":

"Q: Why do you think Chinese websites are so easy to hack?"

"I think web administrators in China are mostly lacking in skills, that is why they are so vulnerable."

"Q: What do you think will bring about the end of the cyber war?"

"I think the mutual threats and attacks will end soon. Maybe those who are fond of defacing websites will get bored quickly, or media on both sides will get tired of reporting defacements."

The era of "cyber wars", characterized by script kiddies, pre-packaged tools like "low orbit ion cannons", and unskilled system administrators ends soon. "This will ultimately lead to great future friendships (between hackers in US and China) and formations of new alliances for future hacker fun," said in a Wired article. The same article also cited a Chinese hacker hoping for a similar future: "when all this is over, we shall meet and be just hackers again[124]." The end of this "cyber war" coincides with the advent of Chinese Heike books and magazines. Reflecting on this time period, Bingxuefengqing[125] (a Chinese Heike from Heike group "Evil Octel") says, "It's not exaggerating to say that Unicode exploits[126] contributed to a generation of Chinese script kiddies. It's as famous as today's SQL injection. They are easy to carry out, friendly to beginners, and anybody who has a bit of curiosity will be drawn to the excitement of exploring a

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[123] This interview is in fact "done by an American security firm" as the magazine suggests, but I am unable to retrieve the source. This is a translation from the Chinese magazine. From Hacker Defense, Vol. 6

[124] From Wired, 01/01/2005, Michelle Delio, http://archive.wired.com/politics/law/news/2001/05/43443?currentPage=all

[125] This name is literarily translated as "sealing off emotion with ice and blood".

[126] This is a flaw of Internet Information Service (ISS) in Windows web servers, with which intruders can modify virtually any file in the target web server by passing UTF-8 characters in the request parameter to bypass security checks. See Brannan, Andrew. "Unicode Vulnerability–How & Why." (2001).

server far away." When talking about the big picture of China's online security, he says, "I think in these two years (2004-2005), there's a polarization in security technology. On one hand, we have professional security domain ... On the other hand, non-professional Hackers – small groups – have start taking form. It's different than the 'great alliance' period several years ago."

I would call this situation "an information wild west", for the sheriffs have no better weapons than the gangsters. "Do you want to know what the girl you have a crush on is saying when she chats online? Do you want to know who she talks with beside you? Do you want to know what your children are doing online? Please use this software[127]", says the beginning of an article introducing a hacker's tool. For every attack, there is a defense. When a Heike talked about his/her motivation in becoming a Heike, s/he says: "Actually I didn't want to be a hacker. I wanted to be a lawful citizen, to play around on the web, chat a bit, download some software, and read some news ... but my computer is being invaded multiple times; I wanted to find out who's behind this and punish them a bit, but my skill is limited and I don't even know how my computer is compromised[128]." The information wild west was not only a dark time for computer users and website administrators, but also a playground for Heike, a space for self-expression, It's a wild west where the cowboys are replaced by Chinese "Xia".

In HackerXFiles, a regular feature is titled "*Xiayinxianzong*" – The Hidden Xia and the Track of Xian. In contrast with Xia, Xian (which can be translated as saints) live apart from society, usually in high mountains, and they are fully absorbed in their own world. This section publishes literature around Heike culture, including short novels and serialized stories. These stories might be about a Heike who works a normal job by day but turns into a super hero at night; or about a war in the cyber space with criminals, mafias, and evil companies; or about a

[127] From HackerXFiles, 2005 vol. 3
[128] From HackerXFiles, 2005 vol. 3

girl who proves the innocence of her boyfriend by collecting evidence from a Trojan horse installed on his computer. Although hacking generally considered a masculine game, there is a cracker team[129] of women regularly writing articles for the magazine.

While enjoying the freedom of the Wild West, Heike start to consider the need to "fix the problematic network security of China", which is described as "defenseless cities[130]." For example, Wooyun.org[131], founded in 2010, is a site that allows any Heike to submit reports of a vulnerability of a website or a piece of software; and the company who is responsible for that vulnerability can read it on the platform (for a fee) and fix it. In this way, some ethical codes emerge to control hacking activities: the Heike has the obligation to notify the company first to ensure their hacking activity is constructive to Internet security; and Heike reserve the right to release their discovery to the public after a period of time, so the company has the pressure to fix their problem in a timely fashion. The company also needs to pay money to the website to view the problems Heike have found. This formalizes hacking activity and renders it more acceptable to the society. At the same time, novice Heike are excluded from the hacker's game (in contrast with the inclusive approach of Heike magazines).

Why Magazines?

It's worth asking why hacker techniques, a topic that largely belongs to online spaces, spread through magazines rather than over the Internet. As I mentioned before, some Chinese readers have limited access to the Internet, either because they do not have a computer at home, or because they are school students who need to spend most of their time on classes, homework,

[129] As they name themselves. Note that "cracker" – the term with negative connotation is used here; indicating the use of language is somewhat chaotic.
[130] From HackerXFiles, "an interview with Chenshisange - CIO of the Heike group 'eighth legion'"
[131] http://www.wooyun.org/. its Chinese name Wuyun means "dark cloud".

and exams. Magazines in the newsstands are more discoverable by new audience than a website sitting somewhere on the Internet. This can be understood through readers' account of their first encounters with HackerXFiles.

"I remember it was the summer holiday after the high school entrance exam, I found you in a little book store. From that moment on, I see you on the bookshelf. Then there's no return: I will save the money to have you on my bookshelf even though that means missing a meal in the school ... following my interests, I studied computer science after I graduated from high school, and devoted myself to it with my whole heart[132]."

In *2600*, a reader reports s/he "was browsing through Barnes and Noble and came across 2600[133]." Another reader mentioned s/he lives in a small town in south Texas, and "everyone here who sees me reading your magazine keeps asking me where they can get your mag[134]." In Henderson's account of "Dark Visitors", a major omission is the possibility that Chinese hackers are using "traditional" media to learn their craft, which is exactly what is happening in both China and United States. Magazines are the ideal distribution channels to attract target audiences; when they pass between hands of a group of readers, they become both culture icons and medium for social interaction. Even in early digital age, magazines still have unique merits because they can aggregate content that is otherwise hard to be found through books or search engines, and periodically deliver content in a sharable, readable format.

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[132] "In remembrance of HackerXFiles", http://blog.csdn.net/q878592748/article/details/23000475

[133] from *Dear Hacker*, p24. Although s/he doubts that "is your zine legal just because the FBI hasn't bothered to leaf through it or do you sneak copies of the shelf when nobody's looking."

[134] from *Dear Hacker*, p22. They did not subscribe via the post office because "they are afraid their moms, dads, or wives will see it and think they are doing something illegal." The reader himself/herself has his/her "cousin to buy it and send it from Houston."

However, this does not mean that paper-based media will last forever: *2600* added online (kindle) subscriptions; *HackerXFiles* and *NoHack* silently ceased to exist at the end of 2012[135]; and *Hacker Defense* became an online only journal. There are several possible explanations for this situation. First, the trend of computer hacking as an amateur activity is fading. New operation systems and web software have made it increasingly hard to hack. As with DDOS activism, in the early days, it is easy for everybody to download software such as Low Orbit Ion Canon to launch a DDoS attack as a form of political protest. But as defensive technology improved, such hacking is less likely to have a meaningful result.

Second, as technologies have become more user-friendly, there is less room for customization, which was another focus of these hacker magazines. Third, the limited access condition does not exist today. There is no need for somebody to consult magazines before he or she can finally access a real computer, and personal computers seldom have constraints from managers like teachers or net café owners. Finally, now that people are used to securing information online, paper-based media lost an important reason to continue. Heike, along with hacker magazines, are the product of technological and social conditions at a certain period of time. But the hacker magazines' friendly attitude towards beginners, their efforts to bring hacking to everyday users of computers, and their celebration of hacking activities to capture the popular attention have inspired a generation of technology enthusiasts.

[135] HackerXFiles stops in 2013, while no more NoHack can be found after 2010, before which combined issues (like "January to May") can be found in this monthly magazine.

Chapter 3 Jike, the Chinese Geeks

The English word "geek", where the Chinese word "Jike" comes from, refers to people who are obsessed with something, especially science and technology. In the United States, "Geek" is first used by high schools students together with other words, often interchangeably, such as "nerds" or "freaks". In 1958, James Coleman led an academic research on adolescent society. During his journey in Illinois high schools, he noticed that there were "adolescent societies" formed in high schools. Although Coleman did not mention the term "geek" directly, he found that students in high schools "cared more for 'good looks' and preferred 'being an athlete' to getting 'good grades' and 'being smart[136]'". Coleman also discovered that there was a group of students who were "smart" and "hard-working", but disregarded or even harassed by other students. Those students were called "geeks", "nerds", "freaks", or "dorks".

John Bishop conducted further research on this topic and tried to explain why students of these groups are persecuted by other students. He found that "Freaks, Goths, Losers, Druggies, Nerds are at the bottom of the status hierarchy[137]", and that "being a nerd is like having a communicable disease. Everyone tries to avoid a nerd because hanging out with one sends a signal that that person is a nerd as well[138]". He also mentioned hostility towards nerds passes from generation to generation because parents do not wish their children to suffer the same fate as nerds as they did in their own school life[139]. Geeks are no better than nerds or perhaps even worse. When studying stereotypes of gifted students, Tracy Cross noticed that "Geeks were

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[136] Coleman, James S. *The adolescent society*. Free Press of Glenco, 1963.
[137] Bishop, John H., Matthew Bishop, Lara Gelbwasser, Shanna Green, Andrew Zuckerman, Amy Ellen Schwartz, and David F. Labaree. "Nerds and freaks: A theory of student culture and norms." *Brookings papers on education policy*(2003): 141-213.
[138] Ibid.
[139] Ibid.

thought to be extremely inadequate socially—more so than the nerds—and also too focused in academic or technical endeavors[140]."

In the Chinese context, such animosity towards geeks is weaker. College Entrance Examinations (*gaokao*) almost solely determine whether a student is admitted to a college or not. As a result, preparing for exams is the top priority for Chinese high schools students. Extracurricular activities inevitably lose their importance, and the students who work hardest are usually given the most credit socially. The term "Jike" is seldom used in the school context; there is another word, "Shu Daizi (书呆子, 'book worms')" referring to children who only learn by rote, but no word can be found in the Chinese language for "smart, hard working, and anti-social child". When the word "geek" is translated into the Chinese word "Jike", it lost its original meaning in American adolescent culture. Therefore, Jike's identity must be understood in other terms.

People's attitude towards geeks started to change in the digital era. Technology and innovation are now considered key factors leading to business success, economic development, and the strength of a nation. Scholars looked into the education system to find out why China cannot produce more geeks working in fields such as computer science. At the same time, researchers in gender studies started debating over what roles geek culture can play in preventing women from pursuing a career in science and technology. In a research report published by Roli Varma, she incorporates some scholars' argument that geek culture rejects women because it is largely dominated by men and masculine standards. Others in the report proclaim that women reject geek culture because geeks carry some undesirable characteristics such as self-isolation

[140] Cross, Tracy L. "Nerds and Geeks: Society's Evolving Stereotypes of Our Students with Gifts and Talents." *Gifted Child Today* 28, no. 4 (2005): 26.

and the deplorable habit of staring at computers all day long[141]. The dynamics of women in geek culture also varies between sub-groups. For example, Varma noticed that "due to low social and economic status, minority women are less likely to resent being associated with geek culture[142]." Nevertheless, The stereotype association implicit in geek culture constitutes a main obstacle for women to advance themselves in the field of science and technology. One attempt to resolve this gender imbalance is delinking the idea of "geek" from computer science related jobs. Beth Plale believes that by telling female students that "you can use computers to help real people with real problems" without referring to the term "geeks", more women could be motivated to major in computer science[143]. But on the other hand, this confirms that geek culture's connection with the technology field is still undeniable.

Meanwhile, geeks are highly valued in workplaces. They are considered "people who deliver technological innovation[144]" to a company. In the book written for managers, *Leading Geeks: How to manage and lead the people who deliver technology*, Paul Glen claims that geeks are "highly intelligent, usually introverted, extremely valuable, independent-minded, hard-to-find difficult-to-keep technology workers who are essential to the future of your company[145]." He further states that "geeks are essential to innovation, and innovation is essential to the future of all enterprises. Without geeks in your enterprise, your future is in doubt." Although Glen acknowledges that geeks are "different from other employees" and that they are usually socially inept, he suggests that managers should recognize the uniqueness of "geekwork" and stop trying

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[141] Varma, Roli. "Women in computing: The role of geek culture." *Science as culture* 16, no. 4 (2007): 359-376.
[142] Ibid.
[143] Siek, Katie A., Kay Connelly, Amanda Stephano, Suzanne Menzel, Jacki Bauer, and Beth Plale. "Breaking the Geek Myth: Addressing Young Women's Misperceptions about Technology Careers." *Learning & Leading with Technology* 33, no. 7 (2006): 19-22.
[144] Glen, Paul. *Leading Geeks: How to manage and lead the people who deliver technology*. Vol. 11. John Wiley & Sons, 2003.
[145] Ibid.

to regulate the behaviors of geeks. He believes that "power is useless with geeks," and "geekwork is less about behavior and more about thought, ideas, and the application of creativity." The "creativity" here has a three-fold meaning: it refers to the problem-solving nature of geekwork , the "thought and ideas" which are valued by geeks, and finally geeks' ability to bring innovation to an organization.

Chinese scholars and businessmen also noticed Jike's value as creative workers. Jike (极客) in Chinese is made of characters Ji (extreme) and Ke. While "ke" signifies that Jike belongs to the "Ke" culture family; and "Ji" suggests that activities of Jike are somewhat "extreme", "deviant" and/or "cutting edge". In *China Youth Research*, Zhu Meiyan thinks that the prominent characteristic of Jike activities is "speed." She further explains that Chinese Jike are "stunningly [sic] wealthy and stunningly young, [they are] leading employees twice as old as themselves. Being mature[146] [sic] and disrespectful of traditional leadership, they treat entrepreneurship as a game and have ones and zeros running[147] in their blood[148]." Zhu occasionally mixes Jike with Heike, stating that "a minority of Jike produces computer viruses to destroy others' computer systems, causing immeasurable loss to society". She also worried about Jike's "yes-or-no binary logic[149]", their tendency to make premature conclusions, their style of "human-to-human interaction impaired by human-computer interaction", and their curiosity to work on issues unrelated to the organizations they serve. In conclusion, Zhu considers Jike a "new challenge to corporative management and leadership[150]" and admits that Chinese managers should avoid

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[146] The author did not mention why Jike are mature. It possibly means that they are actively engaged in business activities and they are no longer merely hobbyists.
[147] Potentially means that Jike are digital natives.
[148] (translated) Zhu Meiyan, Zheng Zhengwen, and Wang Longling. "Jike: an unusual group walking in the digital age." *China Youth Research* 4 (2005): 15-18.
[149] Here I disagree with Zhu's assertion: since Jike frequently encounter complicated topics as shown in the analysis below, it is impossible for them to maintain a "yes-or-no" logic.
[150] Ibid.

"power and command" (command and control, or over management) to make the most out of Jike.

Liu Jinjun[151] thinks that Jike are "people that perform jobs to the extreme[152]." He believes that Jike are more likely to devise original ideas and innovative products, and to pioneer new fields. Similarly, Li Shufu, a manager from the automobile industry, deliberates, in the context of his discussion about Jike, that "every industry needs to push itself to an extreme in order to achieve success" [153]. He did not explain what it means to push oneself to an extreme – it could mean doing one's best, or trying something different (which I will explore further in this chapter), but these statements suggest that "pushing oneself to an extreme" is a unique attribute of Chinese Jike and a fundamental difference from geeks discussed in non-Chinese contexts.

The last change in Chinese public perception of geeks is the prevalence of "geek style" or geek sub-culture. As the positive attributes of geek continue to present themselves in Chinese society, geeks start to identify themselves as consumers. Thus, a series of products are marketed as "geek products,", and geeks are proud of wearing geek clothes and playing with geek toys. Geeks start to distinguish themselves from other social groups. In the past, "the term geek, hacker, and nerd are used interchangeably[154]"; but now, geeks begin to correct other people when they are called "nerds" because "geeks get dates[155]." Geeks start to gain social capital by "defining themselves in terms of certain ideals and by keeping track of their 'geek cred[156]" which

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[151] Liu is the "Executive Dean of Zhongguancun Innovation Academy"
[152] (translated) Liu Jinjun. "Zhongguancun sounded Geeks Assembly." *Zhongguancun* 6 (2014): 023.
[153] (translated) Zhang Jing. "Drive Industry Change with Jike Spirit." *Automobile Observation* 2 (2014): 004.
[154] Roli Verma, "Women in Computing".
[155] Tocci, Jason. "Geek cultures: Media and identity in the digital age." (2009).
[156] Tocci, Jason. "The well-dressed geek: media appropriation and subcultural style." In *MiT5, Massachusetts Institute of Technology (29 April 2007). http://web. mit. edu/comm-forum/mit5/papers/Tocci. pdf.* 2007.

means exhibiting "authentic behavior[157]" in front of geek communities. Websites such as Thinkgeek.com start to sell products that cater to geeks' taste; "geek magazines" begin to emerge, such as *She's Such a Geek* or *Geek Chik;* geek culture is considered as "the third counter-culture" after hippies and yuppies as in Lars Konzack's words[158]. In contrast to hippies who rebel against industrialization and yuppies who rise against hippies, geek culture is "rebelling against the extroverts (like the hippies and yuppies), seeking substance instead of superficiality[159]." Geek, along with its introverted character, have transformed from a tag of denigration to a self-proclaimed symbol of cultural membership. Today, geeks begin to claim their own territory in mainstream culture and try to take a leadership role. In *The Geek Manifesto*, Mark Henderson believes that geek should take the leader role of the society because politics should be more evidence-based, more scientific, which need the specialty of geeks[160]. Lev Grossman believes geeks should be the shepherd of the masses because "they know enough" and "they can give advice" while "most mere mortals have no idea how to handle the overwhelming power of modern devices[161]."

