

Fostering creative citizens in China through co-design and public makerspaces

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This paper presents preliminary findings of a research project aims to propose a novel combination of 1) design interventions, 2) public makerspaces and 3) online design resources as a means of fostering creative citizens in China in an inclusive and bottom-up manner. The preliminary findings comprise research results from the literature review and case studies investigating current practices of makerspaces and similar creative spaces including hackerspaces and fab labs. It was observed that existing studies appeared to focus on facilities and benefits that makerspaces offer to users and/or communities. While there was a certain amount of research that investigated relationships between makerspaces and makers, the notion of empowerment was rarely explored. To complement previous studies, this research will focus on how makerspaces could 1) empower people to make and 2) empower people through making. The case studies – one in the UK and one from China – reveal that having a clear target audience and suitable measures to support them is the key. The social aspects (e.g. providing a dedicated social space for people to socialise, share ideas and learn from each other) are as important if not more so than practical matters, e.g. offering mentoring programmes. Informal settings appear to work well with people with less making experience, as it encourages socialisation, idea exchange and casual conversations. Rather than seeing makerspaces as a place to make artefacts, both cases perceived themselves as a *'platform'* for *'making people'*, e.g. equipping them with skills which will help them pursue their goals.

Keywords: *Maker, Makerspace, Co-design, Creativity, Community*

1 Introduction

This paper aims to discuss the preliminary results of the research project titled *"Fostering Creative Citizens through Co-Design and Public Makerspaces"* funded by the Arts and Humanities Research Council, UK. The study seeks to develop a novel and inclusive means of fostering creative citizens in China in a bottom-up manner through the strategic use of co-design and public makerspaces. The project is a collaboration of academics from Brunel University London, UK and Tongji University, China, and practitioners in the creative sector, namely The Glass-House Community-led Design, Engine Service Design and Tangerine.

The rationale is that human capital has increasingly become the most important asset of a country, and the key to the sustainable economic growth of a city/country is an ability to attract, nurture and retain creative workforce (Florida, 2002). This argument matches the

prediction of the World Economic Forum (2016), which suggests that in 2020, the top skills that employers will be looking for are complex problem-solving, critical thinking and creativity respectively. Previous studies showed that people outside creative disciplines also make design decisions (e.g. brand identity and product ideas) without realising it (Kotler and Rath, 1984). By introducing creative thinking to the Chinese workforce, they will be better equipped to make design decisions, which could lead to better business performance. This project will go beyond supporting people in paid employment and include as many people as possible regardless of their demographic groups, since people outside paid employment could also contribute positively to sustainable economic developments, e.g. carrying out voluntary work.

One effective way of promoting and fostering creativity is to actively engage people in creative activities, such as co-design (Sanders and Stappers, 2008). Previous studies showed that engaging people in the co-design process not only helps fostering participants' creativity, but could also lead to many social benefits, such as encourage self-help attitudes (Boyle and Harris, 2009). As a result, this project intends to foster creative citizens through a novel combination of 1) design interventions, 2) public makerspaces and 3) online design resources. The design interventions will be delivered through co-design projects between designers and community members. The public makerspaces, in this case, refer to physical locations where people gather to co-create, share resources and knowledge, work on projects, network, and build (Department for Digital, Culture, Media and Sport, 2017). The emphasis is on offering multipurpose spaces where creative activities can take place, rather than provide high-tech fabrication tools. In this case, online design resources will be provided in a form of the design case study bank, which will act as a digital repository of community-generated solutions which could be used as building blocks for future developments. This paper will discuss the key findings from two research activities in the first year: literature review and case studies, which seek insights from the best practices of creative communities and makerspaces in the UK and other countries.

2 Literature Review

The overall structure of the literature review aims to cover three key areas (namely makerspaces and similar establishments, co-design and creative citizens) and their interrelationships. However, the literature review in this paper will focus on developing an in-depth understanding of the current situations of existing makerspaces. This knowledge will provide a useful foundation for future investigations, which intend to identify potential roles of makerspaces in fostering creative citizens.

2.1 What is a makerspace?

The '*makerspace*' phenomenon has been widely studied by various disciplines from many different countries, such as the US, the UK, Australia, Scandinavians and China. Sleigh, Stewart and Stokes (2015) described a makerspace as "*an open workshop with different tools and equipment, where people can go independently to make something*". Halverson and Sheridan (2014; cited in Litts, 2015) gave a broader definition of makerspaces as "*communities of practice constructed in a physical place set aside for a group of people to use as a core part of their practice*". While makerspaces are similar to hackerspaces and fab labs in a sense that they are community workshops where members share tools, ideas and knowledge for professional gain or hobbyist pursuits, they are governed by different beliefs (van Holm 2014). For example, hackerspaces reflect the hacking ethos, which believes that "*essential lessons can be learned about the system from taking things apart, seeing how*

they work, and using this knowledge to create new and more interesting things” (Levy, 2010; cited in van Holm 2014). Due to its origin, hackerspaces are more focused on computers and electronics. Fab labs have well-defined characteristics, since the Massachusetts Institutes of Technology or MIT that originated the concept provide clear guidelines for setting up a fab lab. Any organisation that wants to use the term fab lab must adhere to its main qualities, such as public access, support and subscribe to the fab lab charter and participation in the network of fab labs.

