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## **Recalibrating, Reconfiguring, and Appropriating Innovation: A semantic network analysis of China's Mass Innovation and Mass Entrepreneurship (MIME) initiatives**

### **Abstract**

The new turn to Mass Innovation and Mass Entrepreneurship (MIME) initiatives in China mark a concrete step to reconfiguring and appropriating the western maker movement rhetoric to fit China's context. In this paper, we explore the nascent China's maker movement under the guidance of the state's MIME initiative to identify the key issues, actions, rationales, and logics of appropriation linked to this public policy agenda. Empirically, we employ a semantic network analysis (SNA) to identify policy frames of the two principal documents of the MIME issued in 2015 and 2018. Providing insight into the heterogeneous nature of MIME discourses and innovation policy in China, our study Sheds light on how social innovation derives from activism and connect with emerging creative cities discourse, entrepreneurship, and local economic development. Implication for the theory and practice of innovation policy are outlined.

**Keywords:** maker movement, makerspace, innovation policy, social innovation, policy frame, China

### **1. Introduction**

In recent years, more and more people are making things together in community-based workshops. These community-based DIY workshops equipped with a diverse range of making tools and facilities are termed as 'makerspace'. Since 2015, there has been an explosion of makerspaces in China as the state government adopted the idea of 'makers' and 'maker culture' and issued the national 'mass innovation and mass entrepreneurship' (China State Council, 2015) initiative. The adoption and promotion of maker culture echoed with the rapid development of the global maker movement, which is remarkably manifested with the explosion of makerspaces in China (Lindtner, 2015; Wen, 2017; Fu, 2021). According to statistics from the Ministry of Science and Technology (MOST) of China, there are 1952 makerspaces across the country by 2019 (MOST, 2019). Much of these are renamed as 'mass innovation space,' which is different from the global narrative of makerspace (Keane & Chen, 2019). Existing research on makerspaces has proposed two 'paradigms' of innovation. The first suggest that critical and social innovation derives from activism

and connects making to social changes and social movements, often associate with commons-based peer production (Sarpong et al., 2020; Meissner et al., 2021). The second emphasizes entrepreneurial and commercial innovation link to public policy agenda, especially creative cities discourses; connect making with entrepreneurship and local economic development (Carayannis & Meissner, 2017; Van Holm, 2017; Keane & Chen, 2019; Fu, 2021).

A substantial amount of research has identified the continuity of maker culture with previous counterculture, hacker culture, DIY culture, and the open-source movement (Dougherty, 2012; Tanenbaum et al., 2013; Lindtner, 2015; Martin, 2015), and framed makerspace as a site for critical innovation. Instead of profit-seeking, makerspaces and makers under this paradigm are more focused on learning, sharing, collaboration, and creating for social goods. Critical making scholars (Ratto & Boler, 2014) argue that advanced technologies, especially digital fabrication technologies, empower people to be able to make social changes and challenge the existing status quo. Making in this sense is organized in a commons-based peer production model. Making, therefore, become an alternative way of production that potentially challenges traditional industrial production.

Globally, the notion of innovation in policy making is becoming increasingly broad and complexed (Meissner et al., 2017). Governments and enterprises see the potential of makerspace as an incubator for profitable innovation and entrepreneurship. Governments around the world actively incorporate makerspace as part of their public policy agenda to promote local innovation and entrepreneurship. Some scholars argued (Benton et al., 2013; Van Holm, 2017; Tang et al., 2021) the explosion of makerspaces is directly connected with creative cities' pursuits to re-activate post-industrial cities (Pratt, 2004; O'Connor, 2010). Making under such paradigm is usually more focused on public policy goals, including urban renewal, creative industries development, local economic development, etc. From this perspective, makerspace can be understood as part of the new urban infrastructure that attracts new industries, new creative classes, and a new economy. The public policy-oriented makerspace could involve a wide range of players, including policymakers, academics, community groups, and local businesses. It also reminds us of the critical role of the state and local government in institutionalising making and innovation.

The 'Mass Innovation and Mass Entrepreneurship' (MIME) initiative, started in 2015, has been celebrated as commence milestone of China's maker movement (Wen, 2017). This policy initiative directly produced many public policy-oriented makerspaces and promoted maker and makerspace to become

buzzwords (Lindtner, 2015; Xi et al., 2017). Very few studies, however, have deeply examined this policy, for example, the key issues and actions as well as the rationales behind it. Notably, the MIME initiative has released two key policy documents in 2015 and 2018, respectively. The MIME 2018 was made based on the reflection of the past year's experiences. It would be interesting to see what the differences and changes are between the two. In public policy-oriented model in western societies, the role of government is much more about promoting, not directly intervening (Fu, 2021). However, the story in China is very different, and the government can be more intrusive and ubiquitous. This research uses a semantic network analysis method and discourse analysis to examine two key policy documents of MIME initiatives to reflect on the China's innovation policy. It provides an in-depth analysis of the top-level designs, rationales, aims, and measures of the MIME initiatives and digs deeper of the underlying social-techno imageries of the China's central government. By comparing the two key policy documents, this paper also uncovers the trajectory of China's adoption, incorporation, moderation and negotiation of the western-originated maker culture into the China's innovation policy discourses.

## **2. Framing innovation within makerspaces**

Previous studies have examined the innovation of makerspace mainly from two perspectives: a more critical and social perspective and an entrepreneurial and economic oriented perspective. The two views often manifested into two different models of makerspaces. The commons-based peer production model based makerspaces focus on making and creating new things to have social impacts on the one hand. The public policy often links with creative city strategy-based makerspace, concentrate on promoting an entrepreneurial innovation environment.

