

Makerspaces and urban ideology: the institutional shaping of Fab Labs in China and Northern Ireland

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Abstract

Makerspaces—specifically those with a focus on digital fabrication and physical computing—are emerging as symbols of social and economic change in many cultures. Much of the empirical evidence that provides details of this phenomenon has been gathered in neo-liberal market economies in Europe and North America. Existing findings have helped situate makerspaces as sites that emphasise ‘commons based peer production’ underscored by non-proprietary ‘gift economies’ (see Gershenfeld 2005, Anderson 2012, Troxler 2013, Kostakis et. al 2015). These narratives have been expanded by findings that reveal how participation is shaped—and often impeded—by the communities, platforms, and policies surrounding makerspaces (see Alper 2013, Toupin 2014, Moilanen et al 2015, Shea 2016). This paper contributes to the literature through an analysis of the institutional arrangements of Fab Labs in China and Northern Ireland. It argues that processes of institutionalisation within these makerspaces are shaped by the specific urban ideologies they are bound to. Fab Labs in Belfast and Derry (Northern Ireland) are deployed as facilitators and enablers of unification processes in a post-conflict society, while Fab Labs in Shenzhen (China) have been manipulated for a specific post-industrial agenda. Institutionalised makerspaces, shaped by these different realities, challenge existing narratives of maker cultures in several ways: first, the development of makerspaces cannot be divorced from top down processes of nation building, as a range of strategic public policy agencies are involved despite low public participation rates; second, makerspaces are a reflection of local values rather than of the ‘commons based peer production’ paradigm of open source culture; and third, commercial corporations are investing in makerspaces to align with public policy paradigms despite uncertain economic returns. The accounts detailed in this paper further expand dialogue towards a more critical and nuanced analysis of makerspaces and global open source cultures.

1. Introduction

‘Commons based peer production’ is a term commonly linked to scholar Yochai Benkler (2002, 2006). It describes a move away from centralised, industrial-scale production, towards production that does not rely on proprietary systems or the managerial imperatives of the firm. It is based on collaboration among networks of people who view their knowledge and labour as a form of ‘gift’. This phenomenon is also referred to as ‘open source production,’ and is a paradigm which many makerspaces operate within. Due to this phenomenon, makerspaces have been situated as new organisational forms that enable post-industrial production. Attached to this status is a perception that new forms of peer production are more efficient, agile, and egalitarian than formal, centralised modes. Our study contests these

established dynamics of open source culture by exposing the institutions that shape and limit Fab Labs in China and Northern Ireland.

We observed top down, institutionalised, organisational structures within makerspaces that result from the constraints of unique urban ideologies. These ideologies shape individual maker incentives, organisational behaviour, and corporate strategies. Our findings have revealed that makers do not necessarily oppose the commercialisation of their ideas, and that there are a range of intermediary companies facilitating entrepreneurship development for makers, linking them to global venture capital networks. We observed hierarchical organisational tendencies akin to businesses operating within complex political, social, and economic agendas. It became very clear that our case studies are shaped by institutions more than by global maker culture rhetoric: the first from the perspective of the world's largest manufacturer; and the second, from a contested nation-state grappling with a divisive civil conflict. Makerspaces in our cases become symbols of contested meanings and values in specific geo-political contexts.

Makerspaces in Belfast and Derry (Northern Ireland) and Shenzhen (China) were selected because they represent different experiences in the new era of the production of cities through culture and image: Belfast and Derry are examples of European cities whose economic future is dependent on the reinvention of a new urban image based on civic boosterism. Post-conflict Northern Ireland is in need of a new relationship with urban environments that is capable of attracting new industries and investments. Shenzhen, on the other hand, is experiencing rapid de-industrialisation in its inner-city area. It is seeking to transform its urban image from a 'dirty' mass manufacturing city to a 'clean and fun' city.

This article makes an important contribution to the body of literature that contests the exuberant rhetoric surrounding digital maker cultures. Claims of an emergent 'industrial revolution' (Gershenfeld, 2005; Anderson, 2012) linked to maker cultures have been offset by scholarly investigations linking distributed design and manufacturing flows to labour exploitation (Scholz 2013), diminished scale efficiencies, and intensified consumption (Smith et al. 2013). Equity challenges in makerspaces include the privileging of historically masculinised practices (Carstensen 2013, Shea 2016), and the difficulties of enacting the conditions for 'hacker agency' (Shea, In Press). Murray and Hand (2015) situate cultures of making in the Global South in opposition to those in the West through the Indian example of 'jugaad', a practice underscored by "economic constraints and lack of resources" (2015 p143). While the assumption that hackers and tinkerers in the US have historically acted alone in their DIY missions is debased by historical links with military funding (Driscoll 2012). The perception that peer production is non-market and non-proprietary has already been called in to question by Kreiss, Finn and Thurner (2011). The premise that the current making moment is a *movement* is also contested, as the societal impact of emergent digital making techniques has been argued to be a fringe phenomenon (Maxigas & Troxler 2014).