Jike seen as a phenomenon of consumer culture has taken on a larger presence in China than its other shades of definitions. Products designed for geeks are quickly introduced to China and accepted by Chinese Jike consumers. Chinese versions of Thinkgeek.com – websites that sell "geek products" – soon appeared over the Internet[162]. Jike media such as Geekpart.net and Fromgeek.com started to roll out in the name of "Jike culture". Although Chinese Jike do not publicly consider their culture the solution to, the "Internet spirit" promoted by many Jike started

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[157] Such as doing "geekwork", talking in geek's way, and dressing like geeks.
[158] Konzack, Lars. "Geek Culture. The third Counter-Culture." (2014).
[159] Ibid, 5.
[160] Henderson, Mark. *The geek manifesto: why science matters*. Random House, 2013.
[161] Grossman, Lev. "The geek shall inherit the Earth." *Time Magazine* (2005).
[162] For example, Geekcook.com is a Chinese version of Thinkgeek.com

to have an impact on the business world. The core concept of "Internet spirit" in China is "performing to an extreme" when running a business. This means pursuing the fastest growth speed, aiming at the "utmost in performance" of a product, service, or user experience[163]. The "Internet Spirit" also advocate for using Internet tools – such as social media, crowdsourcing, big data, and 2.0 business models. This is the result of Jike entering the business world. There is a debate in China on whether the "Internet Spirit" will impact traditional industries[164]. While advocates of the "Internet spirit" juxtapose businesses leveraging the Spirit and those that failed as a result of their refusal to adopt it, detractors of the so-called Internet spirit declare that its influence on industries is exaggerated. No matter which side wins, the whole discussion serves as an example of the attempt of Chinese Jike to gain more social standing via their technology skills and creative ideas.

In sum, Chinese Jike are free from the bitter history of their American counterparts. When Geek comes to China and becomes Jike, the term refers to people who are smart, capable of bringing changes to society with their technological skills and creative minds, and proud of their membership in Jike culture. Whether Jike are consumers or producers, they are technology connoisseurs who are expert judges of what they buy and how well the business behind the product is running. For the purpose of excavating the topics Chinese Jike care about, I have undertaken a text-mining project in which the articles in a Chinese Jike media are analyzed. I hope this will help create a comprehensive understanding of the Chinese Jike culture.

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[163] Blog.sina.com.cn,. 2015. 'The core of Internet Spirit'. Accessed April 16 2015. http://blog.sina.com.cn/s/blog_c307f67d0101meet.html.

[164] Here is a webpage with a list of articles from both sides. Many are written by CEOs and leading managers from industries. (Chinese) Baijia.baidu.com,. 2015. 'Will Internet Spirit Subvert Traditional Industries'. Accessed April 16 2015. http://baijia.baidu.com/?tn=topic&topicid=xa0a08rZ.

A Text Mining Method for Chinese Jike Media

This section surveys an online Jike media outlet: GeekPark.net. GeekPark is a company focused on building Geek culture. It publishes articles almost every day[165] and holds offline events such as Jike conversations or press conference for new technology products. Geekpark claims that Baidu and Xiaomi's CEO are all members of GeekPark and they invite individuals from abroad such as Google's executive chairman Eric Schmidt to share "geek ideas[166]". An analysis of GeekPark.net's articles will lead us to some insights about Jike's favorite discussion topics and core ideas.

I choose text mining to analyze Geekpark.net articles. Text mining is a type of data mining, a technique used to summarize data from different perspectives to uncover useful information[167]. With data mining, researchers can detect patterns from a large amount of data, which is hardly possible with previous methodologies. Text mining focuses on text-based data – such as media articles or conversations. These data are usually unstructured excerpts from human language rather than numbers listed in tables and, as we know, unstructured data call for special kind of data analysis. Text mining can be used in two ways. The first is descriptive, seeking to "discover theretofore unknown information, something that no one yet knows and so could not have yet written down[168]." Descriptive text mining is often used in meta-analysis of various subjects. For example, biologist may find which proteins interact with one another by looking at which set of biology terms occur together in academic articles[169], and this may generate insights on the direction of future biology research. Another method of text mining involves predictive

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[165] From data in alexa.com
[166] Geek Park,. 2015. 'Geek Park – finding the values inside products'. Accessed April 21 2015. http://www.geekpark.net/pub/about.
[167] Anderson.ucla.edu,. 2015. 'Data Mining: What Is Data Mining?'. Accessed April 16 2015. http://www.anderson.ucla.edu/faculty/jason.frand/teacher
[168] Hearst, Marti. "What is text mining." *SIMS, UC Berkeley* (2003).
[169] Ibid.

text mining. The process involves building a mathematical model from existing data and uses it to predict outcomes of new data. For instance, game companies may build a language model to predict whether players are using toxic language towards other players, and intervene in time to correct their behaviors[170].

In my research, text mining is used in a descriptive manner since my purpose is to generate a broad overview from large amount of media content, and then use that overview for discussions. Here are the questions I ask the data:

RQ1: what are the topics covered by Geekpart.net?

RQ2: what are the trending topics in each time period?

Answering these questions does not require a rigorous quantitative study designed to test hypotheses or create an accurate metric. Instead, a qualitative version of text mining is justifiable and suitable for the task. Although "qualitative analysis" does not mean I can arbitrarily remove data points from results, an iterative process in which methods and parameters are adjusted after each round is accepted and even required to generate meaningful results. In my opinion, adequate transparency - reporting the detail of the process as well as detailing the parameters used in the process - fulfills the ethical requirement for this research. The following diagram lays bare the procedure I used:

[170] Blackburn, Jeremy, and Haewoon Kwak. "STFU NOOB!: predicting crowdsourced decisions on toxic behavior in online games." In *Proceedings of the 23rd international conference on World wide web*, pp. 877-888. International World Wide Web Conferences Steering Committee, 2014.

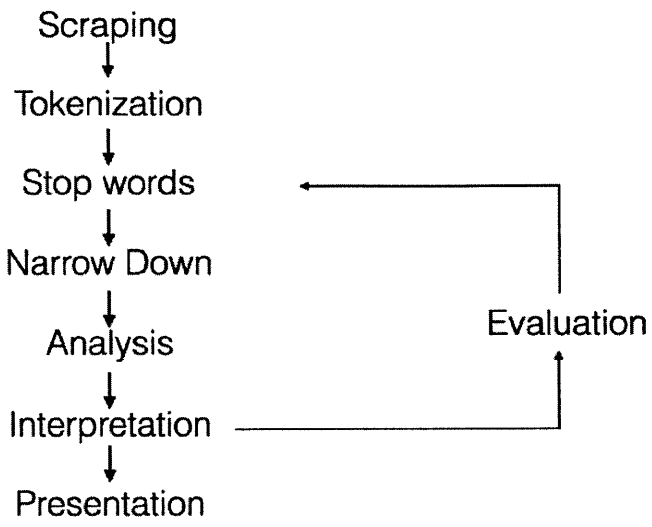

Figure 5 The procedure of text mining in this chapter

The first step is **scraping**. Scraping means downloading data for analysis. In my research, I wrote a Python script to download 917 articles from GeekPark.net. These articles were written by editors of GeekPark.net, and they date from November 2010 to January 2015. From the histograph shown below, most of the articles are written after 2013, which means Geekpark.net is a relatively new website.

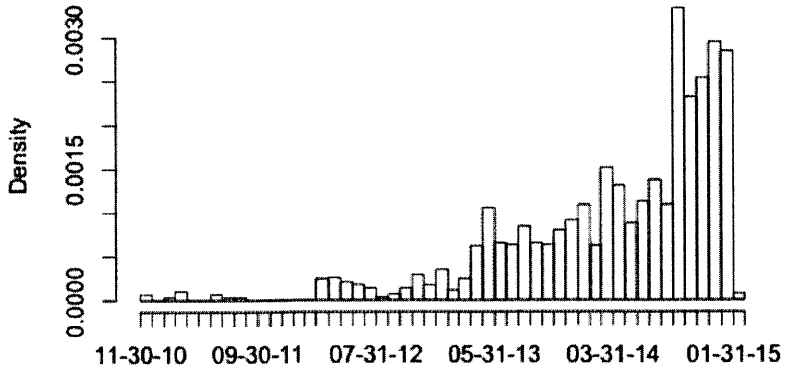

Figure 6 Histogram of articles' distribution across time

The next step is **tokenization**. The goal of this step is to identify the minimal analytic element in a document. Usually these elements are words although other analysis may use paired words (2-gram), words of specific parts of speech, or words that denote locations or people's names. In this analysis, words are the basic analytical unit. Since all articles are written in Chinese and there are no clear separations between words like spaces, I need to break down Chinese sentences into words. I used an open source library implemented by Sun Jian, which is based on Google's semantic language model and conditional random fields[171]. This library is now maintained by NLP[172] China, and claims to have an accuracy rate of 98%. I used a port for R statistical software Rwordseg made by Li Jian[173]. An advantage in analyzing materials written in Chinese is that Chinese words do not have plural forms or variations for tenses. This makes tokenization easier because if there are multiple forms of a word, words expressing exactly the same meanings (for example, "dig" and "dug") would merge in this step.

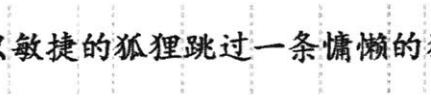

Figure 7 an example of tokenization of Chinese language – sentences are broken down to words.

The third step is **stop words**. Stop words are words such as "a", "the", "be" in English, which are common in the language but have little research value. Filtering out stop words allows researchers to ignore noise data and focus on data related to research objective. This research starts with a list of Chinese stop words in the package StopwordCN[174]. But additional stop

[171] GitHub,. 2015. 'Nlpchina/Ansj_Seg'. Accessed April 15 2015. https://github.com/NLPchina/ansj_seg.
[172] natural language processing.
[173] Jliblog.com,. 2015. 'Rwordseg | Lijian's Homepage'. Accessed April 15 2015. http://jliblog.com/app/rwordseg.
[174] Jian, Li,. 2015. 'Text Mining in Chinese and tmcn package'. Accessed April 17 2015. http://cos.name/wp-content/uploads/2013/11/ChinaR2013SH_Nov03_07_LiJian.pdf.

words may be added later to yield a better result. A list of all stop words used in this study is provided in the appendix of this thesis.

After removing stop words, data sometimes need to be **narrowed down** for further analysis. How to narrow down a data set depends on which analysis method is used afterwards. For example, when drawing a correlation graph, terms that have low frequency need to be excluded, and correlations that are too weak also need to be removed. Otherwise, the graph will be unreadable – even though it still reflects some characteristics of the data, it is too hard to interpret them and they will thus have little research value.

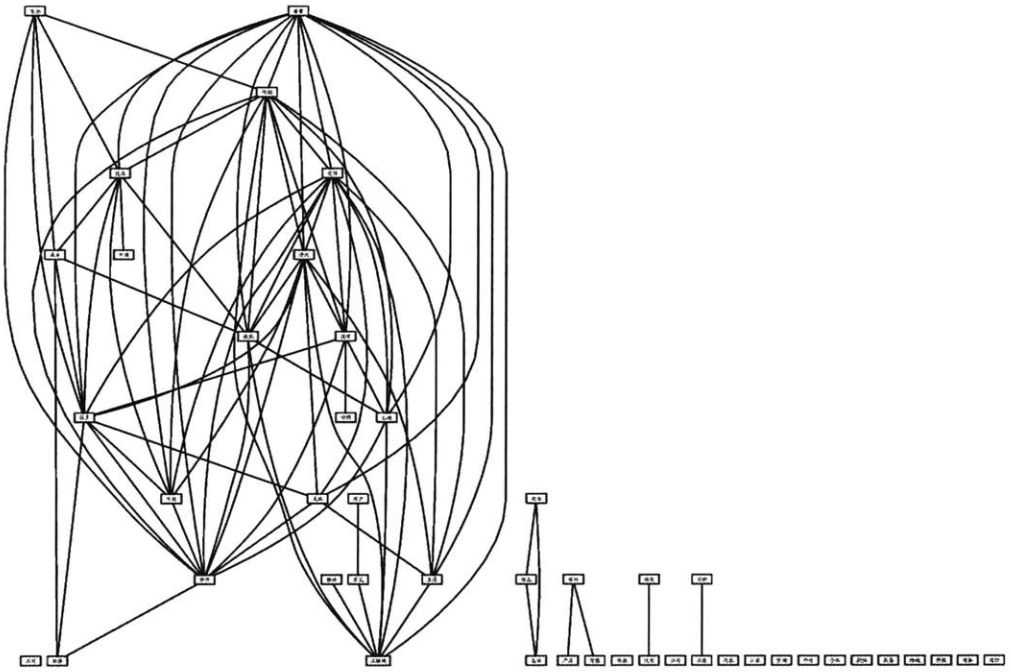

Figure 8 The co-occurance of words drawn without proper narrowing down. Correlations are indistinguishable in this case. What is needed is cutting off words and co-occurrences below a certain frequency

After narrowing them down, the data are ready for **analysis** – allowing me to apply statistical and computational methods to the data. After the analysis is done, the next step is

interpreting the result of analysis in the research context. If the result is unclear, too general, or buried under noise, additional measures may be needed after **evaluating** the problem. These "additional measures" include adding extra stop words and refining parameters in narrowing down or analysis.

Data Analysis

Before discussing results from data analysis, some concepts need to be clarified. **Terms** refer to basic conceptual units in the analysis. In my case, terms are tokenized Chinese words. **Documents** are a collection of terms. Unless otherwise specified, documents are individual articles scraped from Geekpark.net. And finally, **Corpus** means a total collection of all the documents, or the entire research subject. In this analysis, it is the 917 articles as a whole.

The first inquiry I conducted was finding the most frequently used words through the documents. Here is a list of top ten words used in these articles.

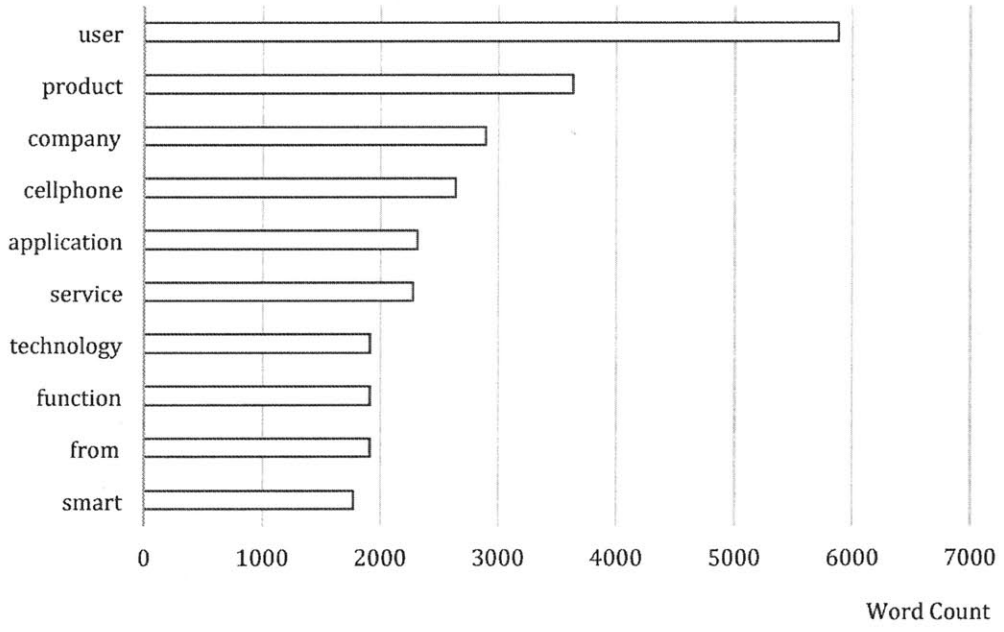

Figure 9 words that appears most in the documents. Numbers are counts of appearance (translated).