Wang, Dunn and Coulton (2015) placed emphasis on community and experience of makerspaces, and, hence, defined the term as “an experience-led community space where people gather to make things together with the assistance of both digital and traditional making tools”. The authors argued that makerspaces are designed to stimulate both social and technological innovation. They also explored the differences between two possible models of makerspaces – 1) the community space; and 2) a space for communities. They described the former as “a space that serves a specific community group”. In this case, the specific community refer to the members of makerspaces, which make this space rather exclusive – especially, some memberships require a formal registration/subscription with a payment. The latter was defined as a place to open to multiple communities that can be seen as a temporary community of makers. The latter model emphasised on inclusivity (see Table 1).

Table 1 Difference between Two Community Space Models

	Community Space	Space for Communities
Community group	One specific community	Multiple communities
Easy to access	Not necessary	A Must
Funding resources	Mostly membership	Other resources

Source: Wang, Dunn and Coulton (2015)

2.2 Why is it important?

Smith (2015) noted that makerspaces, fab labs, and hackerspaces are “part of global movement of community-based digital fabrication workshops”. Sleight, Stewart and Stokes (2015) described makerspaces as “potential game changers for design, entrepreneurship, fabrication, manufacturing and technological innovation”. This might be because the act of making has strong connections with technological innovation, especially the democratization of innovation (Toombs, Bardzell and Bardzell, 2014). As a result, a large amount of investments have been made to support the development of makerspaces – for example, Northern Ireland’s Department for Culture, Arts and Leisure invested £350,000 into existing makerspaces in 2014 and the UK’ Department of Business, Innovation and Skills (BIS) has announced plans to create a makerspace in disused military workshops (Sleight, Stewart and Stokes, 2015). Currently, there are approximately 440 fab labs in 33 countries (Smith, 2015).

Many recent studies also explored the potential role of makerspaces in supporting education, especially STEM (Science, Technology, Engineering and Mathematics) subjects. Several researchers perceive ‘making’ as effective means to educate students about complex problem solving and build future engineering capacity (see Lande and Jordan, 2014; and Kjällander et al, 2017 for examples). In his ‘Educate to Innovate’ campaign, the former US president Barack Obama (2009) committed over \$260 million to provide a hands-on approach to STEM subjects. The value making experience was clearly highlighted in this plan.

2.3 Who uses makerspaces?

Users of makerspaces are generally referred to as 'makers'. Lande and Jordan (2014) defined makers as *"a group of do-it-yourself minded individuals participating in formal and informal communities (doing-it-together and doing-it-with-others) that support and celebrate building and prototyping technical proof-of-concept exploration and ad hoc product development."* Van Holm (2014) gave a broader definition, which described a maker as *"individuals or groups producing objects as part of a do-it-yourself culture."* The author elaborated that a maker can be *"an individual building a 3D printer from an online guide, but can also be someone cooking a family meal or a computer scientist creating a new web service"*. Generally, makers are broadly defined than hackers. Toombs, Bardzell and Bardzell (2014) suggested that maker identity is informed by three primary factors, namely: 1) the development of a tool and material sensitivity; 2) the cultivation of an adhocist attitude as an approach to making in general; and 3) engagement with the maker community. The first factor refers to an understanding of how to use and select appropriate tools as well as materials/medium for a making job. The second factor suggests that makers are generally motivated by practicality and have a high level of optimism and confidence. The last factor refers to their interests in engaging/being part of a community of makers.

According to the study conducted by Sleight, Stewart and Stokes (2015), 80% of makerspace users in the UK are men. This finding is similar to the global statistical data gathered by Moilanen (2012). His study in 2010 showed that the typical member of hackspaces was a 26-29 years old male (94%) with college level or higher education (ibid). Similarly, the results of his study in 2011 suggested that the typical member of hackspaces was a 27-31 years old male (90%) with college level or higher education. The small survey conducted by Lande and Jordan (2014) with 37 participants at Mesa maker event in Arizona revealed that 57% of makers described themselves as artist, followed by designer (49%), crafter (49%), hobbyist (38%) and builder (38%). These findings are similar to the results from Belbin and Newcombe (2013 cited in Slatter and Howard 2013), which reported that the average makerspace users described themselves as *"inventors, artists, entrepreneurs, crafters and youth groups"*. As a result, several experts expressed concerns that a large proportion of makers are affluent males with technical or creative backgrounds.

Toombs, Bardzell, and Bardzell (2015) pointed out that the ethos that *'anyone can be a maker'* could obstruct the fact that *'not everyone can be a maker'*. The authors observed that people from certain demographic groups (e.g. a single mum with part-time jobs without a car) might find it harder to engage with a community of maker and makerspaces. To make disengaged groups, such as young women, interested in making, many makerspaces organised specific events, e.g. MakerGirl which targeted girls aged 9 – 15 and MakeHer which welcome adult women only (Kjällander et al, 2017). The overall goal was to create a learning space and a setting where women feel more comfortable, as well as creating role models for girls. Several researchers pointed out that makerspaces should also be designed to accommodate people with special requirements as well. For instance, Hurst and Kane (2013) argued that technologies available in makerspaces could enable people with disabilities to create, modify or build their own assistive devices, which could make assistive technology more accessible to a wider audience. According to Sleight, Stewart and Stokes (2015), 82% of UK makerspaces have wheelchair access. Although there are makerspaces in every region in the UK, Taylor, Hurley and Connolly (2016) observed that the makerspace facilities are unevenly spread – London, the North West, the South East and Scotland have

more than ten makerspaces each, while the East Midlands, Northern Ireland and the North East each have less than five (Sleigh, Stewart and Stokes, 2015).