### **2.1 Makerspace as a social innovation incubator**

An abundance of literature exists on how the Chinese government imported western 'advanced' concepts applied to China's public policy agenda, such as the Cultural Industries, Creative Industries, and Creative Cities, to tackle China's developmental issues (Keane, 2009; Keane, 2011; O'Connor & Gu, 2014). Many of these attempts, however, were more stressed on the economic transformation whilst avoiding the context-specific social and political aspects in moderation. This creates many challenges, as Keane and Chen (2019) described 'grand narratives and cascading local variations.' These top-down grand policy narratives have turned out to fail to satisfy the needs for social empowerment and address significant developmental

problems. Although China has successfully transformed into a global manufacturing leader, the government still faced severe challenges, such as unemployment, uneven urban-rural development, and the rise of social inequality within cities. These crises forced the state government to take increasingly decisive and systematic measures to redesign at the top level and plan to allocate better all the resources required and ensure the efficient realization of its goals.

Against this backdrop, the state government of China proposed the ‘mass innovation and mass entrepreneurship’ initiative, declared that maker culture and makerspace would be able to empower the grassroots with innovation and entrepreneurship capabilities to address some social problems, such as correcting innovation deficits in manufacturing, ameliorating social and regional inequalities, and reconstructing and regenerating urban spaces. The key to addressing these issues is innovative, especially in technological innovation. Therefore, the innovation embedded maker movement in China should not only be understood as an economic initiative but also a social and political program. Makerspace, in this sense, is envisioned as a social innovation incubator. That explains why the state government reiterates the makerspace as ‘mass innovation space.’ The keyword ‘mass’ shows that making is not a personal thing but is encouraged to reach the public sphere, to have mass impacts.

The term ‘social innovation’ is used to describe a ‘broad range of activities designed to address social problems’ (Tracey & Stott, 2017), for example, inequality, poverty, and environmental problems. Academically, however, the idea of social innovation remains vague. Tracey and Stott (2017) provide us a useful basis for theory building in this area, sorting social innovation into three categories: social entrepreneurship, social intrapreneurship, and social extrapreneurship. ‘Social entrepreneurship’ refers to the process of creating and growing a venture to address social challenges, while ‘social intrapreneurship’ refers to addressing social problems from inside established organizations. ‘Social extrapreneurship’ means combining efforts of new organizations and established organizations to solve social problems. According to their classification, makerspace in China is a social innovation platform that belongs to ‘social extrapreneurship’ that facilitates alternative combinations of ideas, people, places, and resources to address social challenges. This social innovation (social extrapreneurship) requires collective efforts within and between new and established organisations. While Tracey and Stott tend to focus on the social good of social innovation, Cuntz, Foray, and Mostovova (2020) instead build a relatively narrow conceptual framework of social innovation from an economic perspective. This microeconomics-based concept of social innovation implies that the main criteria for identifying a social innovation concern the way the

benefits (profits) generated by innovation are distributed between the private (innovator) and public (society) sectors. Therefore, social innovation is 'by choice.' From this perspective, makerspace can only be thought of as a place for social innovation if its participants direct their activities with a strong will independent of external coercion. This is not to suggest that choices are always free, but instead, focus on a sense of freedom being achieved through making and creating.

Baptista et al. (2019) explored the concept of social innovation from a governance perspective. They maintain that government support and scalability of social innovation should be carefully considered. The government should pay more attention to those social innovations that, while having the potential to deliver social good, and having more prosperous market values. Concerning entrepreneurs and startups, they argue that in favor of policy support for small bottom-up initiatives that have a profit-logic but are not sufficiently robust to survive on their own due to the liabilities of smallness and newness. Phillips et al. (2015) developed a 'systems of innovation' analytical framework for studies of social innovation and social entrepreneurship. As they stated, the private sector is dominated by for-profit enterprises. Social entrepreneurship and social innovation are increasingly being seen as an alternative to the capitalism mechanisms. In contrast to for-profit enterprises, social entrepreneurs focus on the "double bottom line," a motivation to perform both financially and socially. Essentially, the systems of innovation approach identify the role that institutions, both formal and informal, play in shaping the future direction of social innovation. Though from their studies, a clear understanding of how institutions can support the process of social innovation is yet to be developed, a system of innovation approach does provide a potential framework for investigating the role of institutions in promoting social innovation.

Meanwhile, a bunch of research has been conducted to illustrate how maker culture could contribute to produce social innovation in contemporary society, especially how maker education invokes social innovation mindset. Smith et al. (2013) argued that makerspace creates new possibilities for grassroots, communities, and governments to rethink and reconfigure our understanding of innovation. Geser et al. (2019) examined how European countries use makerspace as a tool to develop social innovation tinkering of children and young people under the guidance of the European research and innovation project 'DOIT.' Similarly, Veronika et al. (2018) investigated how to stimulate social innovation skills in makerspace settings under the guideline of the European 'DOIT' project, to connect makerspace with STEM education better. It is clear that maker education is not just a community-level issue but requires the active participation and collaboration of individuals, communities, and governments.

Looking at innovation within makerspace through this perspective, we can see that the government could potentially play an important role in supporting innovation by ensuring that they bring not only economic profits (entrepreneurship) but also social innovation (social entrepreneurship) benefits to society at large. In China, for example, CAS maker institute based in Shenzhen runs a regular children maker program every week, inviting children to have STEM education under the supervision of graduate students of CAS. Interview with the program coordinator, they not only deliver courses, but they also design and develop maker education tools and materials, for example, an interactive, easy to learn coding game that helps children to learn coding skills more effectively and fun. More importantly, they also open their course design and materials to public schools and provide training to public school teachers, and visit public schools to share the maker ethos with the public.