Literatures relating to maker cultures in China are emerging. The works of Lindtner (see 2015), grounded in Human Computer Interaction (HCI), were among the very first attempts to understand maker cultures situated outside of neo-liberal market economies. Whilst we agree on the importance of contextualising China's makerspaces in different cultural, operational, and policy paradigms, our focus on the development of maker industries as a new inner city economy to replace traditional manufacturing adopted by post-industrial cities, offers a critical lens countering more techno-utopian views. We argue that Fab labs in

Shenzhen are used by ‘creative clusters’ as marketing tools to conceal the new wave of urban gentrification in many post-industrial cities (Gu In press).

Other relevant scholarly investigations of maker cultures include Toupin’s survey of feminist hacklabs (2014), Kohtala’s propositions of critical making and sustainability in Fab Labs (2017), Alper’s work on mixed ability maker cultures (2013), and the status of ‘hacking’ as a privilege (Shea, In Press). Hielscher and Smith’s (2013) literature review of community-based digital fabrication workshops reveal a nuanced landscape of hacking and making cultures. Hunsinger and Schrock’s edited collection, *The Democratization of Making and Hacking* (New Media & Society 2016) also deals with the contradictions of the democratising potential of making, drawing attention to how makers are often complicit in the exploitative practices of neoliberalism and globalisation. They also expose maker culture as forgetful, “in order to find a perpetual sense of novelty in their very existence” (2016). More recently, Smith and Light (2017) have developed a thesis about makerspaces and sustainability, providing further evidence that discourses have become more nuanced in their approaches to understanding these new organisational forms.

This article highlights the shared characteristics of institutional arrangements within makerspaces in the two countries. The research methodology is grounded in the ethnographic paradigm (Hammersley & Atkinson 1995). The researchers have spent time embedded within the makerspaces and maker communities of both case studies. Semi-structured interviews with managers of creative clusters, managers of makerspaces, policy makers, project leaders, and maker participants have been recorded across the two sites. We observed makers performing activities within these two makerspaces. Participant observation data has also been gathered as one of the researchers was directly involved in a Fab Labs NI project.

Field research was initially conducted to identify the strategic significance of digital maker cultures in China and Northern Ireland. The study of Shenzhen began in 2015 when the premier of China visited Shenzhen’s makerspaces, cementing state endorsement of maker industries in the country. The study of Northern Ireland emerged through previous research into the role makerspaces play in enabling civic practices and imaginaries (Shea 2015, Shea 2016). Follow up trips and observations were carried out in 2016 and 2017. The investigation is further enriched through observations of specific maker projects, events, and research programs; and analysis of company and policy documents, and online networks.

2. Fab labs and urban ideology

Once synonymous with low value products, ‘making’ can now denote flexible specialisation, high-tech, and high value added. Our case studies provide evidence that makerspaces—shared cultural infrastructure that facilitates these new modes of making—are being prioritised in region-specific policies to diversify their cultural economies. Although this perspective is underscored by economic imperatives, our accounts of institutional influence on Fab Labs in China and Northern Ireland has revealed they are markedly different from makerspaces situated in market-driven economies. In contrast, they are linked to policies that prioritise specific urban ideologies and local aspirations rather than the ‘commons based peer production’ paradigm.

The makerspaces surveyed in this paper are members of MIT’s Fab Lab network. Fab Labs are makerspaces that enable small-scale digital fabrication. An important historical vector in

the formation of the Fab Lab model was Professor Neil Gershenfeld's MIT class titled *How to make (almost) anything*. The success of this class was the kernel that led to the Fab Lab model as we know it today. The title of Gershenfeld's class was the precursor to the phrase "anyone can make (almost) anything," commonly used in conjunction with claims about the democratising potential of the maker movement (Anderson 2012). The idea that technology is the great enabler, or source of enfranchisement, is central to the maker culture imaginary. To be part of the Fab Lab network, makerspaces must address the criteria outlined in the Fab Foundation's Fab Charter. This suggests the Fab Lab being a normative model in itself. Our argument contests this through evidence of Fab Labs in contrasting contexts delivering vastly different impacts and outcomes.