2.4 What motivates makers to make?

A larger survey conducted with 2,600 participants, who were members of DIY communities, revealed that their main motivations for contributing to DIY projects were to “*express myself/be creative*” (Kuznetsov and Paulos, 2010). According to van Holm (2014), the majority of items produced in makerspaces will not go to market, and even fewer will be considered commercially successful. Hence, it can be observed that makers are not motivated by commercial gains. According to Moilanen (2012), although the main purpose of visiting makerspaces was still ‘*building objects*’, ‘*social aspects*’ was selected as the second most important reason. The results of his worldwide survey in 2011 revealed that 69% participated for fun; 34% wanted to help people without getting something in return, and 34% participated due to their commitment to the community (ibid). In addition, Sleigh, Stewart and Stokes (2015) stated that the top three reasons people use makerspace were socialising (41%), learning (35%) and making (33%). Kuznetsov and Paulos, (2010) found out that the majority of DIY projects cost less than \$50. The relatively low financial threshold allows a variety of user group to work with a range of materials across different project domains.

2.5 What role does Makerspace play in a community context?

The research titled ‘*In the Making Project*’ funded by AHRC identified the wider roles that makerspaces play in public life in four broad themes: 1) acting as social spaces; 2) supporting wellbeing; 3) serving the needs of the communities they are located in; and 4) reaching out to excluded groups (Taylor, Hurley and Connolly, 2016). The researchers argued that makerspaces could be seen as the third place, which they defined as “*public resources dedicated to creativity, learning and openness*”. According to their study, makerspaces could act as social spaces by providing a hub where people could work together, learn from each other and socialise. It could serve the needs of the communities by carrying out small making jobs for local residents, schools or local governments without undermining local businesses. Makerspaces could support wellbeing by providing creative endeavours which have positive effects on physical and mental health. Lastly, it could reach out to disengaged groups through various events and workshops.

Other studies also highlighted the importance of social aspects. For example, Moilanen (2012) reported that hackers perceived hackerspaces as their ‘*home*’. Moreover, the study of Slatter and Howard (2013), which investigated makerspaces in Australian public libraries, strongly emphasised on the need for engaging with the community. The interviewees in their study emphasised the importance of partnership, awareness and advocacy from the local community in order to create a successful makerspace. They also stressed the importance of an existing DIY and/or hacker culture in the community – see one of their quotes for an example: “*If you had a community who can’t swim and don’t want to learn how to swim, and then you suddenly build a huge aquatic centre in the middle, it’s not going to be successful.*”

Paonessa and Orozco (n.d.) argued that makerspaces could be used to promote community development. Firstly, makerspaces offer physical spaces which enable people to share tools and other resources, network with each other and exchange ideas. The authors observed that this kind of openness could lead to open innovation with social impact. They used Mess Hall, a makerspace in Washington DC, as an example of social innovation. This makerspace promotes local food production which has helped address the issue of food security in the

local area. Mess Hall contains 35 food businesses which not only share physical space, but also ingredients, experience and knowledge. Secondly, they suggested that by providing tools to materialise ideas, makerspaces could help address the phenomenon called '*idea gap*' where people give up on their ideas because they have no means to realise them. Besides, makerspaces could support local startups by offering physical spaces and appropriate tools. A similar idea was explored by Smith (2015), who argued that makerspaces could support grassroots activism. He gave an example of the city of Barcelona where a fab lab was perceived as means to equip maker-citizens with useful tools and open source designs that enable them to play a more active role in city development.

It can be seen that makerspaces have attracted interests of a wide range of audiences and have been strategically utilised to support several positive actions and grassroots movements, e.g. STEM education, social innovation and community developments. However, studies exploring how makerspaces could be used to foster creative citizen are still rare. These initial findings have provided a direction for primary studies, which will focus on **relationships** between makerspaces and makers, especially how they **empower** users.

3 Case Studies

The case study approach was chosen for the preliminary stage of the project since it enables the researchers to develop an in-depth understanding of the chosen subjects within a short period of time (Bell, 1999). PACT Analysis (which is short for People; Activities, Context and Technologies) was chosen to provide a structure for the case studies. This is because this tool excels in uncovering requirements and is often employed to help designers create design briefs. In this case, it could help the researchers critically review the current situation of makerspaces, especially their relationships with users/makers. In this paper, results from two case studies – one from the UK and one from China – will be discussed to identify key similarities, differences and challenges of their current approaches and practices.

