DIY Media Architecture: Open and Participatory Approaches to Community Engagement

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ABSTRACT
Media architecture's combination of the digital and the physical can trigger, enhance, and amplify urban experiences. In this paper, we examine how to bring about and foster more open and participatory approaches to engage communities through media architecture by identifying novel ways to put some of the creative process into the hands of laypeople. We review technical, spatial, and social aspects of DIY phenomena with a view to better understand maker cultures, communities, and practices. We synthesise our findings and ask if and how media architects as a community of practice can encourage the 'open-sourcing' of information and tools allowing laypeople to not only participate but become active instigators of change in their own right. We argue that enabling true DIY practices in media architecture may increase citizen control. Seeking design strategies that foster DIY approaches, we propose five areas for further work and investigation. The paper begs many questions indicating ample room for further research into DIY Media Architecture.

Categories and Subject Descriptors
Human-centered computing~Interaction design theory, concepts and paradigms; Applied computing~Architecture (buildings); Applied computing~Media arts

Keywords
Media architecture; do it yourself; DIY; do it with others; DIWO; maker culture; participation; engagement; citizen control

1. INTRODUCTION
The discipline of Media Architecture is developing and growing as designers, architects, and planners realise the practice and promise that the combination of digital media and architecture can provide to enhance the experience of the built environment. Not only do the professionals in these disciplines need to consider how to incorporate the use of technology into the development of their profession, but they need to understand how technology can be used to improve how people engage with the built environment.

According to Brynskov et al. [6: p. 1-2], *"Media Architecture is an overarching concept that covers the design of physical spaces at architectural scale incorporating materials with dynamic properties that allow for dynamic, reactive or interactive behavior. These materials are often digital, but not always, and they allow architects and (interaction) designers to create spatial contexts for situations using a variety of modalities."* Media façades are a typical example of media architecture, i.e., building surfaces that can display purposeful information using, e.g., light or projected animations to express changing moods of the occupants of a building. In this paper, we explore the coming together of the three main elements in the creative process of developing Media Architecture: the tangible platforms (façades and other physical material); digital media (smart phone, screen applications, etc.), and; design approaches. In doing so, we examine how to bring about and foster more open and participatory approaches to engage communities, and which part of the creative process depends on the craft and technical skill of experts. We are interested in identifying novel ways to put some of the creative process into the hands of laypeople, and in investigating the impact this may have on community engagement and citizen control.

This paper first explores DIY(do it yourself) and DIWO (do it with others) phenomena by looking closer at three categories of approaches and practices: DIY in *technical* domains (section 2), *spatial* domains (3), and *social* domains (4). We review and analyse each area to then synthesise our findings to propose a variation of Media Architecture that we call DIY Media Architecture. We examine some of the commonalities that may bring these related DIY fields together and what motivates the DIY cultures, communities, and practices. The aim of this paper is to animate and contribute towards a wider discourse. We ask if and how media architects as a community of practice should encourage and foster to 'open-source' our tools and approaches in order for laypeople to not only participate but become active instigators of change in their own right.

2. TECHNICAL DIY: MAKER CULTURE
In his book "Making is Connecting," Gauntlett [19] discusses the shift from Web 1.0 to 2.0 as becoming a "communal allotment" where the ability to share information, ideas, and creations became a reality encouraging participation and collaboration. *"Rather than just seeing the internet as a broadcast channel, which brings an audience to a website (the '1.0' model), Web 2.0 invites users in to play. Sites such as YouTube, eBay, Facebook… are clearly better the more people are using and contributing to them"* (19: p. 7). The ability to connect and communicate through Web 2.0 [27] with people all over the world has assisted not only in the organisation and establishment of networks supporting real-world activities [19], but also what Gordon and de Souza e Silva call "net localities" [21].

As interests in digital activities surge, there has also been resurgence in the practice of craft culture [16]. The value of craft lies in the skills required to create handmade and unique artefacts as opposed to the skills of the expert elite [19]. The notion of DIY arose out of the open-sourcing of craft so that the skills and knowledge required to create, was accessible to anyone and not a matter of affordability that arose from "American optimism, and communicated in a cheerful and unpretentious way" [19: p. 49]. We note the difference between the craft world and art world and acknowledge that those in the pursuit of making may primarily seek neither fame nor fortune, but the enjoyment of the experience of making and creating and sharing artefacts.

Opting for a DIY approach is sometimes based on an implicit decision to oppose consumerism and instead promote individual creation that often goes beyond the material or tangible artefact, as it spills over into the crafting of experiences as well. With the combination of Web 2.0 networking and an increasing interest in making things yourself, the DIY culture has gone beyond the craft world to encompass the development and sharing of technological knowledge, what is referred to as the maker and hacker cultures [1].