Shenzhen is a medium sized city in China's Pearl River Delta industrial zone, in close proximity to the global trading port Hong Kong. For nearly four decades, Shenzhen led the world in the manufacturing of small electronics, specifically mobile phones. This period was linked to the implementation of Deng Xiaoping's Open Door policy in 1978. The early 2000s saw Shenzhen's manufacturing base challenged by nearby towns. This is partly due to the fact that the majority of Shenzhen's population are mobile residents caught in manufacturing capital flows. This saw many large factories relocate or morph into smaller, more specialised operations to align with investment in the 'Shanzhai' mobile phone market. As Anna Greenspan (2014) has argued, Shanzhai is a response to a Chinese market that was largely ignored by the global mobile phone industry. However, Shanzhai's appropriation of product ideas for local use (often in breach of intellectual property rights) earned Shenzhen a reputation as a 'city of fakes,' which continues to influence perceptions of Chinese manufacturing.

The global financial crisis in 2008 saw further change for Shenzhen as a mass manufacturing industrial city. Over six hundred manufacturing plants were shut down and over fifty thousand workers were made redundant. This sparked fears that Shenzhen, a formerly diverse manufacturing city, was losing its competitiveness. Efforts were then made to reinvent Shenzhen's image, to transform its traditional manufacturing base, and to attract new investments. Following the 2015 release of 'Made in China 2025'[1] by the State Council, hundreds of makerspaces were established in Shenzhen. Makerspaces and the narrative of a maker culture continues to be a key form in this transformation.

The Shanzhai mobile phone industry has made a significant contribution to Shenzhen's GDP. In 2009 the year after the global financial crisis, 179 million Shanzhai mobile phones were manufactured in Shenzhen. The successful transformation of Shenzhen therefore cannot be separated from this manufacturing legacy; however, maker culture has proved an effective counter to negative perceptions of the practice. Maker culture has been effective for three reasons: first, it legitimises Shanzhai industries by emphasising their disruptive power in relation to established global mobile phone markets; second, maker culture accentuates the grassroots DIY entrepreneurialism of Shanzhai; and third, maker culture evokes a unique form of 'ingenious Chineseness, marginality and independence, and playfulness and critique' (Chubb 2015: 272) creating a new foundation for the emergent 'Created in China' paradigm (Gu In press).

Maker culture and makerspaces in Northern Ireland are thoroughly entangled with social, economic, and political issues arising from the sectarian conflict that began in the late 1960s. Colloquially known as *The Troubles*, this period was shaped by military and paramilitary violence from groups contesting the political sovereignty of Northern Ireland. The two

groups in opposition were those who fought for the reunification of Northern Ireland with the Republic of Ireland, against those loyal to Britain who fought to remain part of the United Kingdom. These two communities are often identified as either Catholic or Protestant. Although violence has subsided, reconciliation is ongoing, and Northern Ireland's makerspaces are actors in this peace process.

The concepts of 'shared spaces' in Northern Ireland has a meaning that is inextricably linked with historical societal separation due to sectarianism. A shared space denotes a place that actively encourages and supports the co-existence of both Catholic and Protestant communities. So, a shared machine shop—or makerspace—by virtue of its status as a shared space, is embedded with the symbol of post-conflict reconciliation. Makerspaces join other shared creative space initiatives—such as artist run initiatives (ARIs)—that play an important role in the civic reconciliation project. Makerspaces in Northern Ireland have previously been established as an enabler of alternative civic activity (Shea 2015). They have also been viewed through the lens of 'agonism', as a way of explaining how the oppositional forces of sectarian politics of Northern Ireland can become productive (Shea 2016).

The institutional influences traced in this paper reveal an array of individuals, organisations, rules, regulations, and contexts surrounding three Fab Labs in China and Northern Ireland. We have categorised the institutions as primary, secondary, and peripheral to highlight different levels of organisational influence. *Primary* describes institutions or organisations that provide major operational money, support, or guidelines. *Secondary* describes institutions or organisations that provide project money, support, or guidelines. *Peripheral* describes institutions or organisations that have an influence by association.