The case studies in this research include observations and semi-structured interviews with staff and users of makerspaces. The entire case studies aim to cover three different types of makerspaces: 1) well-established makerspaces, 2) community-based makerspaces and 3) makerspaces that are part of other organisations, e.g. museums, libraries and co-working spaces. Each category will include good examples from the UK and other countries. The interview questions were designed based on the four categories of PACT Analysis (see table 2). In this paper, the former two types were investigated: Remakery as the community-based one and Xinchajian as the well-established one.

The interview questions were designed based on the literature review findings. It was observed that existing studies tended to focus on facilities and benefits, e.g. types of machinery and values makerspaces offer to users/communities. While there were a number of studies that investigated relationships between makerspaces and makers, they rarely explored the '*empowerment*' occurred in this type of space. To complement previous research, this study will focus on: 1) *how makerspaces could empower people to make*; and 2) *how makerspaces could empower people through making*. The former focus on how the design of the space could attract people and encourage them to engage with making activities, while the latter concentrates on how the outcomes of making (e.g. artefacts) could benefit people beyond those who are directly engaged with the makerspaces. In this

research, the interviewees include both the staff and users of the makerspace responding to the questions (see Table 2).

Table 2 Questions for owners, staff and users of makerspaces

Subjects	Sub-categories	Interview Questions
People	Maker identity	<ul style="list-style-type: none"> • Please describe key characteristics of current users.
	Access/entry barriers	<ul style="list-style-type: none"> • What might prevent potential users from engaging with this makerspace and how could these barriers be reduced?
	Relationship	<ul style="list-style-type: none"> • How would you describe the relationships between makerspace and users?
	Perception of social impacts	<ul style="list-style-type: none"> • What social impacts do you see/expect from engaging with makerspace?
Activities	Desirable value propositions	<ul style="list-style-type: none"> • What are the core values that may attract people to engage with this makerspace?
	Service design	<ul style="list-style-type: none"> • Please describe main services provided by this makerspace.
	Functionality & Aesthetic value	<ul style="list-style-type: none"> • To what extend does the design of this makerspace enable and/or hinder the delivery of these services?
	Emotional value	<ul style="list-style-type: none"> • To what extend does the design of this makerspace enable people to socialise, share ideas or express themselves?
	Encouragement/ Communication	<ul style="list-style-type: none"> • Please describe how to encourage/communicate with people to get involved in the activities provided by makerspace
Context	Identity	<ul style="list-style-type: none"> • Please describe how you feel in the makerspace.
	Empower to make	<ul style="list-style-type: none"> • Please describe activities designed to help people gain creative confidence to make things.
	Empower through making (impacts)	<ul style="list-style-type: none"> • Please describe how this makerspace was designed to reflect the characteristics of the surrounding community. • What role might this makerspace play in fostering creativity of people in local community?
	Partnership / collaboration	<ul style="list-style-type: none"> • Are there any opportunities for this makerspace to collaborate and/or work in partnership with other organisations? (e.g. pop-up events or co-working)
	Social enterprise	<ul style="list-style-type: none"> • Please describe the main purpose of engaging with makerspace and your potential contribution to community.
Technologies	Physical & digital	<ul style="list-style-type: none"> • Do you have a digital platform? If so, how does it compliment the services you provide physically?
	Facilities	<ul style="list-style-type: none"> • Please suggest desirable technologies that makerspace should consider to provide.

3.1 Case Study 1: The Remakery, London

3.1.1 The Organisation

Locating on Lilford Road, London, The Remakery occupies an entire basement of a residential building (see Figure 1). The organisation was originated based on the ethos of reusing waste and reclaimed materials. Its main service is providing space and a means to make things, which enable people to create positive changes to their community and the environment.



Figure 1. The main entrance of The Remakery. Source: The authors

One of its key roles in the local community is facilitating conversations about environmentally conscious lifestyles. The Remakery was founded as part of a positive movement initiated by the Lambeth Council in response to anti-social problems in the local areas, e.g. squatting. The organisation was originally funded by the Lambeth Council and greatly benefitted from the rise of social enterprise in London and surrounding areas.

The main challenge of most makerspaces including The Remakery is the sustainability of their business models. The organisation has tried several business models. Originally, all members were its stakeholders. Since then, the business model has continuously evolved to respond to the needs of the people. According to the interview, at one point, users could *'come and go as they please'*. Subsequently, the engagement was reduced to the point that the organisation hardly had any users. As a result, several countermeasures had been taken. For example, in 2015-16, it had introduced the membership system to attract wider audiences and enhanced the commitment. At present, The Remakery is a non-profit, multi-purpose and inclusive makerspace where key decisions are made by the committee including its resident makers. The organisation itself has also constantly evolved. A project called *Remaking, The Remakery* started in 2018 is underway. The aim is to regenerate both the interior and exterior space into an appealing and multi-functional makerspace.

3.1.2 The People

According to the interviews and observations, The Remakery attracts both male and female users from the immediate community with making skills varied from mid-range to high. Most of them are around 20 to 40 years old. The place has a clear target audience. It serves a niche group, namely people who are interested in remaking/reusing waste and reclaimed materials, as well as those who are environmentally conscious. The organisation gathers and provides recycled/reclaimed materials that are free for its members to use (see Figure 2).