As Keane and Chen (2017) argued, the state government sees digital technology and entrepreneurship as solutions to China's social problems regarding social transformation. They use the term 'entrepreneurial solutionism' to describe this kind of proclivity that manifested with the slogan 'mass entrepreneurship and mass innovation.' This study has provided examples of actual participation of designated makerspaces, which can be different from the state's grand imagination. The central government's grand narratives can be challenging to come true at local levels. Internationally, makerspace has been recognized as an essential site for empowerment and fostering critical innovations and makings; however, these innovations can be disruptive, not what the state probably wants to see. Hence, it is problematic to expect to use makerspace as a generator of social innovations to solve social challenges. However, it is interesting to understand what kinds of social issues and innovations that the government wanted to see and tackle. Therefore, an analysis of policy frames will be conducted to identify what social issues are incorporated.

## **2.2 Entrepreneurial innovation incubator: makerspace and local economic development**

While California originated maker culture celebrates the virtues of non-institutional, anti-consumerism, anti-capitalism ethos, it still embraces nationally franchised, for-profit, user-fee-based TechShops. Two of the hallmarks of the global maker movement are Make magazine and Maker Faire. In June 2019, Maker Media, the company behind MAKE magazine and the Maker Faire, announced to lay off its entire team staff and pause all operations. The founding father, Dougherty Dale, admitted that "It started as a venture-backed company, but we realized it was not a venture-backed opportunity." Dougherty's company had

raised over \$10 million from Obvious Ventures, Raine Ventures, and Floodgate (Constine, 2019). As a business, not a mission, when these ventures were not interested in the investment anymore, it soon went to bankruptcy. The Maker Media's story clearly shows the limitation of capitalist and corporate influences on the global maker movement. Originated from MIT, Fablabs is another example of how processes of institutionalisation are shaping the global maker movement. However, its strict specifications on space size, types of equipment, and tools showed the institutional influences over the legitimization of 'maker' and 'maker culture.' Apart from the corporate, institutional power, governments worldwide are interested in defining preferences for maker culture, often linking to national schemes around innovation, economic development, etc. s also visible in the global maker landscape. In the US, the White House organized a national maker faire to promote the maker culture to lead a grassroots renaissance in American manufacturing (Fried & Wetstone, 2014).

Substantial research has shown that the recent prevalence of makerspace results from creative cities' pursuit (Holm, 2015; Niaros et al., 2016; Gu & Shea, 2018). Policy discourses and research agenda around the creative city concept tend to focus on attracting the creative class, in this case often referring to foreign makers. This is linked to the idea of 'creative class' by Richard Florida (Florida, 2002). Florida's work addresses the question of why creative people and businesses cluster in cities. He argues that creative businesses cluster to draw from concentrations of talented people who power innovation and economic growth. The ability to rapidly mobilize talent is a tremendous source of competitive advantage for global cities. His ideas can be summarized in a simple formula, the 3T's of economic growth: technology, talent, and tolerance. How to account for some places' ability to secure a more significant quantity or quality of these flows? The answer lies in openness, diversity, and tolerance. This idea that open culture can foster and facilitate human creativity and, on the macro level, is a spur to societal innovation, entrepreneurship, and economic development is responsible for government policy aimed at attracting global makers through supporting the development of maker spaces. It is believed that places with makers and makerspaces gain an economic advantage in both harnessing the creative capabilities of its people and in attracting the footloose creative class.

From this perspective, the Chinese maker movement with the large volume of government-managed makerspaces needs to be understood within the framework of national reform and urban and regional development. Keane (2011) proposed that much of the post-industrial reforms in China follow a 'growth coalitions.' The concept of 'growth coalition' offers a useful examination of the complex and

dynamic nature of makerspace governance in China. The growth coalition raises fundamental issues for local authorities in attempting to accommodate them into a local economic strategy. Keane identified growth coalitions in the development of creative clusters in major cities like Beijing and Shanghai, includes national economic policy bureaus and relevant policy advisory committees, national and international business interests, and communities. Moreover, growth coalitions comprise representatives of local and district governments who engage with developers, financiers, and entrepreneurs.

Understandably, the development of makerspaces requires a broad range of agencies who can contribute knowledge towards a non-traditional public policy end. As Leitner (1990) argues, to develop cities' entrepreneurship, distinctive institutional arrangements and governance networks are needed, for example, public agencies, private sectors, etc. Benton et al. (2013) demonstrate how makerspaces are incorporated into urban policies that promote entrepreneurship and creativity instead of providing direction on urban issues. They argue that makerspaces in urban policies are part of building an entrepreneurial ecosystem based on talent, innovation, and creativity that fosters a vibrant local community. Benton et al.'s (2013) research also highlight the wide range of issues in space governance that can emerge in the founding and management of a makerspace within a governance network, which ultimately intends to institutionalise those infrastructures through formal processes.

Critics of the public policy-oriented maker culture maintain that creativity and innovation can not be managed and governed; creativity and innovation only thrive in a liberal and free environment. However, substantial studies showed the opposite. For example, Bilton (2017) argued, creativity activities thrive on constraints, boundaries, and institutional forces. He criticizes Tom Peter's concept of liberation management, which stipulates that creative people work best when they are free from constraints, asking for management as funky, creative, and anarchic. Instead, his research suggests that creative processes and management processes complement any problem-solving activity rather than antagonistic. As we shall see from the four makerspaces, processes of institutionalisation can also contribute to creative outcomes through setting clear project goals as well as providing a critical reflexive opportunity for makers to be aware of those forces.