As can be seen in the chart, "user" is the most frequent word used in these documents, signaling that Geekpark.net tends to write in a "user-centered design" perspective. Next to it are "product" and "company". This suggests that Jike are concerned about industry development and possibly R&D. The fourth word is "cellphone" which is the only concrete technology object appearing in this frequency word list. Cellphones are the first widely used personal computing device, perhaps the first computing technology that stays with its users all day long. Smart phones today also spark various modes of innovation and entrepreneurship such as social networks, apps, and games. This could be why a large number of Jike articles are related to cellphones.

The next analysis I did was a correlation graph. Correlation graphs are drawn under the premise that when concepts expressed in terms (words in this case) frequently appear together, they respond to a same set of topics. A correlation graph is drawn as such: first, words that appear less than 900 times in the corpus are removed to allow us to focus on the most important words; second, if two words co-appear in the same documents frequently enough, a line is drawn between two words. I used a correlation threshold of 0.3, which means this graph only links paired words that have a correlation coefficient[175] over 0.3. The frequency threshold and correlation threshold can be adjusted to reveal different level of details. Here is the result of the correlation graph:

[175] defined in statistical terms, $\frac{cov(X,Y)}{\sigma_X \sigma_Y}$. Correlation coefficient is generated from document-term-matrix, in which the rows are different documents, and columns are terms. Each record is a list of the numbers of terms appear in each specific document.

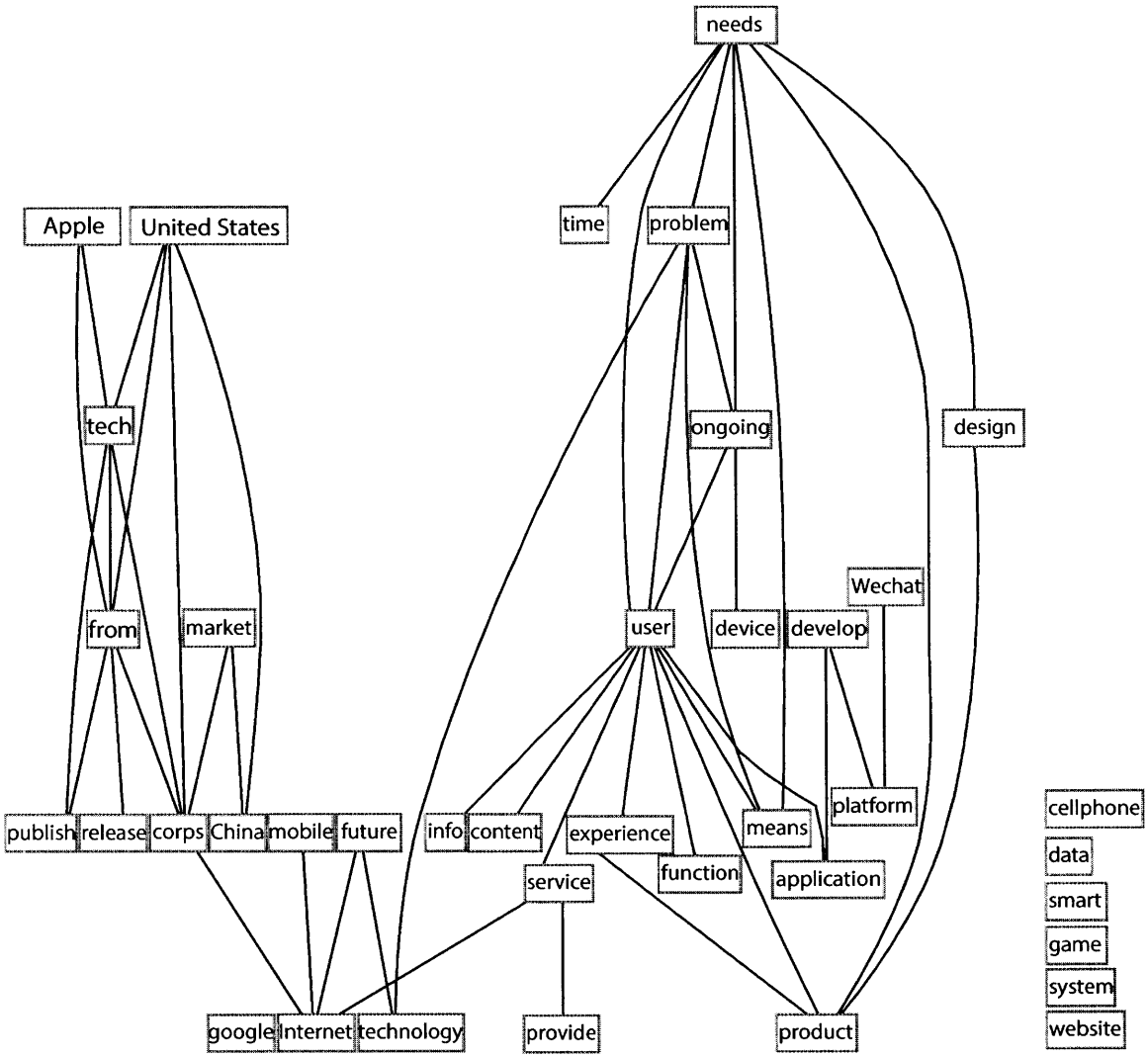

Figure 10 Correlation graph of terms (translated)

From this graph one can see there are two major clusters of the terms. The left one is focused on introducing new technology and business practices. Central terms are "technology (tech)", "from (来自, originated from)", "United States", and "corporations". "China" is frequently discussed with "United States" and "market", suggesting that technology adoption, translation, comparison, and competition between countries are frequently mentioned when Jike media are discussing technology and business. The right cluster is built around the idea of

designing the user experience. Central terms are "user", "needs", "problem", and "products". Developed around "user", there are "information (info)", "content", "service", "experience", and "application". Those are key products or decisive factors for a successful company in the information industry, and user service and user experience suggest the user-centric design paradigm that Jike aspire to. Terms serving as connectors between different groups can be interesting. For example, "design" bridges "needs" and "product", while "product" is coupled with "design", "user", "needs", and "experience" which are elements seen by the authors as the essence of a successful product. Disconnected but common terms such as "cellphone", "data", "smart", "game", "system", and "website" are specific technologies mentioned in Jike Media. They appear frequently, but they are not bound to a certain form of discussion. Connectors between two clusters are also note-worthy. "Technology" is related to both "future" in business/innovation, and "problem" in satisfying users' needs. "Internet" connects to "service" it provides for users, as well as "corporations" in the business domain.

I have to say that this graph shows only co-occurrence. It does not give a hint on causal relationships (such as technology "leads to" future and problem solving). But it is still a useful method for data mining since it manifests hidden patterns. In summary, this graph reveals that introducing progress on technology and adapting technology for the needs of users are two primary topics in Jike media.

A third analysis is built around trending topics in each time period. In a method provided by Olga Streibel, "trend" is defined as a combination of "burstiness" (the unusual increase of the appearance of a term), "interestingness" (related to the frequency of a term), and "utility" (how frequent is the term tagged by the users in a time period)[176]. I only take "burstiness" into

[176] Streibel, Olga. "Mining trends in texts on the web." In *Proceedings of the DC at Future Internet Symposium*, pp. 80-90. 2010.

consideration this time. Term frequency – inverse document frequency (TF-IDF) of every three months is calculated to measure burstiness.

TF-IDF is a common method used in text mining. TF-IDF measures to what extent a term is uniquely prominent in a specific document. In TF-IDF, words that are too rare and words that are too general both get a low score. It is defined as a product of term frequency (TF) – the relative appearance of a term in a certain document – and inverse document frequency (IDF) – a logarithmic value of the inverse of the term frequency in all documents multiplied by a factor[177]. A larger the TF and a smaller DF (document frequency) yield a larger TF-IDF. A larger TF means the term (word) appears more frequently in a certain document; a smaller DF means that the term is not common in every document from the corpus. For example, the term "robot" has a higher TF-IDF in articles written in "2014 winter", because it is only popular in 2014 winter; whereas the term "user" does not have a high TF-IDF value because it is prevalent in all the documents. In this way, I can spot which terms are "trending" in each time period. A list of "trending words" in each time period is provided in the following tables.

Table 1 trending terms in Geekpark.net (translated)

time	**2011Q1**	**2011Q2**	**2011Q3**	**2012Q1**	**2012Q2**	**2012Q3**	**2012Q4**
terms	Dropbox	music	google	Github	SPDY	Digg	remote
	cellphone	IFTTT	chat	Pinterest	HTTP	Alibaba	magazine
	Contact	amazon	share	code	Duckduckgo	Paypal	Wechat
	Function	albums	circle	project	drive	forum	card
	information	iTunes	social	Oauth	auction	product	lonely

[177] It is mathematically defined as $w_d = f_{t,d} * \log\left(\frac{|D|}{f_{t,D}}\right)$. $f_{t,d}$ equals the frequency of the term t in document d; $|D|$ means the number of documents in the corpus; $f_{t,D}$ equals the frequency of term t in the corpus D. see Ramos, Juan. "Using tf-idf to determine word relevance in document queries." In *Proceedings of the first instructional conference on machine learning*. 2003.

	socialize	subscribe	Facebook	branch	Wechat	Wechat	design
	network	google	video	Papermill	draw	manager	MIT
	sync	music	Wakoopa	authorize	Zynga	GPL	menu
	base on	piracy	friend	adult	customize	opensource	rock
	platform	trigger	network	login	legislation	mailbox	class

Table 2 (cont.) trending terms in Geekpark.net (translated)

time	2013Q1	2013Q2	2013Q3	2013Q4	2014Q1	2014Q2
terms	path	technology	technology	technology	vocaloid	NAS
	guard	by year[178]	automobile	Tebow	Ziru[179]	curriculum
	innovation	guest	by year	agriculture	Volvo	lofter
	input	midnight	nokia	finance	fc	grids
	leap	scenery	vote	Baidu	technology	review
	product	wearable	hardware	foundation	review	secret
	animation	seasonal	raspberry PI	Alibaba	automobile	technology
	jailbreak	Sony	surface	Airbnb	group	myfreecams
	voice	Apple	billion $[180]	silicon valley	EU	activity
	department	Xbox	midnight	Xiaomi	calling a taxi	bong

Table 3 (cont.) trending terms in Geekpark.net

time	2014Q3	2014Q4	2015Q1
terms	review	review	Wooyun
	font	inbox	cold jokes[181]
	Go Pro	piano	Yaoqi[182]
	Twitch	robot	100k
	technology	pay	doodle
	Apple	radio	Alienware
	Wechat	air	forbidden palace
	Stars	VR	Hololens
	nonprofit	technology	museum
	Xiaomi	everykey	AI

The tables illustrate that trending words are often product names, company names, and technology fields such as VR (virtual reality). Trending words also show that Jike are not merely information technology enthusiasts; they are interested in a wide range of topics. Topics other

[178] The full term is "... compared with last year"
[179] Ziru, or Wang Ziru, is a famous and controversial technology critic in China.
[180] Billions of dollars. Here it is used as a unit of currency.
[181] "100 Thousands of Cold Jokes" is an animation series made in China.
[182] Yaoqi, or You Yaoqi, is a Chinese manga website.

than information technology include manga, animation, music, automobile, agriculture (as shown in 2013Q4), and museums (such as "museum" and "forbidden palace" in 2015Q1). This may be a result of the fact that Jike culture intersects with traditional industries.

One noticeable trend is that articles in Geekpark.net are becoming "less geeky", or more focused on technology in everyday life instead of specific topics in the computer industry. For example, software jargons like Github, SPDY, HTTP, GPL were trending only before 2013. Although there are other terms such as NAS[183], VR, or AI after 2013, these terms are mostly attached to some products sold in the market. This could mean Jike culture is moving out of the small circles focused on technical details of information technology into a broader popular culture and consumer culture. This may also mean that becoming a Jike is less difficult than before.

The last analytical tool used in this chapter is topic models. I use topic models both for detecting topics and for tracking topical trends. The method I used is called Latent Dirichlet Allocation (LDA), and it can be used to extract "topics" from text corpus. Its idea (in the context of text mining) is that each word in a document can be "modeled as a finite mixture over an underlying set of topics[184]". Through estimating the parameters of the model, we could find out which word is most likely to be assigned to which "topics". In this research, I used an R package provided by Bettina Grün and Kurt Hornik[185]. Before applying topic models, I removed all the terms having TF-IDF less than 0.2. This reduces the total number of terms from 24,805 to 2,210,

[183] NAS is a shortcut for Network Attached Storage. It could be an external hard drive that connect to the network of the living room, streaming movies and picture to the television. Chinese companies such as Xiaomi released a series of products like this.

[184] Number of topics need to be specified by the user. Technical details can be found in the paper written by Blei, Ng, and Jordan. See Blei, David M., Andrew Y. Ng, and Michael I. Jordan. "Latent dirichlet allocation." *the Journal of machine Learning research* 3 (2003): 993-1022.

[185] This package uses a maximum likelihood estimation for LDA models. Details can be seen from Hornik, Kurt, and Bettina Grün. "topicmodels: An R package for fitting topic models." *Journal of Statistical Software* 40, no. 13 (2011): 1-30.

which makes it easier for model estimation and less difficult to yield meaningful results (since the words that are too general are removed from the corpus). This research sets the number of topics to 30, because although more topics may generate a result with more nuance, 30 is enough for this analysis; fewer topics (for example 2-3 topics) on the contrary may lead to a rough result[186], in which each word is forced to be classified into 2-3 topics. I assigned a name for each "topic" extracted by the model. The following table is an example of topics and some words associated with them (in the order of the probability of a word belonging to a certain topic).

Table 4 An example result of topic allocation and the name I assigned to topics

Topic names	**Business**	**ICT**[187]	**Entrepreneurship**	**User Experience**	**Virtual Reality**
Terms	billion $	Internet	product	user	Google
	growth	product	entrepreneurship	product	reality
	from	innovation	company	experience	mail
	seasonal	user	market	function	path
	technology	company	Internet	manager	virtual
	company	technology	China	need	application
	compared to last year	mobile	investment	requirement	glass[188]
	market	service	radio	design	glass
	cellphone	corporation	project	time	VR
	last year	future	team	problem	Oculus

As can be seen in the examples above, the key words[189] in these topics are more general than the terms that emerged from the TF-IDF based trend analysis. The following is a list of names I assigned for all 30 topics. Topics with the same names are allowed.

Table 5 Assigned names for topics

1	2	3	4	5	6	7	8
business	ICT	entrepreneurship	user experience	virtual reality	reading	social networks	social networks
9	10	11	12	13	14	15	16
business	market	cellphone	artificial	user	game	user	payment

[186] See Hornik, Kurt, and Bettina Grün. "topicmodels: An R package for fitting topic models.", 13
[187] Information Communication Technology
[188] This "glass" is in English
[189] "Defining words" refers to the words have the most probability to belong to a topic.

			intelligence	experience		interface	
17 business model	18 mobility and development	19 cultural industries[190]	20 news and information	21 life styles	22 Internet of Things	23 music	24 navigation
25 cyber security	26 operating systems	27 business	28 gadgets	29 entrepreneurship	30 technology and people		

This table delivers us a glimpse of topics discussed in the Jike media under discussion. This result corroborates my analysis in the correlation graph: economic development through business innovation ("business", "entrepreneurship", "business model") and user centered design ("user experience", "user interface") are two most common subjects in Jike media.

Topics can also be tracked with a timeline. Figure 11 shows the development of four topics across the designted time period.

[190] Includes movies, animations, etc.