Figure 2. The reclaimed materials were stored at the back of makerspace. Source: The authors

The Remakery goes beyond serving individual makers and supports local social enterprise by letting out some of its space – for example, Incredible Edible, which focuses on urban farming. Moreover, some of the resident makers run their own social enterprise. The organisation also welcomes both makers and non-makers to its events which aim to facilitate conversations about environmentally conscious lifestyles to the public (see Figure 3).

The volunteers have made significant contributions to the sustainability of the organisation. According to the interview, 90% of operation and management were done by volunteers, including many resident makers. It was observed that many people started engaging with this place as members to get access to the facilities and materials to work on individual projects. The organisation is keen to develop long-term relationships with people. Hence, it tries to get members involved in other activities other than their work so that they would not lose interests and leave after their projects have concluded. By engaging them in on-going projects/activities, the organisation is able to build a long-term relationship with members. For instance, many of resident makers have taken on other roles in the organisation – for example, the interviewee used to be a resident woodworker. Now he is the Director of Communications, Marketing & PR. The key is to create *'reasons to engage'*.



Figure 3. The event held by Incredible Edible at The Remakery. Source: Edible Lambeth

The organisation acknowledges that *“not everyone wants to get their hands dirty”*. However, people can still be part of the positive changes without involving in hands-on making activities. Thus, public engagement goes beyond *‘physical’* elements to include *‘cognitive’* elements through conversations – it is about being part of the community. The interviewee commented that The Remakery is expanding its territory from *‘making’* to *‘thinking’*.

3.1.3 The Activities

The Remakery is perceived as a place for not only making, but also socialising. Most physical activities include, but not limited to, timber crafting and homeware making (Figure 4). The organisation considers itself as part of a community. According to the interview, people came here for the skill sharing and peer-to-peer learning, which is a key reason for some members to join in. It was observed that the resident makers play a key role of giving advice to members with less making experience to help them build up skills and creative confidence (Figure 5). Members could also get peer support. Besides, some training courses offered by the resident makers are in a relatively low price, which appeals to some members.



Figure 4. A new member is crafting her bench. Source: The authors



Figure 5. The experience resident maker (left) mentors a new resident maker. Source: The authors

Activities in The Remakery are rather informal and such social culture, to some extent, benefits from the flexibility of the physical space. The layout and interior are constantly evolved to respond to the requirements of the community/users – for example, the interviewee described the character of the space as *'fluid'*. The space is shaped by what people want to make, and the informal atmosphere encourages people to exchange ideas. It was observed that space gives a *'multipurpose'* vibe (see Figure 6). Furniture is informally arranged and can be moved around easily. The space is not *'fixed'* to a specific purpose or layout. A designated social space is provided for people to socialise. According to the interviews and observations, conversations and socialised activities also take place the making areas.



Figure 6. The social space is designed to promote casual conversations and socialisation. Source: The authors

3.1.4 The Context

From the organisation's perspective, it offers actionable options for local people to take positive actions in regard to their neighbourhood and the environment. At The Remakery, making is considered as a means to 1) get people thinking creatively, 2) engage them in conversations about reclaiming/reusing waste, and 3) offer them opportunities to play a more active role in transforming their community and/or tackling environmental issues. As a result, The Remakery works in collaboration with several social enterprises (e.g. community garden) in their area and organise various events/activities to engage local residents, e.g. holding a discussion panel to find out the requirements of the community and how to address them through making. Currently, the organisation is in the process of building more co-working space for social enterprises that share common interests in an environmentally conscious lifestyle. Additionally, many resident makers also use this space as a catalyst and platform to build up further networks. For example, one of the resident makers has set up a social enterprise to help people with anxiety and other mental health problems through woodworking activities. (See: City Woodwork: <http://citywoodwork.co.uk>)

3.1.5 The Technologies

The organisation has started to focus on its digital platform, which is not only for outreaching, but also creating narrative for wider attention. The website has recently been updated.

3.1.6 Key Lessons Learned

Although The Remakery focuses on a niche group, it managed to attract a wide range of audience (both individuals and social enterprise) who share common interests in reusing waste and reclaimed materials and an environmentally conscious lifestyle). Having a **clear ethos** and personable ways of **keeping people engaged** with the organisation are crucial to the success of relationship building. It successfully *'empowers people to make'* through a number of activities, e.g. mentoring, training, informal peer-to-peer learning and idea sharing. The well-designed service (e.g. providing free reclaimed materials) and the multipurpose space play an important role in supporting these activities. The Remakery also successfully in *'empower people through making'*, as the organisation sees its services as **'actionable options'** for people to make positive changes to their local community and the environment. The interview with the Director of Communications, Marketing & PR noted that although The

Remakery started as a place to make objects, the organisation is now interested in **making 'people'** by giving them skills and providing them job opportunities. For instance, many members and resident makers use this place as a **platform** to start their own social enterprise. Its core value can be summarised as “*to spark the environmentally conscious lifestyle through making*” and to generate the conversation of (re)making. By seeing ‘making’ as the skill and way of thinking to tackle issues, this can be seen as fostering creativity.

