Digital Fabrication and Local Participation: A Community Maker Space Dissolving Boundaries

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ABSTRACT
This paper reports on our experience of setting up, operating, and evaluating the Mixhaus – a mobile community maker space inside a disused shipping container in Townsville, North Queensland, Australia. The project, which emerged from a pitch at the local StartUp Weekend in 2015, has seen community members coalesce around a shared interest in learning about and practising digital fabrication skills and techniques. We present and discuss the data we gathered from interviews, participant observations, and community workshops. Our thematic analysis was guided by the conceptual framework of boundary objects. We found that the Mixhaus maker space presents itself as an object crossing and dissolving boundaries along four different dimensions: an organisational mix, a social mix, a disciplinary mix, and a spatial mix. Our insights inform local community engagement initiatives and policies as well as design implications.

Author Keywords
makerspace, fabrication lab, connected learning, community engagement, community informatics, living lab, digital participation, participatory action research

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Access to information and communication technology (ICT), the internet, and digital devices may be necessary, but access on its own is not sufficient to tackle digital divide issues and engender social inclusion in society (Notley & Foth, 2008). Gurstein (2003) suggests that ‘effective use’ of ICT is a more encompassing goal to aspire to, and it requires two further challenges to be tackled, that is, digital literacy and digital participation. The former has long been embraced as part of the new remit of libraries and librarians who have quickly recognised the need to shift their professional rationale towards knowledge brokers and digital literacy trainers. As a result, a significant portion of digital literacy skills training is being offered by libraries. However, figuratively speaking, once you know how to drive a car and received your driver’s licence, where do you go? The next question around digital participation is less about technical skills and more about the way community members can make effective use of ICT for themselves as well as in connection with others.

In this paper, we present a study that is part of a larger program of research focused specifically on fostering digital participation through social living labs in regional and rural communities of Queensland in Australia (Dezuanni, Foth, Mallan, & Hughes, 2016). The geographic focus on regional communities stems from both the Australian and the Queensland Government’s expectation that their sizeable investment in the provision of a National Broadband Network (NBN) will contribute towards economic development for regional prosperity. Our study sought to untangle some of the relationships between the availability of high-speed broadband internet access, digital participation through living labs, and the impact – potential or real – on regional communities.

Another element that has prominently entered the discussions relating to digital participation is the maker movement (Gauntlett, 2011). With the rise of ubiquitous technology, physical computing, and tangible / wearable devices as well as the declining cost for 3D printers and CNC laser cutters, the ability to manipulate not just digital bits but physical atoms has started to be within reach of lay people. This domain previously mostly limited to the use by engineers and architects is now seeing an entire movement follow in the pursuit of making objects, digital fabrication, and DIY / DIWO1 projects (C. Anderson, 2012; Caldwell & Foth, 2014). These hybrid activities that combine both physical and digital fabrication tools and techniques happen in so-called makerspaces and FabLabs.2

Figure 1: The Mixhaus makerspace

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1 Do It Yourself / Do It With Others

2 http://www.fabfoundation.org/
In a local pilot project, we accompanied and provided financial and research support for a community-led initiative to set up the ‘Mixhaus’ – a mobile makerspace in Townsville, North Queensland (Figure 1). A disused shipping container was purchased from the local port, renovated and transformed into a makerspace fitted with equipment to allow for fabrication, electronics and physical computing workshops and ‘hacking’ activities. Guided by a participatory action research (PAR) approach (G. Hearn, Tacchi, Foth, & Lennie, 2009), we sought to produce a twofold outcome:

a) For the local and regional community: The technical and human resources as well as a governance framework for operating and maintaining the Mixhaus, and;

b) For the researchers: Data collection that documents the living lab setup process and allows us to evaluate the impact of the Mixhaus on digital participation in the local community and the learning processes and outcomes for fostering future community-led and digital participation initiatives.