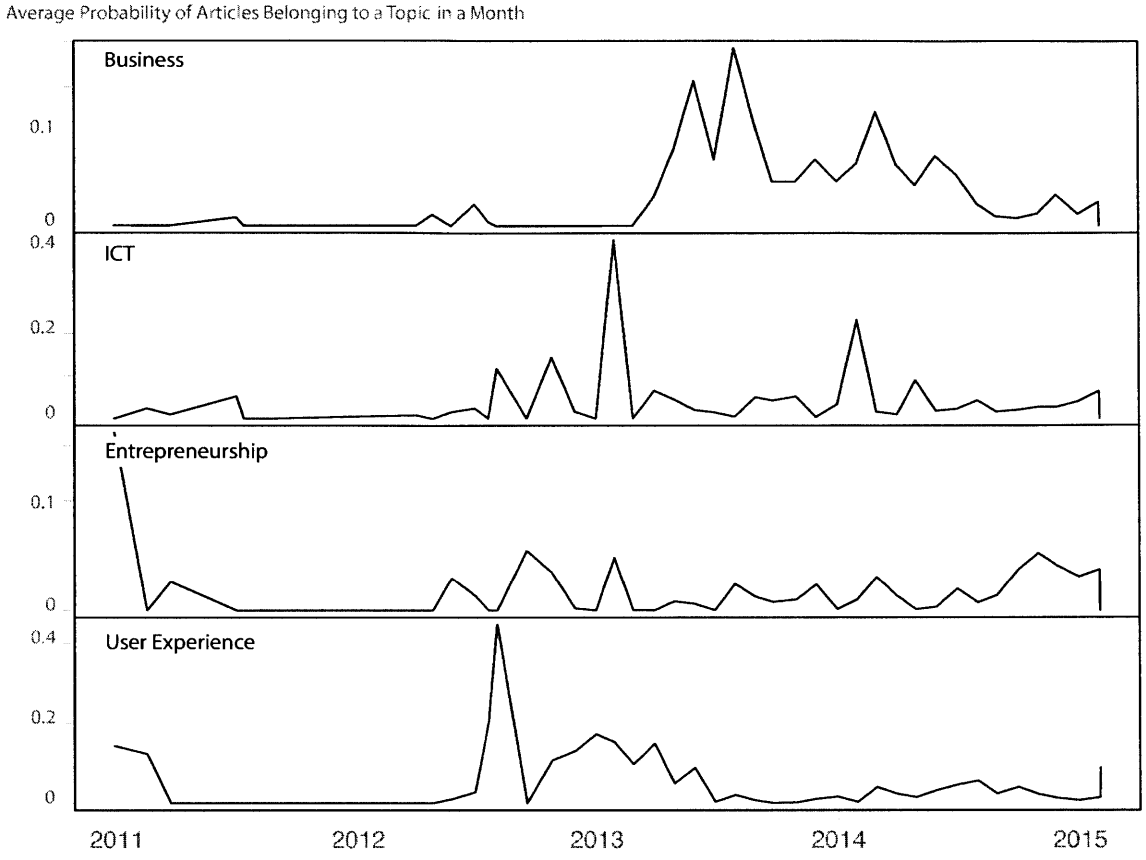

Figure 11 Development of 4 topics across the time

An interesting pattern can be spotted in the graph. Discussions on "user experience" reached a spike in the middle of 2012 and continued as a hot topic in the early 2013; "ICT" articles topped the chart at the beginning of 2013 and peaked now and then; "business" related topics gained attention after 2013, following "user experience" and "ICT"; and "entrepreneurship" is most evenly distributed across time. Does that mean an increased attention to "user experience" helps move the discussions about ICT, which in turn fosters conversations about business practice? Again, I would stress that this topic development chart does not indicate causal relationships, and values only have relative meanings[191]. But at least this graph shows that

[191] "relative" means that if ICT has a value of 0.2 while business has 0.4, it does not mean that business has more weight than ICT at that time. Comparison is only meaningful on how a topic is discussed in different time

articles on user experience are precursors of ICT and business topics. The mere possibility that the user experience may be a key factor in improving Information and Communication Technology and geek-related business imparts great cultural value.

Reflections on methods

This chapter explored a Chinese Jike media source using a variety of text mining methods. As the analysis reveals, this method makes it possible to cull keywords from a large collection of texts, revealing the underlying structures, and identifying trends in discussions. This is an exploratory method, which means it cannot definitively validate hypotheses but it can stimulate discussion and speculation. This study still has many problems to solve and can be improved in the future. For example, by combining it with content analysis that can provide more context, we can improve trend analysis. Besides, assigning topic names in topic model section is always problematic since replacing a set of words with a conceptual "meta-word" is always subjective. It is also possible that topics discovered by the algorithm are not real topics despite the terms (words) that show strong correlation with each other. However, as my first attempt of exploring an unfamiliar corpus of texts, using such text mining method is justifiable.

Further research may include more data sources – currently I am only focusing on Geekpark.net while there are many Jike media active in China at present. More insights may be gleaned from comparing inner structures of these media, comparing them in a temporal manner, and comparing external attributes such as user acceptance and social impact. Geek media across countries are also comparison worthy, although translation could be an issue in the process.

It is also possible to study specific events. For example, how did topics change when Eric Schmidt, Google's executive chairman, came to China and gave a speech in Geekpark? Studies

can be observed from examining topical changes before and after that event, or breaking down the topic composition of the article reporting that event to track the "topical influence" of that article.

Conclusion

Chinese Jike culture is born in the digital age, a time when geek is already a celebrated and respected term in consumer culture and business culture. As a type of "Ke", Jike bear the name "extreme" and are expected to play a positive role in innovating Chinese industry sectors.. But how can Jike be "extreme" agents? Data analysis on Jike media suggests that Jike resort to "extreme" measures in actively introducing technologies and business practice from abroad, incorporating design as a way of solution-finding and technology critique, and embracing popular cultures such as certain types of films, comics and animations.

Globally speaking, geek culture looks like a rolling snowball – it swallows more and more elements from modern life into its domain. Neil Feineman wrote a book titled "Geek Chic". In this book, he classified geek culture into several categories such as "geek food", "geek TV", "geek sci-fi", "geek science and technology", "geek fashion", etc. He also includes common items like T-shirts or coffee[192]. In other words, everybody can look or behave like a geek by picking up these cultural signifiers. Through data analysis we could see, Chinese Jike also discuss many cultural phenomena other than technology. Perhaps creativity is the only decisive factor that separates Jike from other social groups. Jike need to be creatively consuming their cultural goods with an extreme degree of enthusiasm to maintain their Jike status[193].

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[192] Feineman, Neil. *Geek Chic: The Ultimate Guide to Geek Culture*. Corte Madera, Calif.: Gingko Press, 2005.

[193] Here I want to say "geek in general". But wearing a T-shirt or drinking coffee does not make one a Jike.

"Creatively consuming" means Jike are not ordinary technology users, they need to be technology connoisseurs. Chinese Jike not only buy cellphones, listen to music, or try out virtual reality products, they also talk about the products in an insider way: how they are designed, how they improve their user experience and how to explore business models. There is a popular book in China, titled "Everyone is a Product Manager[194]". The popularity of such books resides in the belief that the immense wealth created and possessed by companies such as Apple or Tencent came from their product design. Being able to talk like a product manager allows Chinese Jike feel they belong to the group of innovators and embody those who are surfing at the edge – the extreme edge – of society.

Since Jike are moving into the domain of popular culture and product design, does that mean Jike are friendlier to women than before? Can we foresee that there will be more Chinese women Jike based on the insights from the data? Based on the data I have access to, I will try to answer this question in terms of numbers of men/women workers in different occupations. First, if there are equal number or even more women working on science and technology than men, the gender imbalance in occupation will not be a question at all; otherwise, if there are more women working in culture industries, it may alleviate or reverse the gender imbalance in occupation. According to the sixth census conducted by National Bureau of Statistics in 2010[195], there are 24,202 women in China working on "science, experiment, and development", significantly fewer than 41,553 of men. Similar result can be found in "Information transmission, Information technology service, and Software": there are 176,500 women contrasted with 262,912 men. Will women working in culture industries make a difference? There is a section titled "culture, sports, entertainment" in the census data. Taking apart sports, there are 145,043 women working in

[194] *Everybody is a Product Manager*. Electronic Industry Press, 2010.
[195] Stats.gov.cn,. 2015. 'Data of the sixth census of China'. Accessed May 5 2015. http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/index

culture and entertainment industries, but the number of male workers is 165,564. There are still more men employed in culture and entertainment, though the number is close. So my brief answer is, solely taking occupation into consideration, my discoveries on Jike culture do not help in reversing the gender imbalance in Jike. The gross numbers are (adding up workers in all related industries) 345,745 women vs. 470,029 men[196]. To make Jike culture more accessible to women, we need to either have more women working in technology space, or reshape Jike culture so it may embrace more occupations.

[196] for your interest: in the age group of 20-29, there are 268,548 men vs. 99,285 women working in the occupation of "science research, engineering, and technology". In the age group of 30-39, there are 250,274 men vs. 85,060 women (detailed information such as how many women are working in the software industry is not provided). Thus it is hard to say the younger generation of women is more likely to work in the science and technology field.

Chapter 4 Chuangke, the Chinese Makers

Chuangke(创客), or the "Creative/Entrepreneurial Ke", is the last member of the "Ke" family in this thesis project. Chuangke is perhaps the one most central to this project because it bears "creativity" or "innovation" in its name. The Chinese word "Chuangke" is offered as a translation of "maker", which is also a vaguely defined term. In Chris Anderson's *Makers*, "maker" can refer to every job that involves making things. "If you love to cook, you're a kitchen Maker … If you love to plant, you're a garden Maker. Knitting and sewing, scrap-booking, beading, and cross-stitching – all making."

But when we say "maker" today, it refers to the maker movement. In Anderson's book, the maker movement is described as: 1) a design and prototyping process by people with desktop tools; 2) a set of cultural norms for collaboration; and 3) the techniques of rapid and small-batch manufacturing which spurs entrepreneurship[197]. This movement is made possible by the advance in digital fabrication technologies, like 3D printing, and inexpensive, programmable microcontrollers like Arduino. These technologies have lowered the cost and skills needed for making, transforming "making" a popular movement instead of an elite activity practiced by professionals and a small group of hobbyists.

The Chinese word Chuangke shares a similar meaning with the English word maker, but the character "Chuang" brings more fuzziness to the term. "Chuang" could mean "creative" (Creativity I and II), which refers to the hobbyist part of the maker movement; and "Chuang" also means innovation or entrepreneurship" (Creativity III), which refers to activities such as developing new products or starting a startup company. The two faces of "Chuang" can be synergic or contradictive. For example, when Chinese Prime Minister Li Keqiang reported the

[197] Anderson, "Maker: The New Industrial Revolution".

nation's achievements on creative industries to the People's Congress, he said "(in the year of 2014) multiple Chuangke stood out, and the creative culture industry prospers[198]." The Chuangke here refers to entrepreneurship and Chuangke is regarded as a new "engine" of economic development. But such acclaim also gave rise to a series of government support for hobbyist makerspaces and maker education.

The tension between hobbyist makers and entrepreneurial makers is unresolved. An example is makerspaces' attitude towards entrepreneurs: Chaihuo makerspace in Shenzhen encourages their members to work in startups and allows them to retain their membership of the makerspace; Xinchejian, a Shanghai based makerspace, asks their members to leave if they are involved in startups in order to define itself as a place for hobbyists[199].

In addition to hobbyist makerspaces and entrepreneur-oriented makerspaces, a third force in the Chuangke movement is emerging: Chuangke education. Chuangke education is an attempt to introduce makerspaces to the next generation: teaching children skills needed in a makerspace and let children build what they want. What Chuangke education interests me is that it is changing China at a fundamental level. Although many stylish makerspaces and incubators are prospering in China, they are somewhat of the privileged class[200]. But in my field study, I found that Chuangke education is everywhere: it lives in the privileged schools, but also in schools of less developed regions. I think Chuangke education has the possibility to spread the practices and ideas of Chuangke to the majority Chinese. Besides, Chinese educational makerspaces differs from those in the United States in terms of the ideas they are built upon. Educational makerspaces in US mostly appear in libraries and museums, which might be seen as a way to

[198] Lianghui.people.com.cn,. 2015. '2015 Report on the Work of the Government'. Accessed April 24 2015. http://lianghui.people.com.cn/2015npc/n/2015/0305/c394298-26642056.html.
[199] (translated) Zhang Hao. "We are Makers – Understanding Chuangke." *Programmer* 4 (2014): 20-25.
[200] I don't have much proof on this. It is a personal observation.

promote "connected learning": learning that is "interest driven, socially connected, and tied to school achievement and real-world opportunity[201]." Chinese makerspaces, in the contrary, is seen as an extension of the Chuangke movement discourse: it is a place to train future makers living in a style promoted by the maker hobbyists, and it is also a place to train future entrepreneurs. These characteristics of Chinese educational makerspaces are further reflected in the discussions of educators working in those makerspaces. This chapter studies communities formed by Chuangke educators, trying to discuss their current work, their relationship with other partners, and their attitude towards Chuangke movement and creativity.

This Chapter is based on my field research in three online communities: "Chuangke Education", "Chuangke Education Forum" and "Cats' Friends". They are all QQ groups built around the topic of Chuangke (maker) education. The QQ group technology provides much functionality to support multiple forms of interaction. The QQ group is built upon Tencent QQ – an instant messaging software widely used in China. Anybody who knows the number of a group can request to become a member of that group, though joining a group often requires approval from group managers. Users in QQ groups can chat in text, share pictures and emoticons (emotional icons), and upload files to a public file storage for the group. QQ groups can also hold video lectures with lecturer's slides appearing on side of the screen. Every user with a QQ account can join unlimited number of groups, and a group can hold up to 2000 people. Users in a group can choose whether to receive visible or audible notifications in their desktop computers when new messages come. This design feature is important because if most users choose to opt out notifications of a group, the group will be virtually dead: few people listen to its discussions even though they are still visible as members of that group. The QQ group is an important tools

[201] Ito, Mizuko, and Crystle Martin. "Connected Learning and the Future of Libraries." *Young Adult Library Services* 12, no. 1 (2013): 29.

for organizers in China. Many collective actions or even protests are originated from QQ groups[202]. Users can also access QQ groups through mobile devices. Chuangke teachers heavily exploited the functions of QQ groups. They use the approval feature to ensure each QQ group is topic-centered; the file-uploading feature is heavily used to share software, training materials, and the work of their students; teachers also use the video conference feature to hold conferences with other teachers

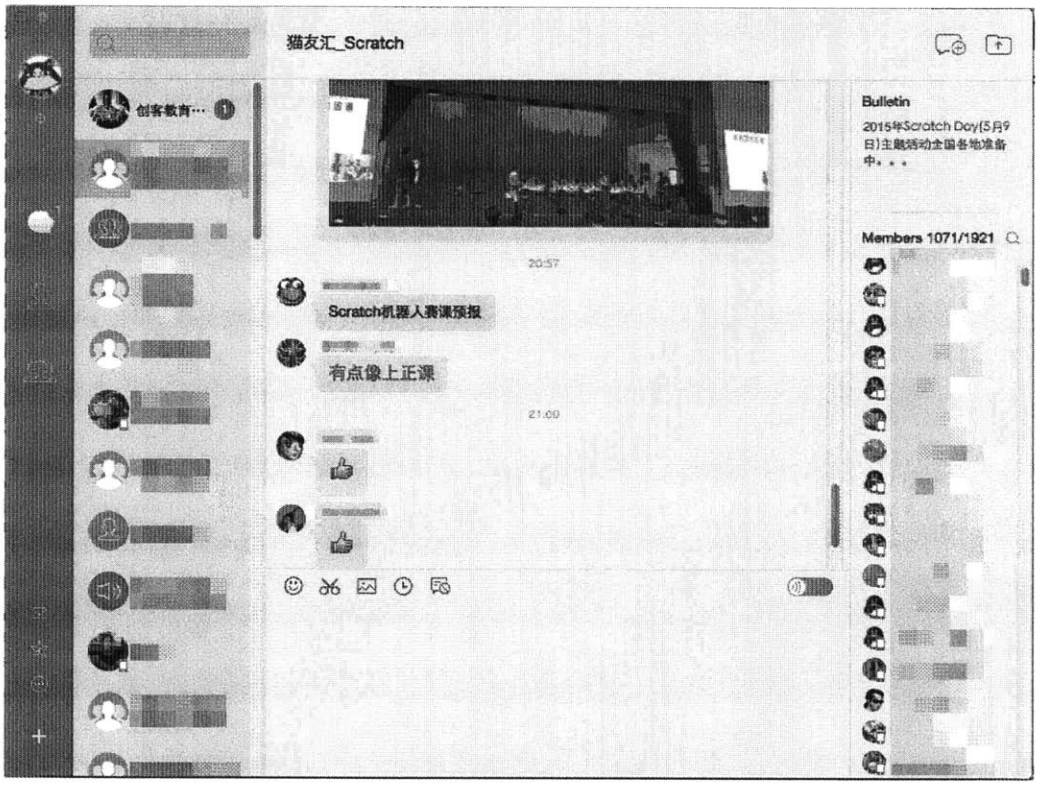

Figure 12 The software interface of a QQ group (with QQ for Mac)

Members in one QQ group often introduce people to other groups, and this is how I was put in touch with Chuangke education related QQ groups. I was a participant in a QQ group built by Jike who write software for non-profit organizations (Non-profit Jike Group). Some people in that group introduced me to "Chuangke Education", a group with 267 members[203] who are

[202] And this makes QQ groups one of the heaviest monitored and censored online space in China.
[203] The numbers are taken at April 24, 2015. The same applies to following numbers.

mostly school teachers. When I asked them why there is not much discussion in this group; they referred me to another QQ group, "Cats' friends", whose 1921 members are users of the Scratch[204] programming platform, a tool designed to teach programming to students in elementary and junior high school (the mascot of Scratch is a cat). In "Cats' friends", there was an announcement of a talk given by Chinese Academy of Science, and a QQ group number was attached along with the announcement. This leaded me to the third QQ group: "Chuangke Education Forum". Through these online communities, the picture of Chinese Chuangke education ecosystem started to unfold before my eyes.

The Chinese Chuangke Education Ecosystem

[204] Scratch is a programming language developed by Lifelong Kindergarten at MIT Media Lab. It is designed around education, and also has a significant role in Chinese Chuangke education field.