3.2 Case Study 2: Xincejian, Shanghai

3.2.1 The Organisation

Xincejian is currently located at 28 East Yuyuan Road, Shanghai. The organisation claims to be the first hackerspace in China (see: <https://xincejian.com/about-2/>). It provides space for different types of making and supports a variety of projects – ranging from physical computers to digital applications. Moreover, it organised various workshops, which enable people to meet, share ideas together, and learn making skills from each other.

The development of this makerspace went through three phases (namely Xincejian 1.0, 2.0 and 3.0) in three separate locations. Originally, Xincejian started off as a not-for-profit organisation. It was initiated by David Li as Xindanwei in 2010. Later on, co-founders Ricky Ng-Adam and Min Lin Hsieh joined to create Xincejian 1.0 (located in 76 Anhua Road, Shanghai) with an out-of-pocket investment. It opened to the public in 2011 before moving in 2012. After the first phase, the organisation received an additional financial boost from 12 stakeholders (mainly very active members) which enabled the space to continue. Most of the projects could be classified as prototyping high-tech, e.g. a telepresence robot. During the second phase, Xincejian’s witnessed significant growth in the number of users. Subsequently, the paid membership system was introduced. Full-time staffs were hired to manage the space. Xincejian 3.0 was launched in 2014 after the relocation to 28 East Yuyuan Road (see Figure 7). Since then, at any one time, 100 members (renewals and new) are members of the makerspace. The organisation also received several visits from local politicians. At present, the organisation is registered as a private company and has received both corporate and local government sponsorships.

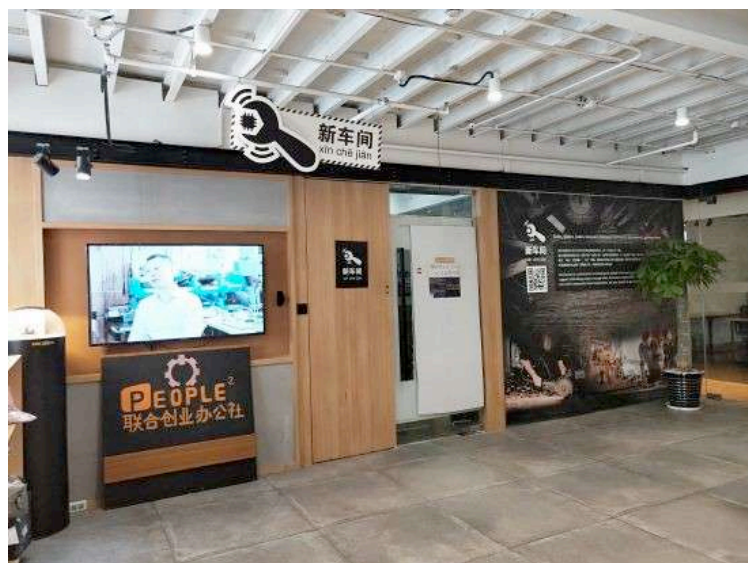


Figure 7. The main entrance of the current location of Xincejian. Source: <http://www.oiponline.cn/blog/xincejian-hackerspace-shanghai>

3.2.2 The People and Activities

According to the official website and the interview, the majority of users and staff of Xincejian are male (approximately 70%). Generally, participants are 21-35 years old, most of which are university students and working professionals. Currently, there are 345 active members in the Xincejian's WeChat group, which is a popular social media platform in China. This makerspace welcomes all types of members regardless of their making skills, knowledge and/or professional backgrounds. It is described as a supportive space for people with curiosity to explore freely without restricted mechanism. The core value is to reward people with pleasure generated through creating and (peer) learning. The makers are inspired and develop their skills further by observing and/or talking to others.

Xincejian is 24/7 accessible (except holidays) for its members. The organisation is considered as a space of freedom, exploration and diversity. Users can benefit from its tools, space and community. With ¥200 (around £20) per month, the members have access to storage space (for an extra monthly fee), basic and advanced making tools (e.g. drills, hammers and laser cutters). Moreover, this makerspace is sufficiently large to accommodate many groups and activities including the Wednesday evening weekly open house techtalks. Workshops organised by both staff and users have helped the organisation financially. For instance, one of the resident makers and the partners have successfully organised a series of workshops for their 'Precious Plastic' project, which focuses on recycling and remaking the plastic waste through an innovative way (see Figure 8), for a number of years. Additionally, Xincejian has supported some of its resident makers to build up viable businesses with their creative projects – it has helped one of the resident makers found a business called 'Vincihub Helicopter Simulator' (see Figure 9). However, the workshops attendees do not have much in common with their daytime users. Based on the interview, Xincejian mainly attracts specific individuals rather than immerses itself into the immediate local community.

Regarding the outreach strategy, Xincejian provides a session called 'Open Nights', which is held at 19.00 every Wednesday (see Figure 10). The organisation invites many entrepreneurs, hobbyists, scholars and makers to share their making experiences, ideas and achievements. The event is free of charge and open to the public. Generally, each session attracts around 30-40 participants – both Mandarin Chinese and English speakers. The aim is to bring together people, who are interested in DIY and hacking, to share ideas and introduce Xincejian to a wider audience.



Figure 8. Precious Plastic hopes to encourage the public to pay more attention to the environment issues.