In the following, we review related literature to introduce key concepts that are applied to the analysis for this paper. We then present our participatory action research methodology and describe the case study site. The discussion section is informed by a key observation we made in the analysis of our data, that is, the ability of the Mixhaus as a local community makerspace to act not just as a living lab but also as a ‘boundary object’ (Star & Griesemer, 1989). Beyond the qualities of the physical artefact itself, the Mixhaus contributed to dissolving and crossing boundaries along four different dimensions: an organisational mix, a social mix, a disciplinary mix, and a spatial mix.

COMMUNITY SPACES AND PARTNERSHIPS
In this section, we will recap key scholarly contributions around two main concepts that this paper is concerned with: First, the changing notion of community space in light of both technology innovation and new technological user practices over time, and; second, different forms of community partnerships that bring about local action and change, specifically with regards to our main interest in fostering digital participation.

First, let us look at community spaces. When the internet first saw widespread adoption beyond the original military and educational usages, the focus was predominantly on telework, distance education, and e-commerce, or, what Cairncross called the ‘Death of Distance’ (1997). However, there were some scholars interested in the impact these new possibilities would afford local communities. This line of inquiry and thought was first referred to as ‘virtual communities’ or ‘online communities,’ but later the interest in local or place-based communities grew, too. Some of the pioneers and thought leaders of this scholarship were Rheingold (1994, 2002), Schuler (1996), Preece (2000), and Gurstein (2000). Walmsley (2000) argued that, “cyberspace might have annihilated distance but not place.” Wellman (2001) introduced the term ‘networked individualism’ to describe the emerging social phenomenon enabled by the internet, that is, shifting from door-to-door and place-to-place relationships to person-to-person and role-to-role relationships. Together with Hampton, they drew on the longitudinal Netville study to analyse the relationship between the internet’s global communication affordances and the local neighbourhood community (Hampton & Wellman, 2002). Around the same time, similar studies were carried out that further corroborated their findings (Arnold, Gibbs, & Wright, 2003; Foth & Hearn, 2007).

Fast forward to today, and the notion of a hybrid space is well established, replacing the old online / offline dichotomy that separated the digital world of cyberspace from the physical, ‘real’ world (Eric Gordon & de Souza e Silva, 2011). The significance of place never disappeared, but it changed. From the early accounts of telecentres (Amariles, Paz, Russell, & Johnson, 2007), we now see an array of community spaces and living labs unfold for meeting up, hacking, making, and coworking, particularly championed by libraries (Bilandzic & Foth, 2013, 2017; Houghton, Miller, & Foth, 2014). It is in this context that we are interested in the Mixhaus as a community-led, mobile makerspace that provides a physical conduit through which digital participation initiatives are being led and run.

Second, we acknowledge that the term ‘community’ requires unpacking. On the one hand, it is often used as a convenient umbrella that signifies the aspiration of the Mixhaus initiative to reach out, engage and be available to the local residents of Townsville whether they identify as belonging to this ‘imagined’ community or not (B. Anderson, 2006). On the other hand, we concede that this ‘community-led’ initiative is in fact not led by the entire community on equal terms, but by specific people, groups and organisations from within the wider community on different terms. This in turn begs the question of the types and nature of community partnerships and governance models at play in the Mixhaus initiative.

Action research lends itself to engendering a balance between research interests and community interests, and with that come various reasons for employing a participatory approach (Reason, 1998). Borrowing from Gurstein’s notion of ‘effective use’ (2003), the goal is to also build effective partnerships between community stakeholders and organisations (Foth & Adkins, 2006). For win/win outcomes to be achieved, the goals and desires of each participant has to be taken into consideration. In the case of a digital participation initiative such as the Mixhaus, the breadth of aims and concerns is wide including artistic and creative needs, educational outcomes, commercial interests, socio-cultural differences, and interpersonal difficulties. Mar and Anderson’s (2010) report on a partnership between arts institutions, businesses, and communities in regional Sydney is relevant to our case, as the complexity of stakeholder interests appears similar. They adopted what they refer to as a ‘3C’ partnership model led by Jock McQueenie bringing together Community, Culture, and Commerce.
In our analysis of the way that the Mixhaus was initiated we introduce ‘boundary objects’ as a conceptual framework (Star & Griesemer, 1989):

**Boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. They may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds.** (p. 393)

Considering the diverse and sometimes even diverging interests at stake across the relevant partnerships, we were curious to find a key quality and ability in the Mixhaus initiative to cross, mix, and dissolve boundaries that we will discuss further below. The original translational quality between amateurs and professionals as described by Star and Griesemer has been appropriated to the context of communities of practice by Wenger (1998) – amongst others – who recognised the ability of boundary objects to bring communities together and in doing so, enabling different community members and groups to collaborate on a shared venture.

Yet, while the object itself may be a conduit or catalyst for the community to come together, it does not automatically dissipate any potential inequities or dissonance with regards to voice, agency, agendas, and power relationships inherent in the diversity of the local community (Foth, 2006a). Studies that employed the notion of boundary object without considering the underlying social repercussions have received critical reviews (Huvila, 2011; Kimble, Grenier, & Goglio-Primard, 2010). Considering these prior insights, we draw on our experience in employing a communicative ecology perspective in order to combine the conceptual framework of boundary objects with this well-established paradigm from media and communications studies (Foth & Hearn, 2007; G. N. Hearn & Foth, 2007).

**RESEARCH APPROACH**

The Mixhaus initiative is part of a program exploring and fostering digital participation in regional and rural Australian communities through social living labs, funded through the Australian Research Council and led by Queensland University of Technology (Dezuanni, Foth, Mallan, Hughes, & Allan, 2014). We view social living labs as community-led spaces that provide the contextual environment for researchers to work collaboratively with community members to identify particular digital participation needs, and then implement initiatives to build digital capabilities and community efficacy (Carroll & Reese, 2003). Mixhaus is a social living lab initiative seen as both context and participatory process that engenders connected, experiential and even transformative learning.

We adopted a Participatory Action Research (PAR) approach with a view to stimulating community engagement in the initiative and gain multiple perspectives (Foth & Brynskov, 2016, in press).

Action research is a democratic and participative orientation to knowledge creation. It brings together action and reflection, theory and practice, in the pursuit of practical solutions to issues of pressing concern. Action research is a pragmatic co-creation of knowing with, not on, people. (Bradbury, 2015, p. 1).

PAR is commonly used to create knowledge that seeks to address complex problems by producing positive social impact through practical and emancipatory outcomes. It is used in education (Atweh, Kemmis, & Weeks, 2002) to explore transformative outcomes of the kind intended through participation in Mixhaus. Context bound, PAR addresses real life problems, treats diverse experiences within a community as an opportunity to enrich the research process (Kindon, Pain, & Kesby, 2007).

Action research, that involved different data collection methods at different stages, was used to generate knowledge and collaborative actions through participants and researchers collaborating and learning together in cycles (Carr & Kemmis, 2003; Kindon et al., 2007). Action research was integrated into the project in order to maximise the learning and outcomes of the project while it was carried out, rather than an evaluation at the end. PAR typically involves a series of iterative cycles, with four main elements: plan – act – observe – reflect (Carr & Kemmis, 2003) or a more flexible action – reflection continuum (Kindon et al., 2007). In this study, reflection and research cycles occurred at action stages 3, 4 and 5 of the Mixhaus initiative (see below) and differed during each stage depending on the ‘actions’ at each stage. The researchers took varying roles as: participants in the initiative; members of the organising Mixhaus collective, observers of the process and outcomes, and socio-cultural animators (Foth, 2006b).

The following sections describe the main stages of the Mixhaus initiative, including the different PAR elements and research methods.