The maker culture promotes informal environments supporting peer to peer learning and learning through making, regarding mechanical and technology driven interests such as 3D printing, computer numerically controlled (CNC) machining, soldering, tinkering, robotics, metal and woodwork. Hackerspaces and FabLabs are examples of "maker spaces" which are found across the globe, with an increasing prevalence in public libraries [4]. Out of the Center of Bits and Atoms at MIT, the FabLab initiative arose as a workshop aimed at providing self-replicating tools to communities. Currently there are 89 FabLabs in 23 countries according to fabfoundation.org. Hackerspaces are community operated informal learning spaces that promote collaboration [4, 7]. Hackerspaces typically house digital fabrication machinery such as 3D printers and CNC routers in addition to soldering and woodworking tools. Mota [30] describes the creation of Hackerspaces as a direct response to the needs and interests of the community who participate within them. The success of digital fabrication is attributed to the DIY movement, which is based on self-improvement through the development of new skills and knowledge: *"Access to tools capable of turning digital designs into physical objects, coupled with the ease with which digital files can and are being modified and circulated, is bringing a third dimension to the practices of sharing, mashup and remix, and giving everyone the opportunity to not only reinvent and shape the world of bits, but also the world of atoms. The next decade will tell if indeed… we are makers."* [30: p. 286]. The affordances of digital networks combined with a resurgent interest in craft culture and DIY movements reflect the power of personal creativity and making throughout communities across the world [7].

The hacker culture comes from a community that has a passion for computers, their development, and a strong belief that information should be free, specifically Free Open Sourced Software [29] and is based on Castells' ideals of *"individual freedom, independent thinking, and of sharing and co-operation"* [cited in 34: p. 24].

Acknowledging the importance of the amateurs or lovers, in the evolution of technology, Paulos supports DIY cultures and calls on technologists and engineers to shift their thinking towards more participatory collaborations and innovations. He encourages ubiquitous computing researchers to enable participation from the everyday citizen to address global issues such as climate change, famine, and poverty [32, 33].

Similar to the shift to Web 2.0 that allows users to create digital content, tinkering platforms have been developed assisting more people to participate in hacking and making. The development of primarily open-sourced and off-the-shelf hacker tools have made it possible for anyone to combine microcontrollers with sensors to build experimental computing for individual purposes [11]. Such tools streamline the process so that users do not need extensive knowledge in computer science, programming or electronics in order to create interactive environments, citizen science sensor networks, robots, or drones themselves. Such platforms and tools include: Arduino, Wiring, Raspberry Pi, MakeyMakey, Ninja Blocks, Beagleboard, SmartCitizen.me, Phidgets, Teensy, and many others.

3. SPATIAL DIY: PLACEMAKING

The crafting of place, DIY placemaking is a concept we describe that encompasses a range of urban interventions for the purpose of appropriating public spaces to assist in civic engagement, the communication of often political messages, or to simply improve the quality and experience of a place. Examples of DIY and DIWO placemaking practices include guerrilla gardening and seed bombing, guerrilla knitting / yarn bombing, parkour and graffiti, which we will now discuss in turn.

The aim of guerrilla gardening is to turn abandoned city spaces into beautiful gardens. Guerrilla gardeners are armed with shovels, hoes, plants, and watering cans all used to plant flowers, vegetables and herbs in unused spaces [20]. Key characteristics of guerrilla gardeners are the use of quick surprise attacks on neglected and weed encroached parts of the neighbourhood [20]. Although there is a parallel drawn between the guerrilla soldiers and gardening warriors, guerrilla gardening movements are seen to be peaceful movements which provide colourful, sometimes edible responses to overgrown and abandoned areas within the urban spaces we live in.

"Guerrilla knitting is defined as a range of practices that employ 'vigorous' or 'militant' knitting activity in mass demonstrations, in urban interventions, and for political causes, using knitting in controversial, unusual, or challenging ways" [31: p. 143]. The juxtaposition of the tangible, tactile, and colourful characteristics of knitting in an urban setting such as around a park bench or bike rack (Fig. 1), makes the presence of knitting felt and known to the city dweller.

Figure 1. Yarn bombed bike rack. [Eli Carrico, Flickr CC]

Corbett and Housley wrote *"The Craftivist Collective Guide to Craftivism"* [9] which defines craftivism as the promotion of

human rights issues through the combination of activism and craft.

Crafts such as cross-stitching are used as tools to spread the message while activism is the core goal of craftivist projects [8, 9]. Crafted or handmade objects placed in the built environment reflect the efforts of the people who made them and therefore increase the engagement and respect that the general public have for such objects compared to mass produced and off-the-shelf objects [8, 9]. The political choice to not buy but to create something for yourself, is how crafts such as knitting, weaving, gardening, cooking, and sewing have taken on activist characteristics [19].

The craftivist collective relies on a central website (craftivist-collective.com) to organise projects and people across the world. The website collects images and information about the projects in order to display the impact of their collective efforts [8, 9]. The collective also uses a range of social media to promote craftivism to a wide range of people [8, 9].