To sum, public policy-oriented maker culture focuses on entrepreneurial innovation and stresses the importance of makerspace as part of the public policy concerning post-industrial urban infrastructure that fosters creativity and entrepreneurial innovation. This type of maker culture tends to enforce a formal institutionalising process on makerspaces risking diminishing the freedom for new ideas and innovations.



It requires a complex governance network that involves central and local governments, private sectors, and communities, contributing to new knowledge exchanges that broaden the innovative capability of makers. On the other hand, the critical maker culture emphasizes more on social innovation and social benefits. They believe maker culture represents a new kind of grassroots digital culture that empowers people to make social changes and challenges the existing status quo. Maker education, for example, is celebrated as a powerful way of nurturing children and young students' social innovation tinkering and capabilities. While the Chinese government led the maker movement aims at creating an alternative way of economic development, the 'mass innovation and mass entrepreneurship' initiative was envisioned to address other developmental issues. This research intends to dig deeper into the Chinese maker movement policy discourses to delineate the key issues and changes of the policy frames.

### **3. Data and Methodology**

#### **3.1 Methods: semantic network analysis**

Policies are often understood as socially constructed (Colebatch, 1998). The socially constructed policies can be best examined through policy frame studies (Schön & Rein, 1994). Policy frames usually refer to 'policy actors' views on the world that affect their problem-solving method (Jung & Park, 2015; Park, Lee, & Paik, 2019). Policy frame analysis can help us better understand the rationales, concerns, and solutions in a given policy. Both quantitative and qualitative methods can be used to analyze policy frames. Semantic network analysis (SNA) is a combined method of both qualitative and quantitative manners to extract messages and underlying meanings from networked words. SNA assumes that text is represented as a network of words, and the relations and patterns between them can contribute to our understanding of policy frames (Junseop, Chisung, & Mark, 2017). SNA methods not only enable us to count the frequency of words' presence but also to examine policy actors' discourses in a systematic manner.

Semantic networks are composed of texts, and texts consist of words in general. A node is defined as a word or concept. As such, a specific word text can be interpreted as networked nodes. Second, to connect different nodes, ties are made between nodes. Ties in this sense mean the relation between or among nodes in a network. In semantic networks, a tie can be defined as proximity among words. In this study, ties between words were linked when they co-occurred in a sentence, which will be elaborated later. Nodes can be connected and clustered together, as such subgroups can be found by looking at these closely connected nodes. Therefore, subgroups generally refer to the organization of closely connected nodes,

which are redefined as a unit that forms concrete meanings in this study. Presence analysis or frequency analysis will be used firstly to clean and organize the data. Frequency analysis indicates how often each concept appears in each type of organization's self-definition without respect to the use of any other concepts. The frequency was converted into a Boolean table to specify how many organizations used each concept.

Jung and Park (2015) developed a 'problem-solution pattern semantic network analysis based on a 'Theory of Inventive Problem Solving' (TRIZ) semantic approach that was used to analyze the frames of government policy. The TRIZ method assumes noun phrases usually represent specific public issues and topics, while verbs can be seen as actions within a semantic network. If some specific nouns and verbs show a "problem-solution" pattern, we can identify the policies intended and what the solutions are designed to tackle these problems. To apply the 'problem-solution' pattern analysis, a co-occurrence matrix is needed. The co-occurrence matrix is representing what words are mostly co-occurred or paired. A raw data format for network analysis, fundamental semantic analysis for identifying policy frames may begin with the co-occurrence matrix. Content analysis will be used to examine these co-occurred words and concepts to determine the policy frames.

### **3.2 Data collection**

As informed earlier, the two Mass Innovation and Mass entrepreneurship policies are the primary policy documents serving as a framework for comparing and understanding China's innovation and entrepreneurship policies. The two policy documents serve as the guideline of the 'Mass innovation, mass entrepreneurship' initiative that was first proposed by Premier Li Keqiang in 2015 and then developed to a 2.0 version in 2018. The MM2015 policy was the kickstarter of the Chinese maker movement, while the MM2018 was an advanced version based on the reflection of the MM2015. Therefore, the MM 2018 policy is also known as the 2.0 version of the MM policy. Since the introduction of 2015, both the central government and local government have invested heavily in promoting the maker movement. The most obvious identifier is the soaring number of makerspaces across the country. However, three years later, critics argue that the maker movement bubble had burst because of many makerspaces shutdown. Therefore, it is interesting to look at how the government responded to the bubble boom and bust (if true). Hence, this study will examine and compare the two policy documents to see: 1) What are the critical issues in designing the maker movement policy in China? 2) What are the differences and changes between the

former and later version of this policy? 3) What can we reflect and learn from these critical issues and changes?

### **3.3 Analysis procedures**

The semantic network analysis involves a set of research techniques and procedures. First, the two policy documents will be processed with a word frequency analysis to see what are the most frequently shown words. The frequency results will then be converted into a descending list of the 50 most frequent words for each document. Importantly, as the original data are all in Chinese, the next step is producing a translated version of the frequency list. The frequency analysis can help us to identify the themes, topics, issues that the two policy documents cover; however, this is not sufficient to do a TRIZ analysis. To do the 'problem solving' study, we need to identify the most matched (co-occurred) words, especially those noun-verb co-occurrences. Therefore, co-occurrence analysis will be conducted, and a co-occurrence matrix table of the two documents will be produced. The co-occurrence tables can help us to do a TRIZ analysis in which nouns represent problems and issues while verbs demonstrate the government's actions.