**Initial Concept Design**

In response to a call by the larger program of research on digital participation to provide seed funding for a creative entrepreneurship and social change initiative, a visual arts youth worker and local video producer took the idea to develop a community makerspace to the 2015 Townsville Startup Weekend.³ At the weekend, a team was formed to develop a business model, gather community interest and aspirations for the space, and pitch the idea to the forum of attendees as well as to a jury at the end. The team named the space ‘Mixhaus.’

**Shipping Container Fit-out**

Following the Startup Weekend, a collaboration to develop the Mixhaus makerspace was developed between two universities, the library branch of a local government, a

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³ [http://www.up.co/communities/australia/townsville/](http://www.up.co/communities/australia/townsville/)
youth arts theatre company, an electronics retailer, as well as various other community stakeholders with their own private and professional affiliations. An informal steering committee was formed to facilitate community engagement and make decisions for the space. A decision was made by the team to purchase a second hand shipping container to create a transportable ‘pop-up’ makerspace and organise facilitated STEAM public workshops to launch the space.

A community planning workshop with 22 participants was organised to identify what activities (and equipment for these activities) community members desired for the space and what skills they could share (Figure 2). Workshop participants were from the university, city council, robotics club and individuals with an interest in physical computing, electronics, hacking and creating. A participatory rapid appraisal method (Theis & Grady, 1991) was used to gather input from community members. Lists of ideas for activities, equipment and skills that were generated from the results of a community survey at the Startup Weekend were posted on the walls and people added items and ticked items they most favoured, which were then given priority by the informal steering committee for designing the space.

The most desired activities and outcomes included: photography, new digital technology, interactive new media art, graphic design, performance installations / participatory art, 3D printing, art -virtual reality, computer developed programming, app and web development, software development, digital privacy, open source data mining and programming home automation, data aggregations and prototypes (Arduino and sensors), robotic applications, cross-generational engagement, exciting social situations, building a creative community, collaboration with people across sectors/disciplines, an idea factory, jobs (from ideas), self-help workshops (e.g. fix and reuse items), having a regular informal ‘open container’ workshop.

The main skills participants said that they could share with others in the space involved photoshop, electronics, software development, web creation and programming, mobile application, ICT, and business and management skills, such as event promotion, marketing.

Planning for Mixhaus Engagement
The collaborating organisations met to decide on the design and equipment for the container and facilitation of workshops to initiate the space. Five workshops were held with volunteers to design and fit the shipping container out as a maker workspace (Figures 3 and 4). These workshops included people with different interests coming together to learn and share DIY building and construction skills. Three community workshops were held to launch the maker / hacker space that occurred at different locations and events with a focus on creative arts and digital technologies/engineering (STEAM). The portability of the Mixhaus afforded the subsequent relocation of the makerspace to local schools and events, such as Ecofest, Lux Lumen, and the Townsville Festival of Ideas.

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4 Science, Technology, Engineering, the Arts, and Mathematics
Our data collection includes eight semi-structured qualitative interviews carried out with key participants of the Mixhaus initiative – both members of the Mixhaus collective who created and continue to organise events, and community members who participated in particular Mixhaus activities. Participants self-selected to participate in the initiative and were purposively selected for interviewing using maximum variation sampling (Patton, 2001). The sample of participants were from diverse backgrounds:

P1: A video producer in his mid 20’s interested in engaging people in technology and using it for new and different purposes and enhancing social and economic opportunities, especially for young people. He is working with the MIXHAUS team to document workshops and development of the space: “I see myself as ‘creator’, ‘thinker’, ‘artist’ : I think big-ideas/concepts and small-detail/angles.”

P2: An electrical engineer and self-described “inventor” in his mid 30’s with a local business in electrical and electronic design, repair, and maintenance. He collaborates with the local university and other local institutions and has offered to loan milling and 3D printing machines and facilitate workshops in the makerspace.

P3: An IT developer employed at the local university who is also a participant and organiser of StartUp activities and was one of two main participants who came to every workshops to construct the shipping container space. He described himself as a ‘doer’ and ‘analytical thinker.’