Source: <http://www.oiponline.cn/blog/xincejian-hackerspace-shanghai>



Figure 9. Vincihub Helicopter Simulator project is designed to help non-experience people to learn flying Helicopter in 10 hours. Source: <http://www.oiponline.cn/blog/xinchejian-hackerspace-shanghai>



Figure 10. Open Nights session. Source: <http://www.oiponline.cn/blog/xinchejian-hackerspace-shanghai>

3.2.3 The Context and Technology

It was observed that makerspace in China has largely benefited from the lower costs of manufacturing facilities, tooling, components and materials comparing to those in the UK and the USA. This might be one of the main reasons that makerspace in China attracts many foreign makers. This situation has helped Xinchejian become widely known globally. Locally in China, its promotion benefits from its social media platforms (e.g. Weibo and Douban). However, the social presence has been inactivated since 2017 with the disappearance of permanent paid staff. Today, the organisation has put more focus on its official account on WeChat since it is more influential in China to announce weekly tech-talks and events.

The success of Xinchejian has led to significant growth of hackerspace and makerspace throughout the whole China (Dongfangzaobao, 2012). However, the biggest barrier that prevents local people to join Xinchejian is the language. In an attempt to be multicultural, all management tasks are carried out in English. As a result, the organisation requires its staff

(especially those in managerial roles) to use English fluently. According to the interview, Xincejian had previously introduced the bilingualism system and had tried to integrate itself into local community. Nonetheless, these attempts were not successful, since its business model has been targeting individuals rather than focusing on community development.

In order to expand, Xincejian expresses a need to help its members make a living through making. Nevertheless, the organisation acknowledges that it is difficult to make a living out of making alone. To address this issue, the interviewee stated that Xincejian has considered prepaid retainer contracts to help 'making a living through making' possible by reducing financial pressure of the maker community (see: coderbunker.com).

3.2.4 Key Lessons Learned

In China, Xincejian provides the first model of how the makerspace initiates, operates and sustains itself for close to a decade. Although it serves a larger group of makers than that in The Remakery, it does have a **clear focus** in terms of its target audience. It accommodates diverse groups of users including digital artists, fashion designers and makers with a non-tech background. Interestingly, people love to use digital technologies and applications in some way. While the organisation welcomes everyone who is interested in making, it excels at identifying makers who could potentially '*make a living through making*' and helping them set up their social enterprise and/or commercial businesses. In order to work with this group of users smoothly, Xincejian has put several **measures** in place, e.g. embracing multicultural users, carrying out all management tasks in English and offering prepaid retainer contracts to ease the financial pressure of its members. It successfully '*empowers people to make*' through a number of activities, e.g. the low-cost membership fee, 'Open Nights' sessions and various workshops. The organisation also makes it possible to '*empower people through making*' even though its approach is rather different from that of The Remakery. Xincejian focuses on supporting individuals through business developments rather than working with the local community. In many ways, the organisation does show interests in '**making people**' by helping them make a living through making. Many members have used this place as a **platform** to launch their careers. Some of their projects have been scaled up and commercialised, e.g. Tokylabs (<https://tokylabs.com/>). Evidently, the organisation has helped foster creativity at the individual level. It combines the digital applications and early start-up businesses which are key areas the Chinese government is keen to support nowadays (Chen, 2018). In Xincejian, the nature of support goes beyond hands-on making activities (e.g. providing tools and materials), as its services also incorporate innovative making, entrepreneurial thinking, and business development.

4 Discussion and Conclusion

The preliminary results show that makerspaces have strong potential to be used as a means to foster creative citizens. At present, makerspaces have successfully attracted a wide range of audiences, e.g. governments, educators, creative disciplines and community developers. Subsequently, makerspaces have been used to support a number of positive initiatives, e.g. STEM education, social innovation, community development projects and public engagement programmes. Previous studies revealed that the main motivation of most makers was to '*express*' themselves and '*be creative*'. Hence, makerspaces could be more widely utilised to support more diverse audiences. The case studies, which focused on relationships between makers and makerspaces – especially how makerspaces could empower people, suggested that the organisation must be clear on 1) '**who**' they intend to empower and 2) '**how**' they intend to empower them. Both cases showed that having a **clear**

target audience has helped them tailor their offers to suit their needs. While the Remakery focuses on helping people who are interested in using waste and reclaimed materials, work toward their environmental goals, Xinchajian concentrates on helping individuals who are interested in making a living through making. Despite their different philosophies, both organisations see themselves as a *'platform'*. Interestingly, their focus has been shifted from making artefacts to *'making people'* – in other words, enabling them to achieve their goals (e.g. helping them set up their businesses). In order to empower people effectively, several measures have been put in place. Whilst many of them can be classified as *'practical'* matters, e.g. providing suitable training, several of which focus on *'social'* aspects, e.g. creating a social space for users to socialise, network, share ideas and learn from each other. These initial findings have provided useful directions for the next stage of the study. In the following stage, the team will explore what role co-design could play in helping makerspaces *'make people'* or enable them to achieve their goals more effectively. Additionally, the study will investigate how to get people participated in co-design as a means to engage them with hands-on creative activities.