## **4. Results**

### **4.1 Key problems and solutions expressed in the two MM documents**

Frequency analysis of the two documents is presented in two descending lists. Table 1 is a descending list of 50 most frequent words in the 2015 Mass Innovation and Mass Entrepreneurship policy document. The word/node column shows the top frequently presented concepts. The frequency column is representing how many times this word recurred in this policy document. The value indicates the centrality of the word in this semantic network. According to the frequency table, firstly, the top occurring word/node is 'entrepreneurship' (chuangye), followed by innovation (chuangxin). Just as this document's title indicates, entrepreneurship and innovation are the two main themes or the rationale behind this policy. Other high-ranked words are, for example, 'development,' 'enterprise,' 'support,' 'improve,' 'encourage,' 'establish,' 'investment,' and 'policy.'

Table 2 is the descending list of 50 most frequent words in the 2018 Mass Innovation and Mass Entrepreneurship policy document. There are several apparent changes to compare with the 2015 version. The top re-occurred word/node is innovation, while entrepreneurship (ranked top 1 in 2015) retreated to second place. For example, other higher-ranked words are development, enterprise, support, division of

labor, responsibility, revolution, industry, and promotion. Compared with the 2015 version, some new terms were represented: division of labor, responsibility, revolution, and industry. This shows a remarkable turn of the maker policy by the state government.

No.	Word/Node	Frequence	Value	No.	Word	Frequence	Value
1	entrepreneurship	177	6.65%	26	mode	12	0.45%
2	innovation	103	3.87%	27	entrepreneur	12	0.45%
3	development	55	2.07%	28	invest	12	0.45%
4	enterprise	49	1.84%	29	talent	12	0.45%
5	support	42	1.58%	30	management	12	0.45%
6	improve	41	1.54%	31	provide	11	0.41%
7	encourage	31	1.16%	32	resource	11	0.41%
8	establish	31	1.16%	33	emerging industries	11	0.41%
9	investment	31	1.16%	34	financing	11	0.41%
10	policy	30	1.13%	35	fund	11	0.41%
11	lead	25	0.94%	36	construct	10	0.38%
12	mechanism	24	0.90%	37	intellectual property	10	0.38%
13	service	20	0.75%	38	staff	10	0.38%
14	drive	20	0.75%	39	government	10	0.38%
15	promote	19	0.71%	40	capital	10	0.38%
16	platform	18	0.68%	41	technology	10	0.38%
17	market	18	0.68%	42	practicable	10	0.38%
18	accelerate	18	0.68%	43	strength	10	0.38%
19	grassroots	17	0.64%	44	organization	10	0.38%
20	institution	16	0.60%	45	environment	10	0.38%
21	mass	16	0.60%	46	nation	9	0.34%

22	system	15	0.56%	47	condition	9	0.34%
23	reform	14	0.53%	48	information	9	0.34%
24	society	13	0.49%	49	stock	9	0.34%
25	employment	13	0.49%	50	oversea	9	0.34%

Table 1. Descending list of 50 most frequent words in the 2015 Mass Innovation and Mass Entrepreneurship policy document

No.	Word/Node	Frequency	Value	No.	Word	Frequency	Value
1	innovation	158	5.20%	26	MOST	16	0.53%
2	entrepreneurship	136	4.48%	27	local	16	0.53%
3	development	72	2.37%	28	shuangchuang	16	0.53%
4	enterprise	41	1.35%	29	technique	16	0.53%
5	support	38	1.25%	30	nation	15	0.49%
6	division of labour	31	1.02%	31	MOF	15	0.49%
7	responsibility	31	1.02%	32	informationization	14	0.46%
8	revolution	28	0.92%	33	further	13	0.43%
9	industry	28	0.92%	34	collaboration	13	0.43%
10	promote	28	0.92%	35	impact	13	0.43%
11	propel	27	0.89%	36	batch	13	0.43%
12	technology	26	0.86%	37	institution	13	0.43%
13	construct	25	0.82%	38	intellectual property	12	0.40%
14	accelerate	25	0.82%	39	build	12	0.40%
15	encourage	24	0.79%	40	market	11	0.36%
16	complete	24	0.79%	41	employment	11	0.36%
17	platform	23	0.76%	42	SME	11	0.36%
18	Internet	23	0.76%	43	MOHRSS	11	0.36%
19	policy	22	0.72%	44	fuse	11	0.36%

20	set	21	0.69%	45	economy	11	0.36%
21	service	19	0.63%	46	improve	11	0.36%
22	demonstrate	19	0.63%	47	lead	11	0.36%
23	mechanism	18	0.59%	48	human resources	11	0.36%
24	base	18	0.59%	49	capability	10	0.33%
25	estate	16	0.53%	50	system	10	0.33%

Table 2. Descending list of 50 most frequent words in the 2018 Mass Innovation and Mass Entrepreneurship policy document.