P4: A community member interested in digital fabrication

P5: A university academic

P6: A public servant

P8: A librarian from the local library branch

P7: An artist with a focus on youth engagement

P8: The initial Mixhaus initiative coordinator

In the following data analysis section we review and discuss the process and outcomes to date of the Mixhaus initiative and consider future opportunities.

CROSSING BOUNDARIES

In this section, we present and discuss the data we gathered from interviews, participant observations, and community workshops. Our thematic analysis was guided by the aforementioned theoretical framework of boundary objects (Star & Griesemer, 1989). We found that the Mixhaus maker space presents itself as a tangible artefact or object crossing boundaries along four different dimensions: an organisational mix, a social mix, a disciplinary mix, and a spatial mix. We discuss these four dimensions in turn.

Organisational Mix

As outlined above, the Mixhaus is a community-led maker space that has attracted attention and interest from different organisations that would normally not easily come together, gel, and work together. This consortium of organisations represents an effective triple helix partnership (Foth & Adkins, 2006) in that educational, commercial, and socio-cultural / community interests are being represented and added into the mix. There are two aspects that appeared to be of particular relevance in supporting our analysis that Mixhaus generated an effective organisational mix: (a) the collaborative governance model that evolved from the grassroots process of the initiative, and; (b) the significance of key roles that emerged from our chronological genealogy of how people’s relationships unfolded.

First, the Mixhaus has been led by an informal steering committee comprising the key organisations lending support and assistance both financial and in-kind. Membership is open and transparent. This collaborative governance has been complemented by a dual approach to online and offline community engagement through a Facebook group as well as a regular series of in situ ‘working bees.’ What is remarkable is the capacity of the early Mixhaus vision in cycles #1 and #2 – even before a tangible artefact had been available – to bridge organisational boundaries. As such, the Mixhaus corroborates some of the strategies of strategic essentialism (Dourish, 2010) in that it forges a group identity to realise the overarching Mixhaus vision. That is part of the definition of a boundary object according to Star and Griesemer (1989) who argue that “boundary objects are both adaptable to different viewpoints and robust enough to maintain identity across them.”

As you develop relationships it changes where things go and the way you see others’ perspectives ... and it also affects the practicalities of trying to achieve those goals or objectives ... it doesn’t muddy the water ... just means you are more informed and more to take into account ... there’s different institutional or organisational dogma versus what individuals want to achieve versus what we as a group want to achieve ... the articulation of that shared vision and making that clear and bringing that together ... bringing together all those individual goals so that everyone can understand how they can achieve what they want to do and what they want to do as part of that aggregate achievement. (P2)

Second, as part of our data analysis we conducted a chronological genealogy of how personal and organisational relationships formed and evolved over time. This analysis revealed that the genesis moment as part of the local StartUp Weekend in cycle #1 brought together university academics with staff from both the local government and the youth arts theatre company over an intense weekend-long engagement process. Each entity then reached out and connected with further prospective partners and community members in a fashion similar to the snowball technique well established in qualitative research methods (Patton, 1990).

Social Mix

In addition to the way that the Mixhaus bridges organisational boundaries, it also brings people together

5 https://www.facebook.com/groups/mixhaus/
from different socio-cultural and professional backgrounds. We found in our data analysis that this social mixing goes beyond the mere temporary collocation of people in the same space for the purpose of a meeting, a working bee, or a maker workshop. We will explicate two aspects of the social mix in more detail: (a) different personas involved in the process, and; (b) the cross-generational exchange.

First, our data analysis uncovered a number of user archetypes, or personas (Alan, 1999), that contributed to the organisational mix:

a) The community animator is an instigator and leader – the “keeper of the vision” – building the momentum by organising workshops and setting milestones (Foth, 2006b);
b) The catalyst is a connector and matchmaker who may not be seen in person often, but they are present digitally and introduce new organisations and community groups, and;
c) The silent stakeholder may not offer much in terms of physical labour at working bees, however, their in-kind contributions are essential and generous, such as facilitating introductions to new people, donations of equipment and resources, and the provision of space and facilities.