3. Fab Labs NI, Northern Ireland

3.1 Institutional arrangements

Fab Labs NI is a not-for-profit organisation based in Northern Ireland that offers programs and services through two digital fabrication labs. It is a direct result of European Union Peace III policy interventions, and is funded primarily through the Special European Programs Body (SEUPB). Also known as the *Fab Lab Intervention Project* (FLIP), Fab Labs NI received an initial operational grant of close to 1 million pounds from the SEUPB in 2011 (Fab Lab Feasibility Study 2016). As such, the SEUPB is situated as having a *primary* influence on Fab Labs NI in this study. The primary local institution of Fab Lab Belfast is the Ashton Community Trust, while in Derry~Londonderry it is the Nerve Centre. The Fab Labs NI project is an intervention that aims to deliver on the following specific peace building criteria, "*Individual Change and Healthy Relationships*" (Ashton Community Trust constitution 2005). It can be viewed as a soft political project that aims to repair and reinvent communities—and perceptions of communities—in Northern Ireland.

Fab Labs NI has received large amounts of operational funding from the SEUPB to respond to significant deprivation in North Belfast and Derry~Londonderry. Both areas were chosen as sites for Fab Labs due to the disproportionate impact the sectarian conflict has had in both areas. Evidence for these decisions were based on a range of indicators, including deaths and injuries arising from the conflict, free school meal provision, and unemployment (Northern Ireland Multiple Deprivation Measure 2010).

The Ashton Community Trust is a community centre situated in an ‘interface’ area—a colloquial term for geographic areas where Protestant and Catholic communities live side by side—just north of Belfast’s city centre. Ashton is a registered charity and company limited by guarantee, that has a remit to provide “facilities in the interests of social welfare for recreation and other leisure time occupation; (and) the provision of education through teaching, instruction, training, seminars, conferences, the provision of facilities for education or any combination of these.” (Ashton Community Trust constitution 2005). The organisational structure comprises a board of directors, a CEO, and eight roles that head the following departments: Community Development, Employment, Victim Services, Childcare, Administration, REAL Project, New Lodge Arts (community arts initiative based around the New Lodge public housing estate), and Fab Lab Belfast. Ashton is audited externally every year and has met the financial probity requirements of a diverse range of supporters whom require various standards and systems for funding applications and acquittals (Ashton Community Trust annual report 2012-2013).

The Nerve Centre in Derry-Londonderry is a creative media arts centre. It is a social enterprise that delivers creative education programs, offers creative production facilities, and programs arts events. It employs 40 staff and has a board of directors comprising of people from industry, the tertiary sector, and the public service. The Nerve Centre was initially a grassroots initiative, having developed as a youth initiated organisation in 1990. The Fab Labs NI project builds on existing work around creative education that the Nerve Centre pioneered in its early years. The Nerve Centre is also a core partner in the Digital Derry Digital Action Team where the Fab Lab is positioned as an integral element of the Digital Derry strategy for building digital capacity and sectoral development in the North West (Nerve Centre annual report 2012). Active policies governing both Ashton and the Nerve Centre include: Staff selection and Recruitment; Staff Training; Equality of Access; Harassment; Domestic Violence; Health and Safety; Fraud Policy; Quality Policy; Communications Strategy; Anti Bullying Policy; Procedures on Domestic Violence in the Workplace; Volunteer Policy; Child Protection Policy; Anti Age Discrimination Policy; Flags and Emblems Policy; Documentation Retention Policy; Smoking Policy; Hospitality Policy; and, Mobile Phone Policy (Nerve Centre annual report 2012, Ashton Community Trust annual report 2012-2013).

Additional primary institutional influences are the Massachusetts Institute for Technology (MIT) and its associated Fab Foundation network. To be part of the network, Fab Labs must address the criteria outlined in the Fab Foundation’s Fab Charter: such as, venues must be open to the public for free or in-kind each week; they must share designs among the wider Fab Lab network; and adhere to the recommended list of Fab Lab equipment. Fab Labs Ireland is an all-Ireland advocacy group that also has a primary influence on the operations and activities of Fab Labs NI.

Secondary institutional influences include the following Northern Irish government departments: The Department of Culture, Arts and Leisure (DCAL), and the Department of Social Development. The Arts Council NI and Craft NI—government organisations charged with supporting arts and crafts activities in the region—are also involved in ongoing project work. Local councils are also involved in the facilitation of programs via in-house ‘Good Relations’ officers. These government roles flow over the border to the Republic of Ireland as well, evidenced by initial support letters from the local council in County Donegal.

Tertiary institutional involvement includes program evaluation exercises undertaken by Queen's University Belfast (School of Urban Planning), and the use of Fab Lab resources by the Ulster University's International Conflict Research Institute (INCORE). INCORE's Peacebuilding and Technology Laboratory (PeaceTechLab)—based in the FabLab at the Nerve Centre—specifically invites explorations into how technology and new media can be used to enhance peacebuilding practice. PeaceTechLab is a partnership with The Young Foundation, The Agirre Lehendakaria Center for Social and Political Studies in the Basque Country, New York based Culture Shock, and Scensei in Washington.