The next step is to examine the co-occurrence of these words. The co-occurrence matrix shows what words are mostly co-occurred, for example, some specific pairs frequently co-occurred or, in other words, frequently used altogether. Co-occurrence words pairs can be used to conduct the TRIZ semantic analysis. According to the TRIZ semantic approach, noun phrases usually represent specific public issues and topics. Simultaneously, verbs can be seen as actions, and specific nouns and verbs show a "problem-solution" pattern. 'entrepreneurship,' and 'innovation' are the two specific public issues that this policy document focuses on. Nouns and verb patterns, such as 'support entrepreneurship,' 'improve-entrepreneurship,' and 'encourage entrepreneurship,' can be used to look at the policy frame. It is worth noting that the current co-occurred words table was produced based on the translated version of the frequency table. Some gerund words were initially translated into noun form for data processing. Therefore, manual work of identifying the verb-noun match was conducted. The Table 3 below are the lists of the two documents' top 10 verb-noun matches.

No	MM 2015	MM 2018
1	support-entrepreneurship	develop-innovation
2	develop-entrepreneurship	support-innovation
3	improve-entrepreneurship	develop-entrepreneurship
4	encourage-entrepreneurship	support-entrepreneurship
5	invest-entrepreneurship	develop-division of labour
6	establish-entrepreneurship	develop-responsibility

7	develop-innovation	develop-technology
8	lead-entrepreneurship	promote-innovation
9	support-innovation	propel-innovation
10	support-development	propel-entrepreneurship

Table 3. Two policy document TRIZ pairs

According to the TRIZ "problem-solution" pattern, it is clear that 'innovation' and 'entrepreneurship' are still the two specific concerning public issues. However, innovation seems to have gained more recognition. Specific nouns and verb patterns, such as 'support entrepreneurship,' 'support innovation,' remain the same. New word patterns such as 'division of labour-development', 'responsibility-division of labour', 'revolution-development', 'technology-innovation', 'platform-innovation', and 'technology-entrepreneurship' are new to this policy. Therefore, the new version maker policy frame focused more on innovation makers (labor), technology, and platform issues.

Below two figures are the visualisation of the two documents. From Figure 1, it is clear to see that entrepreneurship sits at the core of the policy. Every other issue and action are surrounding the core concept, entrepreneurship. In contrast, Figure 2 represents the changes of the 2018 version policy in which innovation replaced the primary concerns from entrepreneurship. Meanwhile, technology becomes more visible and emphasized.

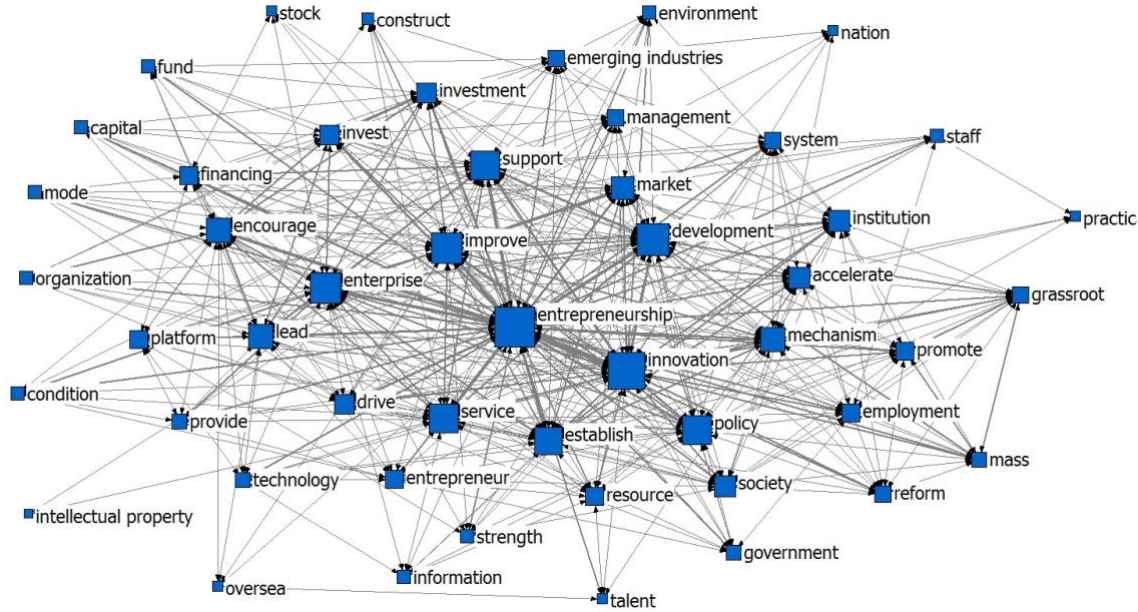


Figure 1. The semantic network of the 2015 Mass Innovation and Mass Entrepreneurship policy document