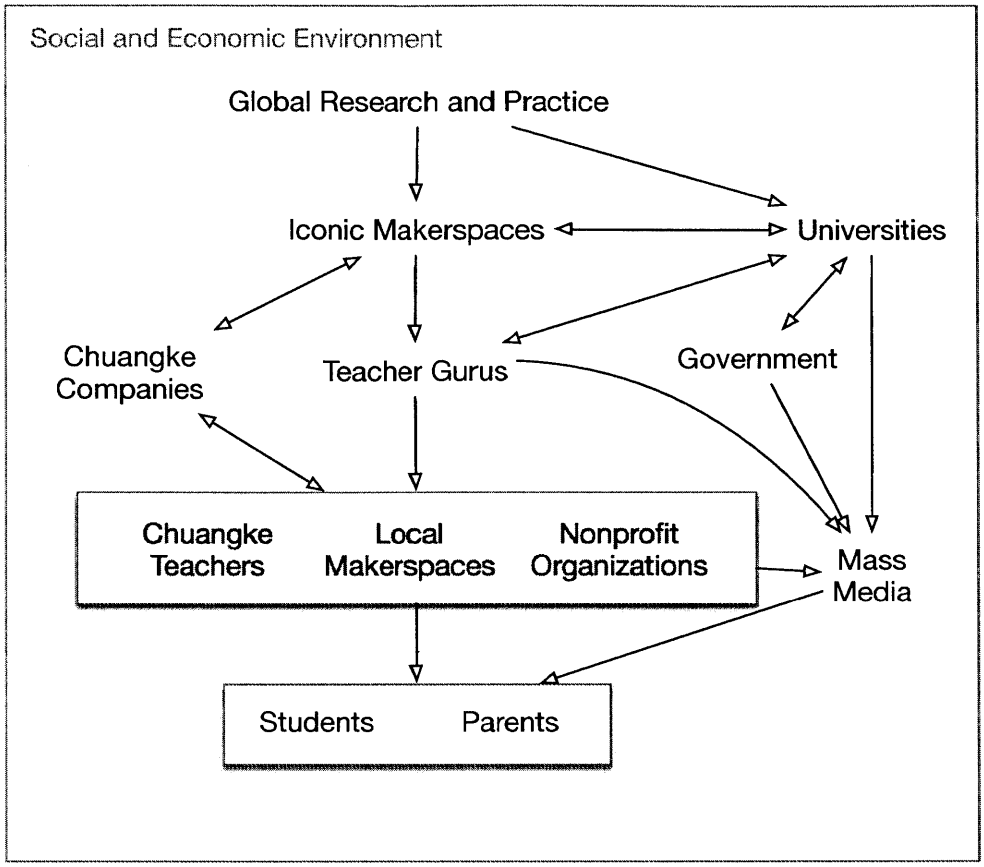

Figure 13 How ideas (primarily) flow in Chinese Chuangke education ecosystem

Chuangke Teachers

The first thing that surprised me is that individual teachers were trying to build makerspaces in their schools. In the QQ groups, this is an example of a typical request made in the QQ groups:

> "Recently I'm going to give a report to the mid-level managers of my school. If it passes, I'll build one (makerspace in my own school)[205]. Would anybody give me some slides or advice in giving a presentation?"

In China, makerspaces in K-12 schools are built by information technology (IT) teachers or teachers in science subjects such as physics. This is different than the case of the United State, where makerspaces are often found in libraries, because they are believed to be a way of

[205] This is a quote from the Chuangke Education QQ groups.

"helping to keep school libraries relevant and vibrant in these changing times[206]". This could be a major difference between maker education in China and US.

Where do these teachers come from? Why do they participate in Chuangke education? The answers can be found in China's educational system, which teaches IT at both the primary schools (usually grade 1-6) and high schools (grade 7-12). In Chinese primary schools, Information Technology is a mandatory class. However, the curriculums of the IT classes are too outdated and too boring to attract students. A Chuangke teacher explains:

> "Students love computers, but they don't love IT classes. They hooray when the teacher is late or asks for a leave. This is really hard to understand[207]."

Some teachers have become dissatisfied with the status quo and have started to find new resources and structures for IT classes. They became "teacher gurus". I define ones as who teach other makerspace builders about how to build makerspaces for children. Teacher gurus also take the task of promoting Chuangke movement and introducing new ideas and new practices. Another group of teachers seeking a new IT education paradigm are high school teachers who teach students to compete in robotic contests. The College Entrance Examination (*gaokao*) directs most educational activities in China after the primary level, but students can gain extra points that add to their examination scores if they perform well enough in the robotic competitions. Another similar competition which grants extra points is the "China Adolescents Science and Technology Innovation Contest", where students compete in subjects such as electric engineering[208]. Students are judged by their skills and the "innovativeness" displayed in

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[206] Fleming, Laura. *Worlds of Making: Best Practices for Establishing a Makerspace for Your School.* Corwin Press, 2015, 2.

[207] Blog.sina.com.cn,. 2015. 'Morning Reading: IT Teachers Should Have the Ability to Develop Cources – Xie Zuoru's Blog'. Accessed April 24 2015. http://blog.sina.com.cn/s/blog_6611ddcf01018u

[208] Some of these policies are being cancelled; different provinces may have different policies.

their works. Teachers who are coaching students for these contests are constantly searching for new ways to improve their students' work, and these teachers also try to attract new students to the contests. When they found the Chuangke movement, either through media or their fellow teachers, many started to consider building makerspaces in their schools. But how can they raise funds for the makerspaces? How do they know what equipment to buy? After they create a makerspace, what activities should they conduct with their students? Many of these answers are offered by teacher gurus.

Teacher Gurus

Teacher Gurus are teachers who provide information for other teachers who are building makerspaces and who teach Chuangke classes. I take teacher gurus out of ordinary Chuangke teachers because they act a special role in Chuangke education; they are the leaders of other teachers and serve as a channel between teachers in the schools and big makerspaces in Beijing or Shanghai. They are experienced teachers and usually have published books – textbooks or books for teachers – on Chuangke education[209]. They are the ones who design curriculums for makerspaces, who diffuse new knowledge, and who introduce new trends to other teachers. Teacher gurus also write blogs, publish articles in forums, and make online courses. Teacher gurus give talks in conferences or universities to promote Chuangke education, and try to connect teachers in different places together. They are also the creators and managers of the online communities I studied. Some have positions in universities. For example, Xie Zuoru, a high school teacher teaching information technology in Wenzhou, also has a position in Wenzhou University and can even advise graduate students for their master's degrees[210].

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[209] Typical titles include "Fun Programming with Scratch" or "Information Technology Education for the Future".

[210] Linziedu.net,. 2015. 'Meeting Notice – Linzi Education Information Network'. Accessed April 25 2015. http://www.linziedu.net/wjtz/2014/1205/article_4017.html

Figure 14 A screenshot of an online MOOC course created by a teacher guru[211]

There are two prominent teacher gurus: Wu Junjie from Beijing Jingshan School and Xie Zuoru from Wenzhou High School in Zhejiang province. Wu is a physics teacher while Xie teaches information technology. Their schools have supported their paths towards teacher guru status. Beijing Jingshan School is one of the most progressive schools in China. It was established in 1960 by the Central Propaganda Department and Beijing Normal University with the purpose of piloting educational reform. For many years, Jingshan School did not hold examinations together with other schools in Beijing, and students there enjoyed a lightened workload and myriad extracurricular activities[212]. Jingshan School is famous for Deng Xiaoping's writing left in 1983: we should "Gear Education to the needs of modernization, the world, and the future.[213]" This writing served as the motto of IT education in China for years and it has been copied and displayed on the walls of many Chinese schools. The home of another teacher guru, Wenzhou High School, started in 1902 during the late Qing Dynasty. It has a long

[211] (translated) Zhstudy.cn,. 2015. 'Scratch micro classes with %Lee from Xinjiang – Smart Learning Online '. Accessed April 23 2015. http://www.zhstudy.cn/course/93.
[212] (translated) Blog.sina.com.cn,. 2015. 'Primary School – Other Primary Schools Class '63 GUYUAN - Sina Blog'. Accessed April 25 2015. http://blog.sina.com.cn/s/blog_71c0dc410101a8c5.html
[213] (translated) Bjjsschool.net,. 2015. 'Beijing Jingshan School'. Accessed April 25 2015. http://www.bjjsschool.net/jingshan/html/main/col13/2013-04/27/20130427180714178560510_1.html.

tradition of science education, and is called "the cradle of mathematicians[214]." The two most typical teacher gurus I've identified have these factors in common. They come from schools that: 1) good enough, so teachers need not worry about whether they can send their students into college; 2) schools that encourage changes and tolerate risks. With these advantages, teachers are able to search for new ideas to improve their classes, and makerspaces are one strategy they've adopted.

Iconic Makerspaces

Iconic makerspaces are makerspaces that are frequently mentioned in media and discussions of Chuangke communities. When Chuangke teachers talk about what a makerspace should be looks like and the future of Chuangke movement, they often refer to Iconic Makerspaces. There are three major makerspaces in China: Beijing Makerspace in Beijing, Xinchejian in Shanghai, and Chaihuo Makerspace in Shenzhen. They have taken three different routes to develop the makerspace movement in China. Beijing Makerspace cooperates with the local government in Zhongguancun, who sponsored the makerspace by contributing a whole floor of a building and 10 million Chinese *yuan*[215]; Xinchejian focuses on hobbyist culture and emphasizes on promoting Chuangke culture; Chaihuo Makerspace has connected itself with Shenzhen's manufacturing capability, which Chuangke can develop ideas with as well as partnering with industry to bring new ideas to the next step of small batch production[216]. Iconic makerspaces may not directly engage in Chuangke Education in elementary and secondary

[214] (translated) Wzms.com,. 2015. 'A Hundred Year of History of Wenzhou High School'. Accessed April 25 2015. http://www.wzms.com/bainian/read.asp?newsID=292.
[215] Equals to about 1.61 million US dollars.
[216](translated) Xie Ying, Tong Xin, and Cai Yifan. "The Innovation and Trasformation of Manufacture Industry: A Survey of Shenzhen Makerspaces." *Scientific Advancement and Policy* 32, no. 2 (2015): 59-65.

schools, but they help define the skills needed for future employees and set new goals for education.

Iconic makerspaces also showcase what a makerspace should look like. For example, Xie Zuoru, a teacher guru, talked about his first experience in makerspaces:

> "I first heard the word 'makerspace' in a talk with Dr. Li Dawei of Xinchejian in Shanghai. ... Li talked about the origin of making in garage culture in the United States to the development of maker movement. He worried about Chinese students' ability on to engage in hand-on practice[217]."

Iconic makerspaces introduce new ideas like "Science Hack Days"; then teachers may try to experiment with these ideas or form new ideas to test in their own schools[218]. Iconic makerspaces also serve as connectors between Chinese Chuangke sphere and the global maker culture, bringing new thoughts from global research and new practices to China.

Global Research and Practice

Chuangke teachers and people working in iconic makerspaces are active learners. Practices from abroad are quickly introduced into Chinese Chuangke communities. Research reports that are useful to teachers, like the NMC 2014 Horizon Report for K-12 Education[219], are quickly translated into Chinese and discussed among Chinese teachers, introducing new concepts and practices for Chuangke education. The international community also provides tools needed in Chuangke education. LEGO Mindstorms NXT[220] is widely used in Chinese robotic contests,

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[217] (translated) Blog.sina.com.cn,. 2015. 'Wenzhou Daily: Building "Dream Lab" with Wenzhou DF Makerspaces – Xie Zuoru – Sina Blog'. Accessed April 25 2015. http://blog.sina.com.cn/s/blog_6611ddcf0101k2c

[218] (translated) Blog.sina.com.cn,. 2015. 'Why Not Have a "Teaching Hack Day" – Xie Zuoru – Sina Blog'. Accessed April 25 2015. http://blog.sina.com.cn/s/blog_6611ddcf01012h51

[219] Johnson, Larry, Samantha Adams Becker, Victoria Estrada, and Alex Freeman.*NMC horizon report: 2014 K-12*. 2014.

[220] LEGO Mindstorms NXT is a programmable module that can be used in robots built with LEGO.

and the LEGO Group has been building LEGO Activity Centers in China for a long time[221]. These Activity Centers serve a similar purpose to educational makerspaces: they hire teachers, design curriculums, and engage with parents and students. In fact, many practitioners in Chuangke QQ groups came from LEGO Activity centers, and they started to experiment with other activities of Chuangke education beyond LEGO robots.

But LEGO products are often too expensive, especially for the schools in remote and less developed regions. As a result, the programming environment Scratch became the next technology cherished by teachers. Scratch is a free and open-source programming environment designed by Dr. Mitch Resnick and his Lifelong Kindergarten group at the MIT Media Lab, for introducing programming to youth[222]. Scratch has been welcomed by students and teachers because 1) users only need to drag and drop blocks to write a program, which allows kids to quickly start to make their projects instead of spending too much time learning a programming language, 2) it allows students to make interactive stories and games, which are fun to play and helpful in building students' self-confidence; and 3) it is expressive and supports the building of complex products. Scratch has been further modified by Chinese companies to support robotic modules, replacing some functions of LEGO robots with less expensive hardware. In a 6th grade Chuangke class, the teacher (who is the member of the three QQ groups I am considering here) requires the students to make a 2-level game to get a passing grade and a 5-level one to get a B. Because Scratch has the advantages mentioned above and because it is free, it soon became the de facto standard technology among Chinese Chuangke teachers. At the same time, many

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[221] (translated) Education.lego.com,. 2015. ' LEGO.Com Official Website – Activity Center '. Accessed April 25 2015. https://education.lego.com/zh-cn/after-school.

[222] Maloney, John, Leo Burd, Yasmin Kafai, Natalie Rusk, Brian Silverman, and Mitchel Resnick. "Scratch: a sneak preview [education]." In *Creating, Connecting and Collaborating through Computing, 2004. Proceedings. Second International Conference on*, pp. 104-109. IEEE, 2004.

Chuangke Companies start to develop hardware, such as microcontrollers[223], robots and model trolley cars for Scratch.

Figure 15 The user interface of Scratch[224]

Chuangke Companies

Chuangke companies are companies that produce products designed for makerspaces and Chuangke education. Typical products from Chuangke companies include 3d printers, electronics, sensors, and microcontroller kits. Examples of Chinese companies are Seeed Studio, Make Block, and DFRobot; but there are also smaller companies. Seeed studio is similar to Adafruit in the US: it has a strong connection with professional makerspaces, who allows the company to adjust its production line according to the needs of the makers. But the product line of DFRobot and Make Block covers a wide range, from 3D Printers to small robots. It is hard to compare DFRobot with US counterparts such as MakerBot of Formlabs, because DFRobot does not limit its business to specific products such as 3D printers. Chuangke companies have

[223] Microcontrollers are electric devices that can be programmed by the users to take input from electrics such as sensor and control devices such as motors.
[224] Scratch.mit.edu,. 2015. 'Scratch - Imagine, Program, Share'. Accessed April 29 2015. https://scratch.mit.edu/.

customized Scratch so that the programs it produces can not only be displayed on screen, but also can control electronics connected to a microcontroller. Making these sorts of controllable electronics such as robots is a major activity of makerspaces. Robots and Trolley Cars are also featured products of Chuangke companies, because they can be used in the robotic competitions. Scratch Trolley Cars help turn abstract computer programs into movement in the physical space, which help students understand the mechanisms of computer programs. Scratch Trolley Cars are welcomed by Chuangke teachers because they can build students' interest in computer science, although teachers have started to complain that there are too many trolley cars:

> L: Don't underestimate that little trolley. In a class, it can make kids scream (with joy).
>
> G: One company making trolleys is enough. There are over 10 trolleys and they are all the same. Scratch itself is enough to make kids scream.

This is an example that Chuangke companies still need to listen to the need of school teachers. Some employees in Chuangke companies are already members of the QQ groups and they work closely with teachers. Products specially designed for teachers start to appear. For example, a Scratch controller board has a home edition and a classroom edition, and the classroom edition can operate in a larger space. Companies also write textbooks to help teachers with their classroom activities.

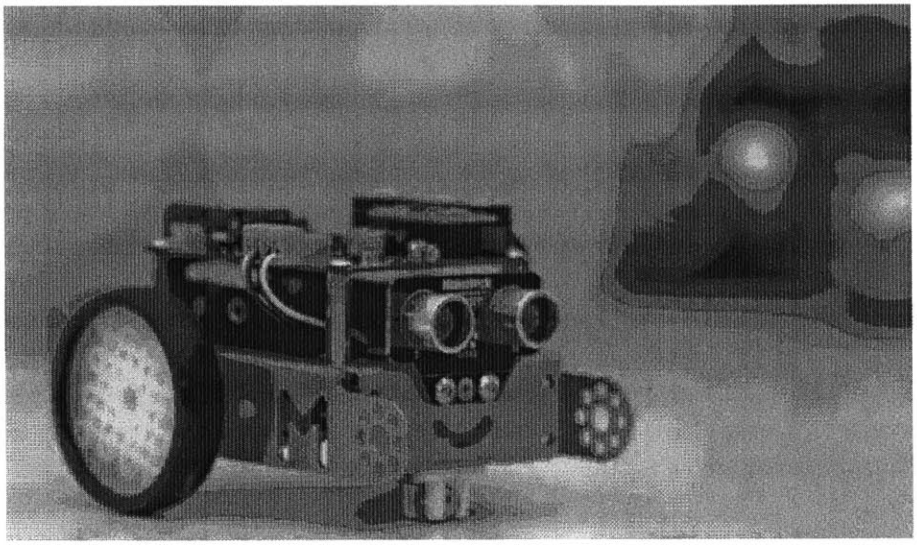

Figure 16 A Scratch trolley car designed by a Chinese company, Make Block[225].