Additionally, we came across personas similar to those that Bilandzic and Foth (2013) found in their study of a library coworking space: “I-wanna-share-it Garrett” attends working bees with the motivation to contribute their specific skillset to the Mixhaus, e.g. carpentry or electrical wiring. “What-can-I-do-here Sophia” is sporadically seen at early working bees and meetings, attracted by invites from catalysts, trying to figure out what the Mixhaus is all about and how it may contribute to their personal plans and goals. However, they may not be seen regularly or at subsequent events at all. Examples include creative arts and film / TV students who found that the early setup phase of the Mixhaus did not yet give them enough of an idea of what they will be able to use this new space for in the future.

Second, although in the early phases of development, even the setup of the Mixhaus space brought to the fore examples of cross-generational exchanges between younger and older community participants that are worthwhile discussing. In contrast to the often exclusive focus on young people that many innovation policy frameworks entail these days, we found not only nascent examples of “senior-preneurship” (Sahut, Gharbi, & Mili, 2015), but also cross-generational exchanges. Community members also aspired for Mixhaus to be a space that generates cross-generational learning, as this dialogue illustrates:

[Mixhaus is] an opportunity for younger people getting involved and opportunities for less advantaged youth and people. (P1)

In so many ways that Mixhaus is a really powerful little statement and needs to be taken full advantage of to try and connect people and it does in little ways and you can see it creates lots of little connections and ideas. (P2)

Disciplinary Mix

The third dimension along which the Mixhaus can be considered a boundary object is with regards to its inter- and transdisciplinary linkages. Here, we discuss how the boundaries of three typical dichotomies became blurred and intermixed: professionals versus amateurs; digital literacy versus physical skills, and; knowledge versus craft.

First, as a maker space, Mixhaus has attracted both professionals and amateurs. Our data shows how the Mixhaus contributes to forms of connected learning (Bilandzic & Foth, 2017) that complement formal institutionalised education provided by schools and universities. For example, community members interested in learning how to sew with conductive thread are able to participate in a workshop where they learn how to add a glowing LED light to their favourite t-shirt. The workshop facilitator brought her visual arts and sewing skills to bear, supplemented by DIY learning of physical computing components, such as the LilyPad Arduino. This example further corroborates studies outlining the rise of the trend towards DIY and DIWO (Mota, 2011; Paulos, Kim, & Kuznetsov, 2011; Ratto & Boler, 2014).

I expect to learn new and different aspects of electronics and building from a hobby point of view, fantastic to make connections with people in local community for solving problems … So far I am picking up DIY skills in around the container / space, which is really useful going forward … that I previously didn’t have … once you have a physical space and person … easier to bounce ideas off, compared to online … someone who is physically there is more likely to trust they will share and the attitude is transparent. (P5)

Second, the Mixhaus is equipped to allow for maker projects in a mixed realm that bridges both physical and digital fabrication. The aforementioned example combines physical components such as the fabric of the t-shirt, the conductive thread, the LED light, with digital components such as Arduino software to program different light patterns. In some previous projects, this has been used to connect data sources, e.g., exposure to air pollution, with the light visualisation in order to display different colours for clean air versus polluted air (Iossifova & Kim, 2004).

Third, related to the resolution of the digital vs physical dichotomy, the Mixhaus also connects what Francisco (2007) calls specification vs craft culture. The disciplines that are driven by a specification culture largely subscribe to the Greek term “epistēmē” referring to knowledge-based disciplines and approaches, largely leading to “white collar,” service-oriented jobs. In contrast, “blue collar” community members with trade qualifications and experience contribute their architectural, design, arts and craft skills (Greek: technē). Rather than reflecting society’s two class system that all too often considers knowledge-based skills superior to crafts-based skills, Mixhaus introduces a levelling factor that puts them on a par and makes clear how each skillset makes unique contributions that the other one is not able to fulfil on its own.