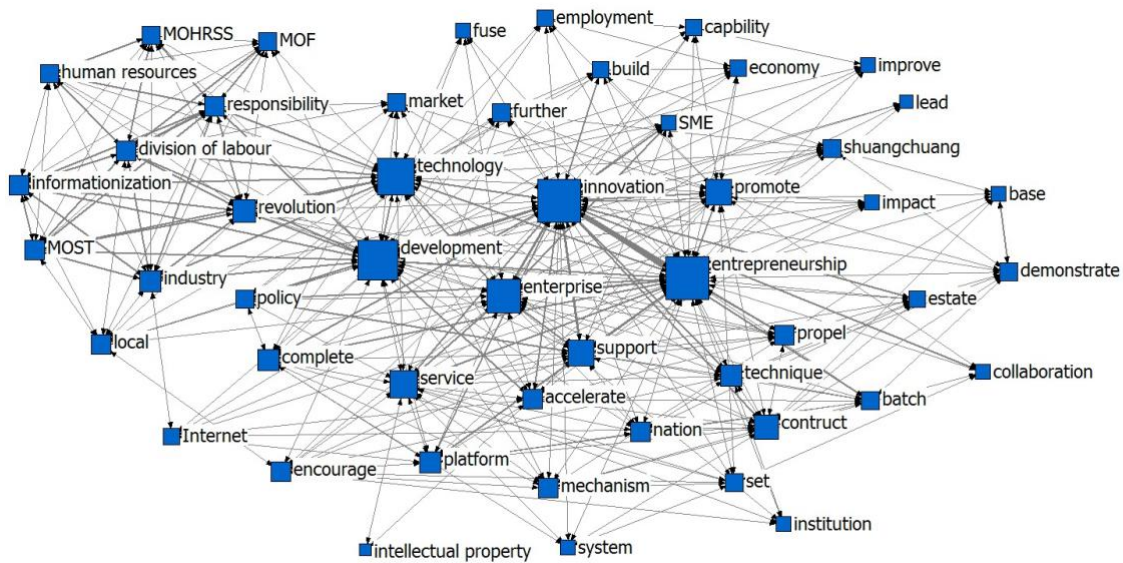


Figure 2. The semantic network of the 2018 Mass Innovation and Mass Entrepreneurship policy document

## 5. Discussion

Not surprisingly, as the policy title suggests, the most frequently used keywords were entrepreneurship and innovation. As the 'world factory,' manufacturing industries served as a vital transformer to help China develop from an agricultural-led economy to an industrial economy. The changing global environment, however, forces China to revolutionize its low-cost, labour-intensive manufacturing toward a more sustainable and 'advanced' one. In doing so, the central government has aggressively learned from the west, importing 'new' and 'advanced' ideas to apply to China's society. One of the examples is the adoption of the concept of cultural and creative industries. The adoption and appropriation of maker culture and makerspace is another attempt to transform the nation while helping to solve developmental challenges. As the 2015 policy document states:

Makerspaces, providing modern facilities in a low-cost environment with the onus on efficiency to encourage public entrepreneurship, play a significant role in fuelling the economy and creating jobs. (Keqiang Li at a State Council executive meeting on Jan 28, 2015, China State Council, 2015).

The state government intended to utilise maker culture to transform the nation's economy into a more creative and innovative one. Maker, maker culture, and makerspace represent a creative and innovative way of doing things that links manufacturing with innovation. As the policy document states:



We have seen makers coming thick and fast, and the cultural and creative industries have been developing with great vitality, Government Work Report on March 5, 2015 (China State Council, 2015).

It is believed that the maker culture could contribute to the creative vitality for the CCIs and enable China to be more creative and innovative. The link between maker culture and CCIs discourse made the state government show that the maker movement in China follows the public policy-oriented paradigm in which the focus is the pursuit of entrepreneurial innovation. By looking at the two policy frames, there are some findings as follows.

### **5.1 Entrepreneurial solutionism**

Both policy document frames show that entrepreneurship is key to this initiative which relates to the government's larger digital China blueprint. As Keane and Chen argued, the mass innovation and mass entrepreneurship initiative, along with Internet Plus, can be better understood as an 'entrepreneurial solutionism.'

The term 'entrepreneurial solutionism' (Keane & Chen, 2019) describes a bias to see entrepreneurship and digital technology as a panacea to solve China's development challenges, a way to realize the ambitious 'Innovative Nation.' No longer satisfied with 'world manufacturing,' China's government has sought to transform China into an innovative one and promote the so-called 'indigenous innovation' (Losacker & Liefner, 2020). This goal is mainly pursued under the paradigm of state policy-led entrepreneurial innovation. The MM initiative, in this sense, should be better understood as a national entrepreneurial innovation movement. The government hopes that makerspaces can empower Chinese grassroots to foster entrepreneurial and commercial innovation and lead China to an innovative path. The government hopes to use this new kind of entrepreneurial innovation to solve all of these developmental challenges such as declining manufacturing, intensified labour market, rural-urban inequality, etc.

The MM 2015 is an excellent example for us to see this entrepreneurial solutionism proclivity. The frequency table shows that the most frequently occurred issues are 'entrepreneurship,' 'innovation,' 'development,' 'enterprise,' 'platform,' and 'Internet.' These issues are all about how to promote the continual development of China's economy by entrepreneurship and innovation, and more importantly, with the power of digital technologies, such as the Internet. In the same year, the state government issued another critical initiative, 'Internet Plus,' which refers to applying the Internet and other information technologies in traditional industries. In other words, the government wants to see grassroots people

revolutionize traditional industries and conventional ways of development with digital technologies. Therefore, mass innovation and mass entrepreneurship can be interpreted as a mass entrepreneurial movement that is empowered by digital technologies. This also in alignment with the co-occurrence matrix results, in which the most frequent ‘issue-action’ pairs are all about ‘support entrepreneurship,’ ‘improve entrepreneurship,’ ‘encourage entrepreneurship.’ Entrepreneurship has become a panacea to solve China’s developmental challenges not only just economically but also politically and socially.