Organisations that exist on the periphery of the Fab Labs NI operation—but that remain influential—include various social enterprises, colleges, and international operations. Locally, the NI Skillset Media Academy of the North West Regional College is a player, as is the UNISON workers' union. A partnership with Oakgrove Integrated College is worth noting, as integrated education is the name ascribed to schools that are not aligned with Catholicism or Protestantism. It is an important, but rather rare, reconciliation project in Northern Ireland. Fab Labs NI also engage the services of social enterprises such as LOAF catering. Its innovative community-focussed organisational arrangements offer sight-lines for those who come into contact with Fab Labs NI.

Internationally, Fab Labs NI have played hosts to the—oft-cited socially focussed—Mondragon Team Academy. Situated in the Basque region, MTA is a “global network of social innovation ecosystem labs.”[2] Fab Labs NI are also increasingly engaged with international tertiary institutions—particularly in Spain—who negotiate industry placements within the Fab Labs for their students. Fab Lab Nerve Centre's involvement in the Future Artist-Maker Lab beginning in 2015, has established ongoing partnerships with international makerspaces in Limerick (linked to the University of Limerick) and UltraLab Madrid (links with Media Lab Prado).

3.2 Maker culture, social technology, and new urban imaginaries

The peace-building project in Northern Ireland is defined by sectarianism and conflict surrounding social, economic, and political difference. The imposition of socio-economic development agendas on local actors underpins approaches to change (Richmond and Mitchell 2011); while civic reconciliation initiatives deemed to favour either Catholic or Protestant communities are commonly contested through organised protest (Murtagh 2011). Despite these geo-political specificities—and its emerging independent economic status[3]—Northern Ireland has taken several cues from the urban cultural policies of other regions. Belfast's Titanic building is a classic case of the global 'creative cities' trend to build large-scale cultural infrastructure to reinvent city image with the view to attracting foreign interest and investment, while boosting civic pride. This symbol of “the new Northern Ireland” (Ramsey 2012) opened in 2012, the same year Fab Labs NI opened their doors to the public. These cultural economy projects seemingly exist at opposite ends of the policy spectrum: one emerged from an urban planning precedent that had been rolled out across multiple cities globally, the other was an experiment, and grassroots in scope. However, both examples play a role in the development of new urban imaginaries.

The promotion of new urban imaginaries in Northern Ireland is salient considering continued speculation over its sovereignty (linked to ongoing processes of devolution from the UK central government). Its Fab Labs NI project is an important actor in this national rebrand as it positions Northern Ireland as a leader in the field of *social* technology. The Fab Farm

project is evidence of this phenomenon. The initiative develops community capabilities to build digital aquaponics farms. Aquaponics uses fish to provide a clean, sustainable and highly efficient environment for the growing of plants. In one project, participants are using their aquaponics farms to provide high quality produce for local restaurants and artisan markets. The project was recently awarded a UK-wide *tech4good prize*, contributing to a rise in the profile of social technology projects within Northern Ireland. Ulster University's Peacebuilding and Technology Laboratory (PeaceTechLab)—based in the FabLab at the Nerve Centre—is also part of this push. They aspire to develop “an international model of practice and learning placing Northern Ireland at the forefront of emerging thought around the positive impact of technology in the world.”[4]

As previously noted, makerspaces in Northern Ireland have been situated as enablers of civic activity, in an era where the very constitution of civic action is diversifying (Shea 2016). This promotion of civics crosses over with makerspaces from market economies, as the rhetoric of self-direction and taking matters into one's own hands, surreptitiously feeds several neo-liberal agendas. Institutional support of makerspaces can therefore be interpreted as an attempt to use the veil of participation and civic duty to develop productive citizens to serve the national economy.

The multiple institutional influences that have been detailed in this article reveal Fab Labs NI as an organisation fit for small scale projects within a community cultural development framework. This situates their work as *local*, as it responds to the specific needs of the surrounding communities. Projects such as *Temple*, and the *Transitional Justice Jigsaw Puzzle* are two examples of civic reconciliation projects that aimed to represent lived experiences of the conflict. *Temple* was an initiative aimed to re-contextualise contested bonfire rituals performed by both Protestant and Catholic communities in the city of Derry; while the *Transitional Justice Jigsaw Puzzle* engaged women from a contested cultural area of Belfast in digital fabrication processes at the Fab Lab. But despite the Fab Labs NI mission as a socio-economic intervention, it remains an operation that has ongoing benefit to a relatively small contingent. In the updated Northern Ireland Multiple Deprivation Measure (2017), areas surrounding both Fab Labs—such as Derry City, Ardoyne, and New Lodge—remain in the top ten most deprived Super Output Areas (SOA).