Nonprofit Organizations and Local Makerspaces

Makerspaces also exist in nonprofit organizations such as science museums or Youth Palaces[226]. A member from the QQ groups who works for a science museum explained why s/he is involved in Chuangke Education:

> "I love popular science from early on. I worked on this (popular science) in my college, and I have my own studio (to make popular science products). Now I'm moved as I see everybody is studying Chuangke. I feel a little regretful for being relocated to the science museum[227]. Now the museum is under construction, and I'm actively applying for a makerspace (to be built). I want to provide space and equipment for STEM[228] teachers and lovers. It should be OK and the museum (with the makerspace) will open next year."

Chuangke working in museums share many similarities with Chuangke teachers in the schools. They work for Chuangke education usually out of love and personal interest, and they

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[225] Kickstarter,. 2015. 'Mbot: $49 Educational Robot For Each Kid'. Accessed April 26 2015. https://www.kickstarter.com/projects/1818505613/mbot-49-educational-robot-for-each-kid.

[226] Youth Palaces are public spaces for extracurricular activities. Typical activities include dancing, calligraphy, and orchestras. Youth Palaces originate from the Young Pioneer movement of the Soviet Union.

[227] In state-owned organizations in China, employees may be relocated to other organizations for management reasons.

[228] STEM is for Science, Technology, Engineer, and Mathematics.

need to pave their own way towards building a makerspace. Since popularizing science and technology is the essential function of science museums, it is easy for people working in science museums to join Chuangke Education movement, as mentioned by the science educator cited above:

> "Initially, I didn't know the word (Chuangke). Then we were building a hands-on activity room. I found the word by accident, (and) it just fit into my mind. So I continued working on this."

For-profit educational makerspaces is also a place for parent-children activities: parents pay a fee, then their kids can take Chuangke classes and have hands-on making experiences. A QQ group member working in for-profit makerspaces wrote online about how his boss decided to invest in makerspaces:

> "My boss was studying in Shenzhen and Wenzhou. He was impressed by Chuangke education in Xie Zuoru's[229] makerspace. So we decided to invest in this. My boss joined LEGO in 2009, and now we have 5 activity centers."

However, these private makerspaces have worries about the talent they can recruit and the market size, especially in less developed cities. The one who works in the for-profit makerspace also expressed this concern:

> "If money is the issue, we can take loans from banks; the key is the lack of people. In inner cities[230] like Zhengzhou, Chuangke education is bogged down. We invested over 100 thousand *yuan*, but only a few kids have come, and the revenue is nearly zero. We can't (pay enough salary to) retain teachers in the makerspace, and the makerspace is solely relying on LEGO activity centers (built in other cities). It is not a long-term business."

When another person decided to build a makerspaces in a small town and asked for advice in the QQ groups, consumption capacity and governmental relationship were brought up:

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[229] Xie is a teacher guru.
[230] On contrary to coastal cities.

H: Hello teachers. We are building a makerspace in a small town for primary and secondary school children. Now (we are) at the planning and budget stage. We already have the space. I'm seeking advice from fellow teachers.

J: Will a small town accept the concept (of makerspaces)?

J: We tried to build one in a town in Zhuhai[231]. But the market demand is not strong, so the plan is suspended.

H: We have the support from the Education Bureau of that town.

J: We have the (support from) Education Bureau too. But the issue is they (the consumers there) can't afford (to spend money in makerspaces).

J: Just gossiping. Things vary in different places.

H: Yeah.

H: Profitability is the key.

J: (If you want to make a) profit, you need to take care of local gods from everywhere. So be careful.

The "local gods" refers to the obstacles one may encounter when doing business in a small regions of China. These obstacles may come from either government agencies or from local tycoons and power brokers. But the conversation above is an example that there are already people in China exploring makerspaces as a serious business and trying to expand them to small cities and towns, even though the market may resist. This is the "Ke" spirit reflected in Chuangke business: finding one's goal in life and fighting against all adversaries. Some of the problems makerspaces are facing come from students and their parents.

Students and Parents

Chuangke Education is certainly welcomed by students. As said in a research report, "Maker culture emphasizes informal, networks, peer led, and shared learning motivated by fun

[231] Zhuhai is a city in Guangdong province.

and self-fulfillment[232]." In some Chinese Chuangke classes, students "no longer concern about how they are graded by the teachers or their ranks in the contests; they care more about the comments they receive in microblogs and forums[233]." In Wenzhou High School, the makerspace is run by a student club - "Science and Technology Making Club". Student applicants sign up to become members and judged by senior club members in terms of their "creative ideas, the will of making, and making abilities[234]." But the students will eventually grow up and face their critical trial – the *gaokao*. In a conversation in the QQ groups, a teacher mentioned:

> E: I have a students who plays so well with Scratch. I almost told him to stop.
>
> E: He will eventually need to pass the High School Entrance Examination and the *gaokao*.
>
> E: If he can get into a key university through *gaokao*, he can continue working on information technology.

The situation is better for the younger kids, because they still have years to go before *gaokao*. Some high schools start to admit students who worked well in Chuangke classes, and Scratch has been accepted as a subject in the National Olympiad in Informatics (NOI) for primary school students[235]. This may add to the motivation of young students taking part in Chuangke classes. However, a more fundamental problem comes from the perception of parents and the educational style in Chinese families. This problem is shown in a discussion between me and a private makerspace teacher:

> H: My initial idea is to let kids play something fun, let them feel interested and discover (science and technology knowledge) by themselves, then I found that the result is not what I think.

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[232] Sharples, Mike, Patrick McAndrew, Martin Weller, Rebecca Ferguson, Elizabeth FitzGerald, Tony Hirst, and Mark Gaved. "Innovating pedagogy 2013: exploring new forms of teaching, learning and assessment, to guide educators and policy makers." (2013).

[233] (translated) Wei Ning. "Are You Chuangke Today?." *China Information Technology Education* 6 (2013): 34-34.

[234] (translated) Xue Yuan. "A High School Student's Road to Chuangke." *China Information Technology Education* 9 (2014): 15-17.

[235] (translated) Blog.sina.com.cn,. 2015. 'Welcome to Jingshan High School Scratch Conference_Xie Zuoru_Sina Blog'. Accessed April 27 2015. http://blog.sina.com.cn/s/blog_6611ddcf01014w5r.html.

Yu[236]: What's the result?

H: Parents come (with their kids) whenever they have spare time. They want to see the end product. Part of the work (made in the makerspace) is just done by teachers. The kids only play with the end product, and they lose their interest as soon as they finished playing.

Yu: You are saying parents don't let their kids spend enough time (on makerspaces)?

H: The thing is that they are looking for the result (the end product of making), but the process of making is the most important.

H: Last time there was a kid who didn't succeed (in making something), and he wants the teacher to make a new one for him.

Yu: What if the teacher doesn't (make a new one)?

H: The teacher thought it was ridiculous, so s/he didn't. Then the kid didn't show up recently.

H told me that "five out of twelve kids in his makerspace are like this", which H thought reflects "the general short-sighted view of society." There are even parents asking whether there is a "certification test" for Chuangke. Qualification tests are widely used in musical education (such as piano education) in China. Students prepare for the tests often get help from hired personal tutors, and passing the test (for example, the piano level-9 test) is usually considered the final goal of education. A qualification test for Chuangke is the last thing teachers want to see, because it depicts a dismal future in which children would practice in makerspaces only to pass some tests and lose the creative nature of Chuangke:

H: if there is a qualification test, then we are finished.

N: this (Chuangke) cannot be associated with qualification tests, or it will become a joke.

H: Yeah, a joke that we won't laugh.

N: Nurturing interest and enhance hands-on (experience) should be the direction. But it must be combined with curriculums.

...

[236] Yu is the author of this thesis. My nickname in the QQ groups is "MIT-Wang Yu", and I revealed my identity as a researcher to meet the ethical standards of field studies. All the names in quotes are anonymized, and the same letter in different sections does not indicate the same person.

D: There are already people who want to make use of Chuangke qualification tests. A vice president of a IPOed private tutoring company told me about this (establishing a qualification test) with an ecstatic look on his face. I hope teachers in this group can hold the last line of defense.

The "last line of defense" should be the dream of Chuangke: a free, open, and creative culture. Chuangke teachers defend for this goal with a determined will of "Ke" warriors; the only difference is this war happens in people's minds.

Mass Media

Reports from mass media is certainly the best support for the teachers. Media resources can be used to attract more people into makerspaces, seek funding, and most importantly, introduce to students and parents what is the Chuangke movement. When somebody appears in a media report, members celebrate it in the QQ groups:

X: It's on *China Daily*! And the front page in *China Education News*!

Yu: Tell us how you get yourself onto the newspaper; maybe we could learn from this.

X: The reporter contacted me. It's easy: work hard, then (you will be in the news).

X: They (the reporters) followed me for two whole days.

H: Sounds that we have a bright future. Keep it up.

X: I have two makerspaces: one is inside a school, the other outside it. Xinhua News Agency spent a day on each of them.

The Chuangke movement is attracting more attention from the media since the central government equaled Chuangke to the future success of the nation. The question is how much reporters will report Chuangke educators instead of iconic makerspaces, and how many reports will notice the cultural value instead of the economic value of the Chuangke movement.

Government

The Chinese government considers the Chuangke movement as an opportunity for economic development. Apart from the *Report of Work on Government*, the State Council also

decided that the country needs to "develop market-based, professionalized, integrated, networked 'Crowd Innovation Space (众创空间, "crowd Chuang space")' based on the incubator model of makerspaces and Innovation Works," and "this will provide a low-cost, convenient, all-round, and open service space for small business and individual innovators[237]." The Chinese government not only focuses on the entrepreneurial side of Chuangke movement, they are also interested in spreading Chuangke activities to the general public. Even Mitch Altman, an influential figure in the global maker movement, appraised Chinese government's effort in promoting maker movement. Altman said that "he has met Chinese officials who understand the importance of encouraging people to do what they love[238]", and the officials acknowledge that "people need to love exploring their creativity, taking risk and playing[239]." In a Maker Carnival which exhibits maker creations, the Communist Youth League of Shanghai "helped to attract over 50,000 visitors[240]." Chinese government also "has a policy to install a 3D printer in each of its approximately 400,000 elementary schools over the next two years[241]." This plan is accompanied with plans of training teachers to teach students how to use 3D printers. Another ambitious plan is Shanghai's effort to bring makerspaces to neighborhoods. By the end of 2015,

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[237] (translated) Politics.people.com.cn,. 2015. 'the State Council supports "Crowd Chuang Space" to build new platforms for corporate innovation'. Accessed April 25 2015. http://politics.people.com.cn/n/2015/0129/c70731-26475025.html.

[238] Slate Magazine,. 2015. 'The Chinese Government Is Investing Heavily In The Maker Movement'. Accessed April 23 2015. http://www.slate.com/blogs/future_tense/2014/

[239] Ibid.

[240] Parker, Emily. 2015. 'In China, Lessons Of A 'Hackerspace". *WSJ*. Accessed April 23 2015. http://www.wsj.com/articles/SB10001424052702

[241] Krassenstein, Brian. 2015. 'Chinese Government To Put 3D Printers In All 400,000 Elementary Schools By Next Year'.*3Dprint.Com*. Accessed April 23 2015. http://3dprint.com/56699/china-3d-printers-schools/.

Shanghai is planning to have 72 neighborhood makerspaces[242], and the final objective is to have a makerspace in every neighborhood.

However, teachers in the QQ groups are a little afraid that the government's ambition may eventually become another "Great Leap Forward" - an economic and social campaign that occurred in 1958 which turned out to be fruitless and a waste of natural and economic resources. Chuangke teachers think that Chuangke has not been widely recognized by students and parents, and although the needs grow slowly, but it is not as fast as the government's expectations.

Universities

Chuangke education is largely a grassroots movement, and in this field Chinese universities fall behind teachers in high schools. But the academia has its own agency: it can theorize ideas; it can introduce foreign ideas; and it can advise policy makers. However, when theory lags behind practice, frictions between universities and teachers appear. The Chinese Academy of Sciences once announced a talk titled "invention comes from discovery", given by a "Creativity Expert" in the "Department of Education Creative Talent Education Research Society." The announcement of the talk is soon teased by the teachers as too exaggerated and too "phony". The 8th Reform of Basic Education is also attacked by teachers. It is planned by the Ministry of Education. And despite the involvement by many experts, it took a top-down approach and disregarded the opinions of the teachers. As seen in the comment below, the reform is micro-managed and it does not leave enough freedom to teachers,:

> G: This reform does not allow us to explore at the course level. Instead,it directly provides educational methods and frameworks. The slogans are high-end, the operations are low-end[243], and the middle-layers are omitted. How could it (the reform) not be skewed (from its original intention).

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[242] (translated) Sh.eastday.com,. 2015. 'When Chuangke Meets Grassroot – the Opening of the First Shanghai Neighborhood Creative Space and Chuangke Expo '. Accessed April 27 2015. http://sh.eastday.com/m/20150320/u1ai8632013.html.

But some teachers rejected constructivism-based educational theories[244] such as "Inquiry Teaching" or "Minimal guidance teaching". They think that those approaches shy away from teaching in practice and are thus not suitable for the populated classrooms in China. I am not arguing whether certain educational methods suit Chinese schools better. My point is that Chuangke teachers are creative individuals, just as the "Ke" in the name suggests; they are no longer teachers who follow textbooks and prescribed curriculums. The Chinese academy needs to change its way to communicate with those teachers. Luckily, changes have already been spotted : in some colleges, graduate students were sent to conduct fieldwork in makerspaces owned by teacher gurus; students from universities helped teacher gurus in making MOOC courses for other teachers; and Scratch is translated into Uyghur language by university students, enabling the tool to be taught in remote regions such as the Xinjiang Uyghur Autonomous Region[245].

The Missing Element

What's missing in Chinese Chuangke sphere? They are artists, art museums, art teachers, writers and media makers. In the United States, art museums are active partners in building makerspaces, whereas in China, art museums themselves are somewhat irrelevant to Chuangke and makerspaces. Although this thesis project is about "creativity in technology communities", and internationally the maker movement is also more about science and technology. But artistic expression is an important part of human life. I think the art part is a missing part in Chuangke

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[243] G used two words: high-end (高端) and low-end (低端). These terms are usually used in products. Here H may want to say that the slogans of Chinese government are beautiful, but the practice is not as beautiful as it claims to be.

[244] Constructivism is an educational theory which believes that "people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences". See Thirteen.org,. 2015. 'Constructivism As A Paradigm For Teaching And Learning'. Accessed April 27 2015. http://www.thirteen.org/edonline/concept2class/constructivism/

[245] This is according to the information provided by the teachers in QQ groups.

movement in China: it is hardly supported by any of the parties mentioned above. The problem is rooted in the reward system of Chinese society, and the solution is hard to find.

Pedagogical Creativity

Teachers are building makerspaces at schools; public and private makerspaces are waiting for students to attend their workshops; and the Chuangke education movement has attracted attention from the government, the Chuangke companies, the business sector, and the media. But what is the purpose of Chuangke education? The answer is creativity. Even though Chuangke education is not directly involved in entrepreneurship and small businesses, they still need to answer to the "Chuang" in Chuangke and the grand narrative of "Created in China": How can China nurture more creative students in schools? How to teach the children to be creative (Creativity III), so they may become innovators for the nation when they grow up?

The teachers' opinion split on this topic. Some believe that creativity is an ability that should be nurtured through education:

> L: The goal of educational reform is change the way students are educated, treating them as the creators instead of recipients of knowledge.

Other teachers argue that education should be focused on developing skills. They think that "pedagogical creativity" and interestingness (make learning interesting) is the last thing to concern about:

> K: From the beginning, Interestingness is not the inner requirement of learning. Tying interestingness to learning is like tying gold to the wings of birds. It (the bird) can never fly or never fly high. At last, interestingness is a gorgeous decoration: (education) seems to be good-looking with it; but in fact, (interestingness) is the most worthless (thing).

When a new tool, for example Scratch, is introduced into the educational space, teachers start to debate on how to teach this tool: whether classes should be focused on the fun part of the tool, or on the skills the students should learn:

J: (There are) three motivations of learning: the needs of students (close to what we say about interestingness), the needs of social life (close to what parents and society want the kids to learn), and the needs of the subject taught (whether Scratch has value in IT classes).

K: There is a story that during World War II, 100 American soldiers were sent to Germany. They were required to be fluent in German language within 100 days, and they made it!! Because if they couldn't, what's left to them would only be death if their American identity were discovered.

Y: Hmm, urgent needs motivate learning.

R: The American example illustrates the potential of learning, but it is not what education is for.

R: The Americans learn Germen to survive, but whether they are happy (when learning German) is another matter.