## **5.2 Reconfiguring and recalibrating innovation**

The MM initiative seems at the core is a mass entrepreneurship movement and focuses on entrepreneurial and profitable innovation on the one hand. On the other, this initiative is also designed for social innovation differently. Unlike western individualism-centric maker culture, maker culture in China is more a collective one. The MM initiative is not just designed to solve economic challenges but also social and political. One example is how the 2018 document frames makers. The state listed a group of people that should be encouraged to become makers as below: College students, Peasant and migrant workers, Veterans, Overseas Returnees, Women, Residence from Hong Kong, Macao, and Taiwan, Ethnic Minorities, i.e., Tibetan

This maker's framework might look so different than we think makers are in the west. It also doesn't fit the British Council survey’s result. According to the British Council (2016) demographic depicted, the typical maker in China is young, male and educated. Why are these groups of people selected by the state? First, China has an increasingly large number of college students, which also means an increasing number of graduates. As the job vacancies are very limited, the best way seems to be entrepreneurship. Second, the Nong Min Gong migrant workers have played an essential role in China's economic growth since the open-up policy in the 1980s. However, with the international companies moving their factories out of China, the unemployment of Nong Ming Gong has become a critical issue to social stability. Third, it is hard for the government to take care of these veterans and get them a job as most of them are less educated. Besides, there has been a growing number of overseas students and professionals choosing to return home in recent years. The state must take advantage of these well-educated talents. Women, minorities, and residents from Hong Kong, Macao, and Taiwan are also challenged by the state government. Maker culture seems a great tool is working as a social mediator for the government to tackle these issues. As the report says:

Through mass entrepreneurship and innovation, people would have better way-out, the unemployed would get income, those having low income would become the mid-income holders, and the income mix would be improved. Once mass entrepreneurship and innovation become a trend, the social atmosphere will become better, people would no longer worship power and influence but aspire to set up and grow their businesses through their talents, and there will be a more fair and equitable society." - Mass Innovation, Mass Entrepreneurship 2018 (China State Council, 2018).

It is interesting to see how the state policy depicts a utopian future of adopting maker culture. The makerspace is described as a magic site to let college students find jobs, to let graduates have capabilities to have start-ups, to make the social atmosphere better, and to have a more fair and equitable society. The question is how successful the 'everyone can be a maker' narrative has been? Is makerspace open and power to these prioritized groups of people selected by the state? According to British Council's survey (2016), typical maker's demographics are: 'young, male, highly-educated and technically literate.' This survey data echoes my fieldwork data to a large extent. During my fieldwork, I've visited many makerspaces and interviewed makers with different backgrounds, ranging from college students, engineers, artists, entrepreneurs, children, and very few samples of them are peasant and migrant workers, ethnic minorities, veteran, and residents from Hong Kong, Macao, and Taiwan. The actual participation of makerspace and maker movement is far away from the state's design and imagination. Undeniable, the attempts to use the maker culture to solve social problems are still illuminating.

### **5.3 A top-down and institutionalised approach**

The two MM policy frames also show that the maker movement in China is a top-down one. While the public policy paradigm of the maker movement does exist in the western context, the role of government is more about support and propaganda. In China, however, it can be more intrusive.

Although the original narratives of maker culture and maker movement emphasize the community management and non-hierarchical organizational structure, the global landscape of maker scenes has significantly been shaped by corporate and political influences. Kohtala (2018) uses the framework of 'sociomateriality' to study FabLabs' relationships with incumbent institutions and how they impact the formation of norms and routines internally in Europe. In France, makerspaces have been institutionalized and popularized by the generalization of the label "Fab lab" (Lhoste & Barbier, 2018). In the UK, politicians have viewed maker communities as transformers of the creative economy - developing innovative products and forming new models of social, civic, and educational practices. For example, the Hello Shenzhen bilateral exchange program serves as a bridge between the UK and China makers, in which a select few

makers from two sides can visit and reside in each other's makerspaces and local maker scenes. In South Africa, the government-funded makerspace serves as mediating entities between formal and informal elements of the country's innovation ecosystem (Armstrong et al., 2018). In China, some scholars argued that the state government uses the maker movement to promote the creative industries and their soft power (Wen, 2017). More specifically, Shea and Gu (2018) studied the institutional arrangements of makerspaces in North Ireland and China, arguing that institutionalization processes within these makerspaces are shaped by the specific urban ideologies, linking them to specific local economic development agendas. Based on their studies, this chapter hopes to explore how these hybrid arrangements are negotiated and implemented through the governance models of makerspaces. It is clear to see from the two policy documents that the maker movement in China is very much a top-down and highly institutionalised one.

## **5. Conclusion**

This study sheds light on the nascent maker movement in China and examines the policy frames of the Mass Innovation and Mass Entrepreneurship initiative. Used a semantic network analysis method, this research identified and compared the two key policy documents. The semantic network analysis results show that both are centre on the innovation and entrepreneurship issue. However, MM2015 focused more on promoting entrepreneurship while MM 2018 emphasized more on supporting innovation. Compared with MM2015, MM 2018 stressed the importance of technology. By examining the two policy frames, some conclusions can be drawn as follows:

First, the MM initiative shows the proclivity of the Chinese government to see entrepreneurship and digital technology as a panacea to solve China's development challenges, a way to realize the ambitious 'Innovative Nation.' Second, the MM initiative has become an instrument to drive China's transition from an industrial-based economy to a service economy and highlighted some of the attempts to address structural and developmental issues. The enthusiasm towards makers industry and makerspaces, I argue, marks the concrete step towards the Chinese government grand narrative: innovative nation. The developmental problems are not limited to economic but also political and social. More importantly, the MM initiative aims to promote a top-down approach maker movement to pursue a national government economic development agenda, emphasizing entrepreneurship and innovation. Therefore, this initiative mainly produces the entrepreneurial-focused makerspace other than commons-based peer production maker communities. This is not to suggest that the governance model is exclusive and heavy-handed in terms of space and program management. In fact, a complex process involving various actors, many non-

governmental actors, is taking place. Nevertheless, it suffices to say that the government not only plays the role of promoter and supporter of makerspaces but partner and manager, which makes their influence much more intrusive and ubiquitous.

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