The framing of Fab Labs NI as a peace-building intervention means its production capacities are limited. As such, production within Fab Labs NI remains bespoke. However, the policy long game involves attempts to move away from the Fab Lab as community development apparatus, towards Fab Labs that perform a function in the national innovation system. In a white paper prepared for Belfast City Council, digital fabrication labs were proposed to be included in *Social Innovation Zones* as part of “mixed innovation districts” that aimed to regenerate “spatially disconnected communities” (Murtagh 2015, 3). This document drew on examples from the Basque Country, where evidence suggests that social economy clustering is viable and “has the potential to scale up to create meaningful economies” (Murtagh 2015, 3).

Makerspaces in Northern Ireland reveal a specific view of maker culture as they are situated in relation to a sectarian conflict that fuels ongoing tensions around national and local identity. Beyond this, they are charged with creating hope and opportunities for those affected by tensions on the ground. In practice, Fab Labs NI carry out discrete projects, shaped heavily by institutions, so they may contribute to the “new Northern Ireland”

imaginary. These realities depart from the idea of the normative makerspace, that promotes peer production as a counter to industrial-scale economics.

4. Shenzhen Open Innovation Lab (SZOIL), China

4.1 Institutional arrangements

Shenzhen Open Innovation Lab (SZOIL) is a physical space and an online network that links actors in the maker culture ecosystem. It has four major functions: research and development, innovation and entrepreneurial education, community development, and the development of maker supply chains (it specifically promotes itself as a conduit between the mass production ecosystems of Shenzhen and small hardware start-ups). SZOIL emerged out of complex state, industry, and local interests in makerspaces and maker culture, and is the first makerspace in Shenzhen to be affiliated with the global Fab Lab network supported by MIT's Center for Bits and Atoms. It has been endorsed by the Fab Lab network as a research and development partner of Fab Lab 2.0, an initiative that prioritises manufacturing machines of the future.

At the primary level, SZOIL is a joint venture between Shenzhen Industry Design Association (SIDA)—a government body representing local industry development agendas—and Maker Collider—a platform offering products and resources to the maker community[5]. These industry associations locate and negotiate development opportunities with commercial operators in areas with strategic importance to government. In Shenzhen, SIDA is very influential in a range of real estate projects driven by local policies aimed at promoting local creative industries, specifically those related to maker industries. SZOIL is located in the Sino-Finnish Design Park within the Futian Free Trade Zone, a local government initiative that promotes the clustering of high technology firms with closely affiliation to SIDA. The Sino-Finnish Design Park is one of many creative clusters that have emerged within the Futian Free Trade Zone since 2015. Director of SIDA, Shirley Feng, is a co-founder of SZOIL and a key promotor of Shenzhen as a 'City of Makers' and as a UNESCO 'City of Design'. However, SZOIL's affiliation with the Taikong Maker Alliance, places SZOIL in the heart of Chinese innovation policy by linking it to the country's space and military program.

Co-founder of SZOIL and Maker Collider (and other maker-related initiatives in China) David Li, has become the face of China's maker industries through his advocacy work in aligning the concept of open source hardware development with Chinese Shanzhai[6] culture. However, Li openly opposes the open source movement's aspiration to maintain egalitarianism. In contrast, the mantra at SZOIL is 'not everyone can do it'. According to Li, "everyone has creativity in them but not everyone can take their ideas to the next level". Here he alludes to the reality that the "next level" is a complex mix of combination of knowledge, networks, empowerment, action, and capital.

Our study situates intermediary commercial corporations as secondary influencers of SZOIL. These organisations link makers to venture capitalists, global Internet of Things (IoT) platforms such as Amazon, and agile manufacturing plants located in China. Commercial corporations occupy an important position in SZOIL's organisation through their control of upstream and downstream services that are essential for makers. SZOIL provides services for makers to attract funding, acquire engineering solutions, develop design specifications and procure manufacturing contracts. These networks connect makers to over 150,000 industrial

designers and 5000 agile manufacturing factories located in Shenzhen. In this context, processes of ‘making’ are an enabler of the potentialities of associated products and business opportunities.