5 References

- Bell, J. (1999) *Doing Your Research Project*. Maidenhead: Open University Press.
- Boyle, D. & Harris, M. (2009) *The Challenge of Co-production*. London: NESTA.
- Chen, Y. (2018) Upgrade the innovative enterprise. How to facilitate it? (创新创业升级版, 如何发力). *Gov. Cn*, [Online] http://www.gov.cn/zhengce/2018-10/08/content_5328403.htm (accessed: 01/04/19)
- Department for Digital, Culture, Media and Sport (2018) *Guidance: Libraries and makerspaces*. [Online] <https://www.gov.uk/government/publications/libraries-and-makerspaces/libraries-and-makerspaces> (accessed: 25/02/18)
- DongFang Z. (2012) *There is growing Chinese People coming to Xinchajian (新车间的中国人越来越多了)*. *IFENG.com*, [Online] http://book.ifeng.com/gundong/detail_2012_12/05/19840408_0.shtml (accessed: 02/04/19)
- Florida, R. (2002) The Rise of the Creative Class: Why cities with gays and rock bands are losing out the economic development race, *The Washington Monthly*, May 2002, 15-25.
- Hurst, A. & Kane, S. (2013) Making "Making" Accessible, *Proceedings of the 12th International Conference on Interaction Design and Children (635 – 638)*. New York, NY, USA: ACM.
- Kjällander, S., Åkerfeldt, A., Mannila, L. & Parnes, P. (2017) Makerspaces Across Settings: Didactic Design for Programming in Formal and Informal Teacher Education in the Nordic Countries, *Journal of Digital Learning in teaching Education*, 34(1), 18-30. doi: 10.1080/21532974.2017.1387831
- Kotler, P. & Rath, A. (1984) Design: A Powerful but Neglected Strategic Tool. In M. Bruce and R. Cooper (Eds.), (1997) *Marketing and Design Management*. London: International Thomson Business Press.
- Kuznetsov, S. & Paulos, E. (2010) Rise of the Expert Amateur: DIY Projects, Communities, and Cultures, *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries (295 – 304)*. Reykjavik, Iceland: ACM.
- Lande, M. & Jordan, S (2014) Making It Together, Locally: A Making Community Learning Ecology in the Southwest USA, *2014 IEEE Frontiers in Education Conference (FIE) Proceedings*. Madrid, Spain: IEEE. ISBN: 978-1-4799-3922-0
- Litts, B.K. (2015) Resources, facilitation, and partnerships: Three design considerations for youth makerspaces, *Proceedings of the 14th International Conference on Interaction Design and Children (347-350)*. Medford, MA, USA: ACM.
- Moilanen, J. (2012) Emerging Hackerspaces – Peer-Production Generation. *Proceedings of 8th International Conference on Open Source Systems: OSS (94-111)*. Hammamet, Tunisia: IFIP Advances in Information and Communication Technology. doi: 10.1007/978-3-642-33442-9_7

- Paonessa, L. & Orozco, A. (n.d.) What is a makerspace, and how does it promote community development? [Online] <http://beeckcenter.georgetown.edu/makerspace-community-development/> (accessed: 15/12/18)
- Sanders, E. & Stappers, P. (2008) Co-creation and the new landscapes of design, *Co-Design* 4(1): 5-18.
- Slatter, D. & Howard, Z. (2013) A Place to Make, Hack, and Learn: Makerspaces in Australian Public Libraries, *The Australian Library Journal*, 62(4), 272-284. doi: 10.1080/00049670.2013.853335
- Sleigh, A., Stewart, H. & Stokes, K. (2015) *Open Dataset of UK Makerspaces: A User's Guide*. London: NESTA.
- Smith, A. (2015) Tooling Up: civic visions, Fablabs and grassroots activism. *The Guardian* [Online] <https://www.theguardian.com/science/political-science/2015/apr/04/tooling-up-civic-visions-fablabs-and-grassroots-activism> (accessed: 27/03/19)
- Taylor, N., Hurley, U. & Connolly, P. (2016) Making Community: The Wider Role of Makerspaces in Public Life, *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. San Jose, CA, USA: ACM. doi: 10.1145/2858036.2858073
- Toombs, A., Bardzell, S. & Bardzell, J. (2014) Becoming Makers: Hackerspace Member Habits, Values, and Identities. *Journal of Peer Production*, 5 (October 2014), ISSN: 2213-5316.
- Toombs, A., Bardzell, S. & Bardzell, J. (2015) The Proper Care and Feeding of Hackerspaces: Care Ethics and Culture of Making. *Proceedings of the 2015 CHI Conference on Human Factors in Computing Systems*. Seoul, Republic of Korea: ACM. doi: 10.1145/2702123.2702400
- Van Holm, E.J. (2015) What are Makerspaces, Hackerspaces, and Fab Labs? *SSRN Electronic Journal* (January 2015), doi: 10.2139/ssrn.2548211
- Wang, D., Dunn, N. & Coulton, P. (2015) Grassroots Maker Spaces: A Recipe for Innovation, 11th *European Academy of Design Conference*. Paris, France: Paris Descartes University Institute of Psychology.
- World Economic Forum (2016) The Future of Jobs Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution. [Online] http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf (accessed: 18/02/18)

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