Whether Americans could acquire fluent Germen in 100 days, the debate is about whether Chuangke education should be based on self-motivated exploration or strict guidance from teachers. There is no obvious answer about which approach is better. Are tiger moms better than parents who raise their children in a laissez-faire style? The opponents of skill-oriented learning argue that a "creative habit" is the goal to pursue:

F: The dream (of Chuangke Education) is not (what is defined by) the Academy of Science, it is about having a creative heart, a habit to be creative.

B: Your notion of habit is great.

Yu: Want kind of habit is a "creative habit"?

F: In my opinion, people with a creative habit will ask themselves whether everyday objects or services can be improved whenever they see one.

F: This is the creative habit.

Yu: Interesting.

B: I want to add that, caring about new stuff everyday, receiving new information, updating and completing one's knowledge structure, preparing for one's own innovation is also parts of the creative habit.

This explains why tools such as Scratch become the nexus of Chuangke teachers' pedagogy. When teachers argued about whether Scratch is important as a programming language, a teacher guru explained why Scratch is transforming IT education in China:

E: When a company comes up with a product for K-12 students to re-create, they (the students) must first become a skilled technician. They need to accumulate knowledge in electric circuits, computers, mechanics, and even by then they need to learn how to use the products. But their intelligence development determines that they can only learn the surface (part of the product), and finally they are controlled by the teachers to make some groundbreaking "inventions". For K-12 education, a good product is only a platform, and students shouldn't spend all their time in learning about the platform. They also shouldn't spend a large amount of time in how to use these platforms.

But will spending time on the "creative habit" instead of skills and platforms yield more scientists, more inventors, and more entrepreneurs for China? It is hard to say, at least for now. In the book *Creativity: Beyond the Myth of Genius*, the author Robert Weisberg surveyed cases on inventions, scientific discoveries, and artistic creativity. In his study, Weisberg closely examines the continuity and discontinuity involved in the discovery process, and he concludes that deep and constant engagement with knowledge and materials, including new data and discoveries, is the key to success.[246] If what Weisberg said is true, the "creative habit" does not inevitably lead to more scientists and inventors. However, as I mentioned in Chapter 1, Creativity III is only one type of creativity. Chuangke education may not produce as many entrepreneurs as needed for the economy, but it is producing Heike and Jike: the ones who hack and critically think about their environment and society. The final stop of Chuangke education is creative agents: the ones who can evaluate the natural and social environment they live in, hack

[246] Weisberg, Robert W. *Creativity: Beyond the myth of genius*. New York: WH Freeman, 1993.

into existing systems, and play with new ideas. Creative agents are in turn needed by the makerspaces. A member talked about what type of people is needed in building makerspaces:

H: we have hardware, tools and equipment; but the key is having somebody who has a creative mind.

Yu: What kind of people "have a creative mind?"

H: My understanding is (people who) have curiosity and who are willing to solve problems in new ways.

Yu: Everybody has curiosity. Would you give me an example on how people who "have curiosity, solve problems in new ways" could be better?

H: I have a colleague who likes planting flowers. He often forgets watering the flowers when he is busy. Then he thought about a method: putting a temperature sensor, humidity sensor, and a beeper in the flowerpot; (the device) alert (him) when (the flowerpot is) dry, reminding him to water (the flowers).

H: Lots of activities we are doing are mere imitation. There is no original innovation. And I found that many so-called Chuangke are like this, so I feel I'm lost.

To make a makerspaces a success, Chuangke themselves are not enough. Heike, Jike, Chuangke – the three pillars of Chinese technology communities – are needed to cooperate in makerspaces.

Teachers as "Ke" Worriors

In the QQ groups, I met with an undergraduate student. F who studies in a normal university, and F "led a group of graduate students" customizing Scratch to support trolley cars. I did not like F at first because s/he frequently says "I'm too old", which is certainly not a positive attitude for an undergraduate student. Then F talked about life after his graduation:

F: (I will) stay in the mountain areas for 10 years.

F: I won't even know what's happening in the outside world.

F: Everyday is (about) a few people and a few things.

K, a teacher arguing for the "skill" side in the creativity debate, led a "Talent Development Program" in his/her school. K's program includes a programming club in which kids learn a programming language and develop multi-level games; a math Olympiad training which is not purposed for contests; an oral English practice plan which simulates real-life situations; a physical education plan which combines multiple sports activities; and a plan to let students make videos. What K envisions is an education for talented students who are "totally non exam-oriented" and "not focused on developing academic abilities." I thought K made this plan with the help from his/her school and some educational experts, but I was wrong:

> K: I did it all by myself.
>
> K: It was originally designed for my son, hoho.
>
> Yu: Then you must have a high status in your school.
>
> K: I'm only an ordinary teacher, (I have) no status.
>
> K: I'm not even allowed to do it (the educational reform plan) under my school's name.
>
> K: I'm doing it under my own name.

A third example is described by Xie Zuoru, a teacher guru. He mentioned a senior teacher who wanted to spread robotic education to underdeveloped regions:

> "I was studying at Beijing in 2009, then Mr. Sha invited me to a dinner, saying he wanted my help. It turned out that he was preparing his post-retirement life then: he wanted to drive to poverty regions and promote robotic education[247]."

These facts echo with my definitions on "Ke" in Chapter 1. Chuangke teachers show no respect for the status quo; they envision a future and diligently work for their ideals; and they care more about their dream than their own reputation. They are Xia Ke warriors with knowledge as their weapon.

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[247] Blog.sina.com.cn,. 2015. 'The Education Dream of Chuangke and the Chuangke Dream of Educators – Xie Zuoru – Sina Blog '. Accessed April 27 2015. http://blog.sina.com.cn/s/blog_6611ddcf0101jb5k

This dream of Chuangke educators is better described by a teacher guru, Wu Junjie. In his article in *China Information Technology Education*, he devises a term Jieke (the "outstanding" Ke) as a new translation of geek. He considers Jieke as a new hero in the modern world:

> "When Chinese speak of Ying Xiong Hao Jie (heroes[248]), they place their heroic capacity in terms of numbers. Those whose ability exceed ten people are called Ying; those whose ability exceed one hundred people are called Xiong; those whose ability exceed one thousands people are called Hao; and those whose ability exceeds ten thousands people are called Jie. So when geeks are going to change the world, they are defined as Jie Ke, they really have the capital to change the world – they are leading ten thousand people[249]."

In the same article, Wu depicts another dream of Chuangke, a dream for everybody:

> "In China, a country with 200 million migrant workers and 60 million left-behind children, is it impossible to encourage everybody to be a Chuangke? In fact, everybody hopes to be a Chuangke, because everybody wants to lead a better life, a life with dignity, and even (a life) respected by others. The vision of Chuangke movement revealed an ideal status of being a human being – 'live one's life in one's own way.' This transcends external satisfaction granted by power, money, and false reputation. And Chuangke movement encourages everyone to be a Chuangke, because only when everybody is a Chuangke, humanity can be liberated from external goals imposed by others, achieve one's freedom and fulfillment."

In Wu's description, some Chuangke may become leaders of society; others will not be leaders, but will have a liberated mind. This might be the impact Chuangke hope to have on the world.

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[248] Ying, Xiong, Hao, and Jie (英雄豪杰) are four Chinese characters having the meaning of heroes. They can form a single word together or be used separately like yingxiong (英雄) or haojie (豪杰).
[249] Wu Junjie. "Chuangke Education: Jieke and Future Consumers – a Brief Discussion on 2014 Horizon Report." *China Information Technology Education* 9 (2014): 7-12.

Conclusion

In this thesis project, I surveyed three technology communities in China: Heike, Jike, and Chuangke. In Chapter 2, I inspected Heike (Chinese hackers) culture manifested through the Heike magazines. I found that hackers utilize hacking activities as an opportunity for learning, creative imagination, self-expression, and creative interaction with their everyday environment. In Chapter 3, I looked into Jike (Chinese geeks) culture by text-mining articles from a Jike website. The data analysis tells us that Jike developed their taste of technology from discussions revolving around user-centered design. In Chapter 4, I studied conversations in three QQ groups on Chuangke (Chinese makers) education. Those conversations reveal an ecosystem of Chuangke education in which young makers are nurtured and teachers dreaming of becoming Chuangke, providing us a glimpse of a nation of active entrepreneurs and self-actualized people.

Although this thesis project focuses on technology communities, it does not imply that artists and artistic creativity are irrelevant. In Chapter 2, Heike expressed their artistic imaginations through Heike magazines; In Chapter 3, I showed that Jike are actively embracing cultural industries and that designers are engaged in Jike culture as it develops; the makerspaces in Chapter 4 are also a place where art could be made, and Scratch (the tool used by Chuangke teachers) is also a tool for storytelling and artistic expression. Artists are inevitably joining the technology culture as it evolves, and artistic expression is indeed an essential part of creative culture.

Although I examined three communities separately with separate methods, it does not mean these communities have clear boundaries. In fact, what I provided are three lenses to look into Chinese technology culture and three perspectives to examine how technology, government,

history, and myth in a nation interplay with the creativity in technology communities. In reality, the three types of "Ke" may converge in two different ways. The first way is within the development of these cultures throughout history. Heike appeared first and was the most active one in 1998-2006[250]; Jike rose around 2010, when many former Heike evolved into Jike; Chuangke started to gain attention from around 2012, and Jike are the first group of people who were engaged in the Chuangke movement. This historical timeline does not mean that one type of "Ke" disappears at the emergence of the next "Ke"; different kinds of "Ke" can coexist at the same time and attribute of one type of "Ke" is often carried into the next "Ke". For instance, many Chuangke are also technology connoisseurs as well.

A second point of convergence is their connection to economic development, especially their ideal about shifting China's mode of production from "Made in China" to "Created in China". This view is often reflected in people's attitudes towards entrepreneurs. For instance, two most valued American entrepreneurs Bill Gates and Steve Jobs are often seen as exemplary models for Chinese technology leaders and communities. Bill Gates grew up in an upper-class family and conducted his business in a businessman style, whereas Steve Jobs came from an average family, had more interaction with early underground hacker and geek culture, and achieved his fortune primarily by design and life-style selling. Therefore in a western point of view, Bill Gates is more of a businessman while Steve Jobs is more likely a geek, but both of them are not known as makers. However, through many Chinese media and online discussions, both Bill Gates and Steve Jobs are cited as examples of how Jike changed the world, although

[250] These numbers are only rough estimates. The Internet was introduced to the universities in China at 1994, and the US history of Commando 64 modem networks does not exist in China.

Jobs is more frequently associated with Jike culture[251]. Even when discussing Chuangke, Gates and Jobs are exmaples of how Chuangke utilize technology to create new business opportunities.

Some Chinese examples could be more interesting. Zhang Chaoyang is the creator of a (once) popular Chinese website Sohu.com. He is considered a Heike only because he started his business in the early days of the Chinese Internet. Zhang is seldom ascribed to Jike or Chuangke because his business is less relevant in today's Chinese Internet and his business is less associated with the taste of Jike – user-centered design. Jack Ma (Ma Yun) created Alibaba, possibly the most successful Chinese company in the Internet economy. According to the criteria discussed in this thesis, Ma is neither a Heike nor Jike. But he still appears frequently in Jike media. Articles about Ma are not about himself: they are on how to assess his business in Jike's perspective, and how can Jike create a similar business empire as Ma's. The third example other than Zhang and Ma is Lei Jun and his company Xiaomi. Xiaomi is a typical company built on the concepts of Jike. In the introduction page of its website, it says that "Xiaomi was founded in 2010 by serial entrepreneur Lei Jun, who believes that high-quality technology doesn't need to cost a fortune[252]." The "high-quality" here refers to the designer ideal of Jike, and Xiaomi's stress on its entrepreneurship nature relates to the discourse in Jike and Chuangke culture. Thus Lei is both described as a Jike and a Chuangke. Chinese technology enthusiastics use heroes in a different way from their western counterparts. Instead of merely setting up cultural icons[253], these heroes are more often used to exemplify that what these cultures can achieve in the national narrative of economic development, which is an important way to gain external support from the government or corporations.

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[251] Baidu.com (the most popular Chinese search engine) yields 212,000 results for Gates and Jike, and it yields 1,050,000 results for Jobs and Jike.
[252] Mi.com,. 2015. 'About Us- Mi Global Home'. Accessed May 4 2015. http://www.mi.com/en/about/.
[253] Whether Jack Ma or Lei Jun is a culture icon of Jike is still debatable.

Despite their appreciation of heroes, Heike, Jike, and Chuangke are grassroots and inclusive cultures. As discussed before, Heike do not even need to possess a computer to read the magazines and practice the hacker arts through net cafés; many products Jike used are free-to-access Internet products, which are accessible to a large population; and the Chuangke movement and its educational practices discussed in Chapter 4 are moving to underdeveloped regions of China. In fact, there are grassroots heroes and antiheroes as well. Here I will nominate one for each category.

Laoying[254] ("the old eagle", whose real name is Wan Tao[255]) is a Heike(?)[256] who is active in the so-called "great alliances period." He was famous as the founder and leader of "Chinese eagles", a Heike alliance which engaged in some hacker conflicts[257]. After Heike culture faded, he opened an Internet security organization called Yingyan ("eagle's eyes") Security Culture Network. However, in contrast to what the young Lao Ying did in his hacker days, today he is more acknowledged for what he accomplished in the philanthropy sector. iyiyun.com (the "Charity Cloud"), which is a sub-project of Yingyan that already produced three products for social good: "Yiyun Map," a mapping platform similar to Ushahidi[258] where anyone can create a themed map and crowdsource geographic information for philanthropic use; "Yiyun Signal Flare," a mobile app for locating missing people in times of earthquakes; and "Yibo," an advertising platform where website owners roll out public service ads for social good and non-

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[254] "老鹰"

[255] "万涛"

[256] Lao Ying's identity as Heike is debatable. Some people say he is better at self-promotion than using technology. See Zhihu.com,. 2015. Accessed May 4 2015. http://www.zhihu.com/question/24216404. Laoying was promoted as the "Heike Godfather" by some Chinese media, and he used his popularity in media to promote his nationalist view. This is another reason why I disagree with the saying that "Chinese hackers are nationalistic."

[257] I will not go into details because these "events" are often covered by rumors and misrepresentations and this thesis is a (media) fact based project.

[258] Ushahidi is a crowdsourced mapping platform which is famous for helping mapping rescue resource in the Haiti earthquate.

profit organizations can advertise for free. Laoying, a formal Heike[259], finally made his transition to Jike and Chuangke by bringing social change with Jike's design mindedness and Chuangke's technological capability.

An opposite example is the story of Li Jun. Li was only a vocational high school student when he met his Heike "master" in a net café in 1999 (the "great alliance period"). He tried to find a job in IT companies without a college degree but failed several times[260]. Subsequently, Li started to make computer viruses and sold them for money. His famous work is a virus called "Praying Panda[261]", which affected millions of Chinese computers and earned him a four year sentence in prison in 2007[262]. After he got out of the prison in 2009, he tried to search for jobs in information security. However, he does not possess the computer science knowledge required by these companies: he created his virus simply by combining existing hacking techniques but what those companies looked for was uncovering unknown vulnerabilities in computer systems[263]. Li's experience in making viruses only contributed to his bad reputation. In 2013, Li was arrested again for running online casinos[264]. Li Jun's story is a result of several factors: the social class he came from, his lack of education, his personal choice, and his false sense of "being empowered" through Heike technology. Li's story also illustrates that although Heike culture is inclusive, it does not mean that the underprivileged can improve their economic status through the Heike route. To the contrary, Laoying acquired a college degree and developed his habit of

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[259] Or self-claimed Heike

[260] Tech.163.com,. 2015. 'uncovering the profiting network behind the "Praying Panda"'. Accessed May 5 2015. http://tech.163.com/07/0214/05/3793OG9D000915

[261] 熊猫烧香

[262] (translated) News.163.com,. 2015. 'Li Jun of the "Praying Panda"'. Accessed May 5 2015. http://news.163.com/special/review/xiongmaosha

[263] (translated) Tech.163.com,. 2015. 'Heike Stories: the "Praying Panda" is inferior in techniques'. Accessed May 5 2015. http://tech.163.com/13/0705/06/930ISNR000091

[264] (translated) Tech.qq.com,. 2015. 'Li Jun is arrested again for online gambling'. Accessed May 5 2015. http://tech.qq.com/a/20130614/014491.htm.

reading and writing during college years[265], which has contributed to his success in transitioning from a Heike to a Jike and then to Chuangke. What I want to say is although Heike, Jike, and Chuangke culture empower social elites and underdogs as well, but members from different social classes benefit differently from these social technological movements.