While many maker projects develop in the context of loose organisational control, entrepreneurial development processes at SZOIL are highly coordinated to maximise economic outcomes for makers. At the secondary level, various local and international institutions offer the promise of streamlining services. The global crowdfunding service Indiegogo, Rone Phoenix Nest (Shenzhen), and electronics firm CYM provide supply chain services to global makers. US based think tank The Institute for the Future (IFTF) and New York University's Hacked Matter are key research partners linking SZOIL with international brands while contributing to its international prestige. The British Council's ‘Hello Shenzhen’[7] initiative and the Thingscon network in Europe have both run joint programs through SZOIL. While WIRED's video promoting Shenzhen as ‘The Silicon Valley of Hardware’ has raised the profile of the region internationally by situating it as a ‘Future City.’

Significant peripheral influencers include state media organisations such as CCTV and the Xinhua News Agency. They endorse makerspaces as a nationwide mass innovation and entrepreneurship model central to the development of China's Cultural and Creative Industries. This momentum is linked to China's 13th Five Year Plan, that saw maker industries included as a key sector in transforming China's manufacturing future.

4.2 Maker culture and the re-imagining of a post-industrial city

Despite aggressive promotion of grassroots entrepreneurialism, Shenzhen maker industries have emerged from a top-down campaign to attract external investment. As such, makerspaces are an overt part of government-led urban regeneration strategies that aim to dramatically change the image of Shenzhen. These initiatives occurred in the wake of successful creative city promotions in Shanghai. Shenzhen developed tax free zones for technology industries and funded new makerspaces in creative clusters which urged commercial corporations to invest, or take part in extending the value chain of maker industries. The city also developed new entrepreneurship programs attached to maker industries. Emergent industries attached to digital making also embody a sense of fun and novelty, an appropriate match for a city searching for a post-industrial look. Leveraging the cultural capital of maker culture in the development of new urban imaginaries has successfully masked Shenzhen's socio-economic problems with the rhetoric of progress and solutionism.

Shenzhen has been sponsoring the global Maker Faire since 2010, and in 2015, the mayor declared Shenzhen the world's first ‘city of makers’. In 2012, Shenzhen also became a UNESCO city of Design which helped promote its status as having the highest IP rights per head in the world, which marked a significant shift in external perceptions of Shenzhen. Shenzhen has drawn inspiration from ‘media cities’ and ‘creative cities’ policies and schemes elsewhere in the world: the former placing emphasis on the production and distribution of ‘symbolic goods’ which place high value on originality, innovation, and creativity (Hesmondhalgh 2013); while the latter emphasises using large-scale flagship cultural institutions to improve the image and identity of a city, and to enhance the built environment for commercial, cultural, and recreational purposes (Landry and Bianchini 1995). These are key attractions to policy makers in China (O'Connor and Gu 2006). In addition, media cities

serve either as nodal points in the global networks of cities (for example, Hong Kong as the gateway to Asia) (Hoyler and Watson 2013) or as global innovation hubs (for example, Silicon Valley) (Saxenian 1996).

Unlike Shanghai, the displacement of existing communities due to cluster development and gentrification—in urban villages such as *Baishizhou* that offered cheap accommodation to factory workers—has not been widely contested (O'Connor and Gu 2012, Gu 2014). Furthermore, the idea that putting makerspaces in creative clusters would attract people (and sell properties) has firmly taken hold in Shenzhen. The city currently has over twenty creative clusters oriented towards attracting makers and adjacent industries. 'Maker' as a term has become a powerful motif in the branding of inner city properties, and makerspaces are situated as amenity infrastructure.

Our investigation has also revealed that media conglomerates Tencent and Baidu have opened makerspaces in order to be part of an elite policy making network. Despite a lack of robust business models and best practices, these companies are supporting makerspaces as a form of speculative investment. These corporate-backed makerspaces, and the promises of innovation attached to maker industries, has influenced the projection that China will become a world leader in the IoT and Artificial Intelligence (AI) by 2030 (Mozur 2017). This is also supported by reports situating China as the biggest investor in hardware start-ups globally[8].

The departure of mass manufacturing industries in Shenzhen have contributed to falling employment and tax revenues. This provides context as to why the remaining industries, local government, and local residents invest so much hope in maker industries. The hegemonic image of Shenzhen as a mass manufacturing city has been replaced by an equally hegemonic vision of the city of makers within less than ten years. Makerspaces, like the flagship cultural projects in other creative cities, carry particular symbolic and cultural importance to Shenzhen.