In lay terms, this dichotomy is often referred to as the creative-right vs the analytical-left brain. However, it has
deeper implications with regards to a society that has increasingly been optimised for a one-sided orientation towards the analytical world of épistémē. Community members of the crafts/technē persuasion often struggle to establish a sense of belonging. Mixhaus responds to these struggles by offering a supportive and inclusive space for creatives. In the words of a commentator, Mixhaus resolves the “conundrum of creating a club for people who hate to belong to a club that has them as a member.”

**Spatial Mix**

Finally, the Mixhaus as a type of living lab situated inside a portable shipping container offers qualities of a nomadic place for fabrication and making. By moving the Mixhaus from one location to another, it acts as a hyperlocal ‘urban acupuncture’ device that contributes towards local placemaking efforts (Houghton, Foth, & Miller, 2015). The Mixhaus as an innovation ‘skunkworks’ in turn has implications for Australia’s innovation agenda and regional economic development policies in that it challenges assumptions behind notions of what counts as entrepreneurial and how should incubation spaces function (Foth, 2015).

In many ways I think that’s where Mixhaus fits in well because it’s mobile … and it's not just that identification with one particular group or one particular location. (P3)

Moreover, there are possibilities and opportunities related to the aforementioned disciplinary mix at the intersection of épistémē and technē. They have led community participants to also question the spatial quality of the Mixhaus. They have started to refer to the Mixhaus not only as a space but a mobile, portable, nomadic platform. This notion illustrates the way that it creates a foundation in the community on top of which other opportunities can be envisaged and initiatives can be built, which in turn can connect with other areas of interest, such as civic activism (E. Gordon & Mihailidis, 2016).

A platform to get people involved and a new way to create revenue … building things for other things to build on … facebook for game developers and business to market themselves … creating opportunities. (P1)

I see Mixhaus as a moulding together of all of them [interests] on a higher level project wise. (P1)

Somewhere [Mixhaus] where people can get hands on experience, which is very important with the laws and regulations of the Australian Government. I have worked with university students who don’t know what a fuse is so hands on stuff – basic knowledge lost / not being learnt, because [regulations] barred from getting practical experience. Yet, here [with Mixhaus] people are able to step outside the box and have a place to and access to tools to do this. (P4)

If something has to be done try to avoid bureaucracy – better to ask for forgiveness than permission – easier to write code and see what happens than ask what someone thinks first, same as physical stuff … could sit around and plan but better to try something from scratch and start again. (P3)

**CONCLUSIONS**

This paper presented our critical account of accompanying the development of the Mixhaus from the initial ideation and conceptualisation to the actual deployment and first evaluation of its impact. As with many action research studies, the tendency to remain idiographic is inherent in a single case study and its qualitative approach. From a socio-cultural animation perspective (Foth, 2006b), as researchers we sought to increasingly make ourselves redundant and hand over responsibility and leadership requirements to local community stakeholders. Considering that the academic funding for this project has come to an end, it has been our aspiration right from the start to ensure the Mixhaus makerspace is community-led and continues to have a life of its own. It appears we have partly achieved this goal, yet it is too early to tell to what extent the Mixhaus will have an impact on levels of digital participation in the community, and if the Mixhaus will weather the dynamics – and at times turmoils – of the local community’s communicative ecology.

As a boundary object, the Mixhaus has demonstrated its ability to be tailored to the circumstances and limitations of the local community. At the same time, it remained stable enough to provide a shared vision that connected different stakeholders and started to dissolve boundaries. However, the planning and engagement activities associated with the Mixhaus initiative also brought to the fore difficult and challenging social and personal discrepancies amongst community members. This reminds us of existing critique the notion of boundary objects has received, which we concur with. As an inanimate artefact it does not possess mediating or diplomatic qualities per se; in fact, sensitivity, diplomacy and humility are required as additional skillsets in order to bring such community-led initiatives to fruition.

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