What is the next type of "Ke"? It is hard to tell by now. Chuangke is still young; its culture is evolving; and its possibilities are yet to be discovered. My opinion is that a critical change must take place in technological, economic, and social conditions[266] in order to form the strong social identity needed for a new type of "Ke". Some companies and organizations have tried to forge their own "Ke[267]" but with little success. For example, Intel China tried to promote the concept "Chuangbianke" (Change Maker, or "Innovative Change Maker") as a new term for those who "are self-confident, those who do not set limits for themselves, and those who seek resource and solutions for social problems[268]." Intel's activities around "Chuangbianke" such as the Social Innovation Week are rather successful, and these activities attracted much attention from the media and the public. In fact, Intel's effort set an example of how IT companies can engage in corporate social responsibility. However, the concept of Chuangbianke is less accepted by a greater population performing the similar "tech-for-good" works and it is far from becoming the next "Ke". A similar failure is Justering's[269] developing the idea of "Chuangsike" ("Innovative Thinker"), which has a lesser influence. NGO 2.0, the project of which I am a key member, promoted the concept of "NGO-Techie Network", a side project that connects Jike to

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[265] Gongyi.qq.com,. 2015. 'Heike Laoying comes to the non-profit field'. Accessed May 5 2015. http://gongyi.qq.com/a/20140414/016988_all.htm

[266] such as the "information wild west" in the case of Heike, the change in economic development mode and business model in the case of Jike; and the introduction of digital fabrication technology in the case of Chuangke.

[267] Usually for social good

[268] (translated) Intel.com,. 2015. 'Unleash the Power of Chuangbian, Elevate Everybody's Creativity'. Accessed May 5 2015. http://www.intel.com/cd/corporate/pressroom/apac/zho/date/2015/547165.htm

[269] Justering is a Chinese IT company focused on non-profit technology

non-profit organizations (NPOs). NGO 2.0 held several hackathons and tech workshops and tech salons to bridge Jike and NPOs with mixed results[270]. Some projects showed great potential of making social changes by designing for social good, but few projects are successfully deployed into the field. NPOs have their own needs such as developing a website or making a mobile app, whereas Jike are more interested in making "cool stuff" such as drones and sensor networks. An alternative approach to build bridges between the two groups could be stressing the creative expression of both parties instead of centering the activities around technology issues or organizational needs. As I mentioned in Chapter 1, as different types of "Ke" converge and new border-crossing practices appear, perhaps in the future Chinese will not talk about "Ke" as separate entities and cultures and in that future, everybody will become a creative agent, contributing creativity to one's personal life and society.

[270] Wang, Jing. "NGO2. 0 and Social Media Praxis: Activist as Researcher." (2015).

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Appendix I A List of Stop Words Used in Text-mining

The additional stop words I used:

"使用 (use)", "可能 (maybe)", "已经 (already)", "很多 (many/much)", "没有 (no)", "目前 (currently)", "非常 (very)", "点评 (comment[271])", "一种 (one type of)", "一款 (a[272])", "一定 (some/must be)", "一下 (one time)", "之后 (afterwards)", "其实 (in fact)", "产生 (make/produce/result in)", "小时 (hours)"

Stop words come with StopwordsCN:

[1] "第二" "一番" "一直" "一个" "一些" "许多" "种" "有的是"
[9] "也就是说" "末" "啊" "阿" "哎" "哎呀" "哎哟" "唉"
[17] "俺" "俺们" "按" "按照" "吧" "吧哒" "把" "罢了"
[25] "被" "本" "本着" "比" "比方" "比如" "鄙人" "彼"
[33] "彼此" "边" "别" "别的" "别说" "并" "并且" "不比"
[41] "不成" "不单" "不但" "不独" "不管" "不光" "不过" "不仅"
[49] "不拘" "不论" "不怕" "不然" "不如" "不特" "不惟" "不问"
[57] "不只" "朝" "朝着" "趁" "趁着" "乘" "冲" "除"
[65] "除此之外" "除非" "除了" "此" "此间" "此外" "从" "从而"
[73] "打" "待" "但" "但是" "当" "当着" "到" "得"
[81] "的" "的话" "等" "等等" "地" "第" "叮咚" "对"
[89] "对于" "多" "多少" "而" "而况" "而且" "而是" "而外"
[97] "而言" "而已" "尔后" "反过来" "反过来说" "反之" "非但" "非徒"
[105] "否则" "嘎" "嘎登" "该" "赶" "个" "各" "各个"
[113] "各位" "各种" "各自" "给" "根据" "跟" "故" "故此"
[121] "固然" "关于" "管" "归" "果然" "果真" "过" "哈"
[129] "哈哈" "呵" "和" "何" "何处" "何况" "何时" "嘿"
[137] "哼" "哼唷" "呼哧" "乎" "哗" "还是" "还有" "换句话说"
[145] "换言之" "或" "或是" "或者" "极了" "及" "及其" "及至"
[153] "即" "即便" "即或" "即令" "即若" "即使" "几" "几时"
[161] "己" "既" "既然" "既是" "继而" "加之" "假如" "假若"
[169] "假使" "鉴于" "将" "较" "较之" "叫" "接着" "结果"
[177] "借" "紧接着" "进而" "尽" "尽管" "经" "经过" "就"
[185] "就是" "就是说" "据" "具体地说" "具体说来" "开始" "开外" "靠"
[193] "咳" "可" "可见" "可是" "可以" "况且" "啦" "来"
[201] "来着" "离" "例如" "哩" "连" "连同" "两者" "了"
[209] "临" "另" "另外" "另一方面" "论" "嘛" "吗" "慢说"

[271] This is because the website has a comment section
[272] usually used with nouns such as "products"

[217] "漫说" "冒" "么" "每" "每当" "们" "莫若" "某"
[225] "某个" "某些" "拿" "哪" "哪边" "哪儿" "哪个" "哪里"
[233] "哪年" "哪怕" "哪天" "哪些" "哪样" "那" "那边" "那儿"
[241] "那个" "那会儿" "那里" "那么" "那么些" "那么样" "那时" "那些"
[249] "那样" "乃" "乃至" "呢" "能" "你" "你们" "您"
[257] "宁" "宁可" "宁肯" "宁愿" "哦" "呕" "啪达" "旁人"
[265] "呸" "凭" "凭借" "其" "其次" "其二" "其他" "其它"
[273] "其一" "其余" "其中" "起" "起见" "岂但" "恰恰相反" "前后"
[281] "前者" "且" "然而" "然后" "然则" "让" "人家" "任"
[289] "任何" "任凭" "如" "如此" "如果" "如何" "如其" "如若"
[297] "如上所述" "若" "若非" "若是" "啥" "上下" "尚且" "设若"
[305] "设使" "甚而" "甚么" "甚至" "省得" "时候" "什么" "什么样"
[313] "使得" "是" "是的" "首先" "谁" "谁知" "顺" "顺着"
[321] "似的" "虽" "虽然" "虽说" "虽则" "随" "随着" "所"
[329] "所以" "他" "他们" "他人" "它" "它们" "她" "她们"
[337] "倘" "倘或" "倘然" "倘若" "倘使" "腾" "替" "通过"
[345] "同" "同时" "哇" "万一" "往" "望" "为" "为何"
[353] "为了" "为什么" "为着" "喂" "嗡嗡" "我" "我们" "呜"
[361] "呜呼" "乌乎" "无论" "无宁" "毋宁" "嘻" "吓" "相对而言"
[369] "像" "向" "向着" "嘘" "呀" "焉" "沿" "沿着"
[377] "要" "要不" "要不然" "要不是" "要么" "要是" "也" "也罢"
[385] "也好" "一" "一般" "一旦" "一方面" "一来" "一切" "一样"
[393] "一则" "依" "依照" "矣" "以" "以便" "以及" "以免"
[401] "以至" "以至于" "以致" "抑或" "因" "因此" "因而" "因为"
[409] "哟" "用" "由" "由此可见" "由于" "有" "有的" "有关"
[417] "有些" "又" "于" "于是" "于是乎" "与" "与此同时" "与否"
[425] "与其" "越是" "云云" "哉" "再说" "再者" "在" "在下"
[433] "咱" "咱们" "则" "怎" "怎么" "怎么办" "怎么样" "怎样"
[441] "咋" "照" "照着" "者" "这" "这边" "这儿" "这个"
[449] "这会儿" "这就是说" "这里" "这么" "这么点儿" "这么些" "这么样" "这时"
[457] "这些" "这样" "正如" "吱" "之" "之类" "之所以" "之一"
[465] "只是" "只限" "只要" "只有" "至" "至于" "诸位" "着"
[473] "着呢" "自" "自从" "自个儿" "自各儿" "自己" "自家" "自身"
[481] "综上所述" "总的来看" "总的来说" "总的说来" "总而言之" "总之" "纵" "纵令"
[489] "纵然" "纵使" "遵照" "作为" "兮" "呃" "呗" "咚"
[497] "咦" "喏" "啐" "喔唷" "嗬" "嗯" "嗳" "http"

Appendix II Source Code for Text-mining

1. Scraper (Python)

```
import requests
from pymongo import MongoClient
from bs4 import BeautifulSoup

client = MongoClient()
db = client.geekpark_data
posts = db.posts

url_prefix = "http://www.geekpark.net/?page="
page_start = 1
page_end = 154
for page in range(page_start, page_end):
    print "scraping page: " + str(page)
    raw_html = requests.get(url_prefix+str(page))
    soup = BeautifulSoup(raw_html.text);
    records = [];


    gpcards = soup.find(id="last-masonry").find_all('div', class_="gpcard")
    for card in gpcards:
        title = card.find('h1').text
        link = card.find(class_="title")['href'];
        date_tag = card.find(class_="publish_time").find('span');
        if date_tag:
            date = date_tag.text;
        else:
            date = u'';

        author = card.find(class_="author").find('span').text
        likes_tag = card.find(attrs={'data-action':'like'}).find('span')
        if likes_tag:
            likes = int(likes_tag.text.encode('utf-8'))
        else:
            likes = 0

        comments_tag = card.find(attrs={'data-action':'reply'}).find('span')
        if comments_tag:
            comments = int(comments_tag.text.encode('utf-8'))
        else:
            comments = 0

        records.append({
            'title': title,
            'link' : link,
            'date': date,
            'author': author,
            'likes': likes,
            'comments':comments,
        })
```

```
    # save record to mongodb
    posts.insert(records)
    # print records

print "scripting end"
```

2. Adding text to scraped content (Python)

```
__author__ = 'wangyu'

import requests
from pymongo import MongoClient
from bs4 import BeautifulSoup
from bson.objectid import ObjectId

start_object_id = 0;
domain_name = "http://www.geekpark.net"

client = MongoClient()
db = client.geekpark_data
collection = db.posts
if start_object_id != 0:
    posts = collection.find({'_id': {'$gt': ObjectId(str(start_object_id))}})
else:
    posts = collection.find()
```

3. Transforming scraped content

```
# -*- coding: utf-8 -*-
from pymongo import MongoClient

client = MongoClient()
db = client.geekpark_data
collection = db.posts
posts = collection.find()
i=1

for post in posts:
    content = post[u'content']
    index = content.find(u'通知他们') + len(u'通知他们')
    print post
    break
    print post[u'_id'], index, i
    i = i+1
```

4. Data analysis

```
library(rmongodb)
library(Rwordseg)
```

```
library(tmcn)
library(tm)
library(zoo)
collection <- "posts"
db <- "geekpark_data"
mongo <- mongo.create()
namespace <- paste(db, collection, sep=".")
cursor <- mongo.find(mongo, namespace, mongo.bson.empty())

######
# load an array of dates
date_list <- c()
while (mongo.cursor.next(cursor)) {
  val <- mongo.cursor.value(cursor)
  date_val <- as.Date(mongo.bson.value(val, "date"))
  date_list <- c(date_list, date_val)
}

################################
# extract data from the database
# store data in 2 places:
# 1. content_list: a list of each qtr of a year. each element is a vector of
articles;
# 2. total_content: a vector of all articles, word segmented.
################################
i <- 0  # for test use only. Control how many samples
total_content <- c()
content_list = list()
while (mongo.cursor.next(cursor)) {
  val <- mongo.cursor.value(cursor)
  content = mongo.bson.value(val, "content")
  qtr = toString(as.yearqtr(as.Date(mongo.bson.value(val, "date"))))
  if(substr(qtr, 0, 2)=='NA'){
    cat("invalid date", i)
  }
  else{
    content_list[[qtr]] = paste(content_list[[qtr]], content, collapse = " ")
  }
  content <- segmentCN(content, returnType="tm")
  total_content <- c(total_content, content)
  cat("parsing #",i,"\n", mongo.bson.value(val, "date"))
  i <- i+1
  if(i > 30){
    #break
  }
}

# for total content - generate a total corpus
d.corpus <- Corpus(VectorSource(total_content))
d.corpus <- tm_map(d.corpus, removeWords, stopwordsCN())
# some additional stopwords
```

```
d.corpus <- tm_map(d.corpus, removeWords, c("使用", "可能", "已经", "很多", "没有", "目
前", "非常", "点评", "一种", "一款", "一定", "一下", "之后", "其实", "产生", "小时"))
d.corpus <- tm_map(d.corpus, removeNumbers)
d.dtm <- DocumentTermMatrix(d.corpus, control = list(wordLengths=c(2, Inf)))

# draw a dendrogram
quartz(family="STKaiti")
par(family="STKaiti")
plot(d.dtm,
     terms
     =findFreqTerms(d.dtm, lowfreq
                    =900),
     corThreshold
     =0.3, family="STKaiti"
)

# extract data for community detection
numTerms <- 1000 # how much terms to output (sort by frequency)
assocThreshold <- 100
d.dtm.m <- as.matrix(d.dtm)
d.dtm.colSums <- colSums(d.dtm.m)
d.dtm.freq <- d.dtm.m[,names(sort(-d.dtm.colsums)[1:numTerms])]
d.dtm.freq[d.dtm.freq>1] <- 1
d.dtm.assoc <- t(d.dtm.freq) %*% d.dtm.freq
d.dtm.assoc[d.dtm.assoc<assocThreshold] = 0 # disable weak links
# filter out lonely nodes
d.dtm.conn <- d.dtm.assoc
d.dtm.conn[d.dtm.conn>1] <- 1
assoc.table <- d.dtm.assoc[names(linkage[linkage>1]),names(linkage[linkage>1])]
write.table(assoc.table, sep=";", file="assoc_matrix.csv") # write to csv for gephi
to use

# topic analysis
# ! not used in the paper
# unreliable
library(slam)

# a standard way to calculate tf-idf mean
term_tfidf <- tapply(d.dtm$v/row_sums(d.dtm)[d.dtm$i], d.dtm$j, mean) *
      log2(nDocs(d.dtm)/col_sums(d.dtm > 0))
# an alternative way
d.dtm2 <- DocumentTermMatrix(d.corpus, control = list(wordLengths=c(2, Inf),
weighting=function(x)weightTfIdf(x,normalize = FALSE)))
term_tfidf <- col_means(d.dtm2)

d.dtm <- d.dtm[, term_tfidf>=0.2]
d.dtm <- d.dtm[row_sums(d.dtm)>0, ]

# estimating topic model
library("topicmodels")
k <- 30
```

```
SEED <- 2014
VEM2 = LDA(d.dtm, k = k, control = list(seed = SEED))

# drawing line graph for topic transition
library(xts)
which(row_sums(d.dtm2)==0)
date.list.filtered = date.list[-c(3, 63, 322)]
date.xts = xts(VEM@gamma[,1:4], as.Date(date.list.filtered))
date.xts.period = period.apply(date.xts, endpoints(date.xts, 'months'), mean)
plot(as.zoo(date.xts.period), screens=1)

# print trending terms
# using tf-idf
# not so effective
out.vector = c()
for(i in names(content_list)){
  content_list[[i]] <- segmentCN(content_list[[i]], returnType="tm")
  cat('converted', i)
  # out.vector <- c(out.vector, paste(content_list[[i]], collapse = ' '))
}
names(out.vector) <- names(content_list)
d.corpus <- Corpus(VectorSource(out.vector))
d.corpus <- tm_map(d.corpus, removeWords, stopwordsCN())
d.corpus <- tm_map(d.corpus, removeNumbers)
# d.dtm <- DocumentTermMatrix(d.corpus, control = list(wordLengths=c(2, Inf),
weighting=weightTfIdf))
d.dtm <- DocumentTermMatrix(d.corpus, control = list(wordLengths=c(2, Inf),
weighting=function(x)weightTfIdf(x,normalize = FALSE)))
d.dtm.df <- as.data.frame(t(as.matrix(d.dtm)))
colnames(d.dtm.df) <- names(content_list)
# print top words sorted by tf-idf in each time slice
for(i in names(content_list)){
  print(d.dtm.df[order(-d.dtm.df[i]),][1:20,c(i), drop=FALSE])
}

# print top burstness
# (i.e. tf-idf of a time slice in a time window of all previous slices)
# in each time slice
time_slice_names <- names(content_list)
for(i in (length(d.corpus)-1):1){
  d.dtm <- DocumentTermMatrix(d.corpus[i:length(d.corpus)], control =
list(wordLengths=c(2, Inf), weighting=function(x)weightTfIdf(x,normalize = FALSE)))
  d.dtm.df <- as.data.frame(t(as.matrix(d.dtm)))
  print(time_slice_names[i])
  print(d.dtm.df[order(-d.dtm.df[1]),][1:20,1, drop=FALSE])
}

tdm <- TermDocumentMatrix(d.corpus, control = list(wordLengths=c(2, Inf)))
terms(VEM, 10)
```