Although the evidence situates makerspaces as part of a national policy directive, they are emerging as a rare form of a 'shared space' in Shenzhen where politics, economics, and civics collide. The spirit of Shanzhai helps build common ground between individuals, commercial interests, and the state, underscored by antipathy towards the control and domination of global technology corporations. Maker culture in China has contributed to a transformative narrative: from manufacturing as low skilled, low value added, dirty and labour intensive to high tech, highly skilled, 'clean' and high value added. This has presented new opportunities for China, while offering context to its status as the 2nd largest economy in the world. However, complex socio-political agendas and the need to transform traditional manufacturing industries in Shenzhen has absorbed makerspaces like SZOIL and created new forms of hierarchies.

5. Conclusion

This study has shown how the established urban ideologies that drive unique institutional practices can significantly shape makerspaces. Evidence has strongly suggested that identity politics in China and Northern Ireland—underpinned by shifting socio-economic status—has provided much of the policy momentum for makerspaces. In China, we see the performance of a new design-led and high-tech identity to accompany its increasing global soft power; and

in Northern Ireland, a fledgling identity is emerging that emphasises skills in the development of innovative social technology.

Maker culture in our case studies does not display the traits of typical open source culture. Individuals involved in the makerspaces are organised under shared visions of new urban imaginaries, prescribed through policy. Furthermore, investment in makerspaces are heavily influenced by the state and the civil societies that they are embedded in. In both our cases, makerspaces are part of the reconstruction of urban images through innovation and creativity. Our research has revealed high level government attempts to reconstruct cities by leveraging the ‘hope’ attached to ‘innovative’ maker cultures. Here, makerspaces are used to rewrite the meaning of the city and replace negative urban images—of dirty manufacturing or disruptive civil conflict—with a positive vision of the future. The development of makerspaces is an attempt to reposition the two cities in the global circuit of media and creative industries.

We also examined the symbolic significance of makerspaces as an embodiment of a grassroots ethos. Initially seen as an industry of the past, Shanzhai manufacturing became central to Shenzhen’s attempts to reinvent its identity. This has contributed to the emergent urban ideology that makerspaces and maker culture will transform Shenzhen into a futuristic city. While in Northern Ireland, ongoing social cohesion efforts were rebranded as opportunities for digital social innovation. We also discussed the conscious attempts by local governments and commercial corporations to position makerspaces as essential inner city cultural amenities. Shenzhen, in particular, has aggressively marketed makerspaces to the likes of real estate developers. This evidence suggests makerspaces represent an elite vision of urban cultures, and that the pursuit of the makerspace as civic institution inviting widespread participation, has been marginalised.

Whilst the paradigm of maker cultures derived from ‘commons-based peer production’ has been consciously preserved and marketed by policy makers in both countries, they present very different realities aligning closely with civic boosterism and urban renewal. As such, the current momentum could very easily stall due to shifting political sands. In Northern Ireland, there is a question mark regarding ongoing support for Fab Labs NI from the EU in the post-Brexit climate. In China, if government forces shift polices (and money) away from the makerspace project, it is difficult to say where they will raise funds for ongoing operations. China’s increasing alignment with international common laws could also have a lasting effect on IP infringement.

The new urban imaginaries constructed with the help of makerspaces, represent a partial view of urban cultural policy. Each makerspace has different implications for industry sectors and local communities. In Shenzhen, there is very little mention of the workers made redundant due to the de-industrialization process or those left behind by the maker led property boom. While in Belfast, sectarian civil disruption and economic marginalisation are ongoing within many communities.

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Notes

[1] For more information about the Made in China 2025 policy initiative, see <http://english.gov.cn/2016special/madeinchina2025/>

[2] For more information about the Mondragon Team Academy, see <http://mondragonteamacademy.com/>

[3] Northern Ireland has received significant economic stimulus from the UK and EU governments since the Good Friday Agreement in 1995. The country is currently moving towards a more independent economic foundation as peace-building initiatives offering financial subsidies are being wound down.

[4] For more information about PeaceTech Lab see, <https://www.youtube.com/watch?v=SBknWcDBndI>

[5] “About Us, SZOIL” <http://szoil.org/wp/#About>

[6] The literal translation of ‘shanzhai’ is ‘mountain fortress’ and it designates to a group of outlaw entrepreneurs who operate outside of the authoritarian control of economic and cultural production.

[7] For more information about the Hello Shenzhen initiative, see <https://creativeconomy.britishcouncil.org/projects/hello-shenzhen/>

[8] “Why Crowdfunding Is Still Booming, Especially For Chinese Tech Companies” <https://www.forbes.com/sites/benjaminjoffe/2017/07/18/crowdfundings-death-has-been-greatly-exaggerated-creators-ship-especially-in-china/#31cf7d082c40>

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