Parkour is an urban play form where the player (traceur) relies on calisthenics and gymnastics to traverse through the built environment [35]. It is a creative reinterpretation and a sensory experience of space. The perception and understanding of the material form and feeling of the city is heightened as the traceur moves over and between buildings, bridges, walls, etc. The playful activity of parkour is challenged by the boundaries created by the built environment, and it is the overcoming of these obstacles that generates feelings of empowerment and ownership of physical space. *"Parkour's emotional connection with place comes as a result of both the sensually intimate nature of Parkour activity and the use of a conceptual frame highly integrated with the urban context."* [35: p. 9]. The urban experience that parkour offers, although not necessarily illegal, does illicit conflict with the normative regulations, ownership boundaries, private space, etc. Parkour exemplifies the DIY appropriation of public space for the crafted physical experience of the city for purposes of fitness and exercise.

Figure 2. Graffiti. [Jungla, Flickr CC]

Graffiti is often viewed as an act of vandalism and therefore considered against the law in many cities. Iveson argues that, *"graffiti writers demonstrate by their actions that they do have a right which is denied them by law – the right to use the surfaces of the city as a medium of public expression. The 'right to the city' is a cry, a demand and a lived experience in the face of exclusion."* [24: p. 436]. Research into graffiti found that it is a complex form of expression where individuals purposefully affect urban environments through their art, where the right to public vs. private space becomes contentious. Graffiti blurs the edges between property and behaviour codes, and is seen to

construct "a sense of place where sociality is in question" [12: p. 39]. Graffiti writers usually do not wait for permission or seek formal approval, they do it for themselves, and therefore we consider them to be part of DIY place-makers.

Graffiti writers tend to consider their work as a way to bring vibrancy and colour to dull urban spaces [38] that are often forgotten (Fig. 2). They use their skills and artform as a means to appropriate public space from corporate business or entities. *"Graffiti writing was a protest at this 'corporatisation' and an attempt to engage with the urban landscape in a way that represent more than private commercialism"* [37: p. 78]. Rowe and Hutton [37] conclude that graffiti is a connection between the writer and the urban landscape. It is an artform that is filled with cultural meaning and highly appreciated by its community. The creation of place through graffiti has been questioned and studied by Dovey et al. [12] who conclude, *"While it is applied to and erased from urban surfaces, it is more than a veneer applied to the urban fabric because of the deeper social identifications it both facilitates and expresses. The graffiti, like the sense of place, is deeply ingrained without being deeply-rooted as essence; it is immanent rather than transcendent,"* [12: p. 38].

4. SOCIAL DIY: URBAN CITIZENSHIP

Having introduced notions and examples of DIY and DIWO movements in both technical and spatial domains, we now briefly discuss two examples of DIY in the social domain – DIY citizenship and DIY urbanism.

In an attempt to link and understand the individual actions, the blurring of borders, the overlapping interests and motivations, we believe there are two key concepts that provide a bigger picture description of what these DIY phenomena mean in a social and urban context. First, Ratto and Boler propose, *"'DIY citizenship,' [as] a term intended to highlight the diversity of ways citizenship is enacted and performed,"* [34: p. 4]. This concept focuses on digitally mediated practices where people rely on social media and Web 2.0 for the sharing of content, ideas, and information to create global communities with interests ranging from political action, craft, design, science, and technology. This open sourcing of information can also be viewed as political as it questions the rights of public vs. private property and challenges boundaries of authority [34]. DIY citizenship asks how people and communities are using creative ways to shape, alter, and rebuild their environments to be how they want them to be and not how they must be. DIY citizenship goes beyond standard political actions such as voting but is about participation, diversification, and social interventions.

Second, Iveson [25] proposes DIY urbanism as a link between the small actions and appropriations of urban space such as the ones mentioned previously (Guerrilla Gardening, Parkour and Graffiti) into a larger understanding or vision that affects the socio-cultural experience of cities. What links these small actions is that the inhabitants of the city imagine and create a tailored city within the city by occupying or transforming urban spaces through the injection of new meanings and functions [25]. These inhabitants are motivated by their own purposes and often operate at the fringes or even outside existing policies and laws, they take action upon their rights as inhabitants of the city.

5. TOWARDS CITIZEN CONTROL

Dade-Robertson [11] makes the analogy between Graphical User Interfaces (GUIs) of personal computers with how he defines *Architectural User Interfaces* (AUIs) as buildings that

mediate between computational information and people. In so doing, he connects the disciplines of architecture and human-computer interaction (HCI), arguing that not only does media and technology affect how people experience urban environments, architecture similarly has an affect on the development of computer technologies [11]. He believes that through the rise of ubiquitous computing the value of physical environments has been re-acknowledged increasing the opportunities for architectural influence on the evolution of HCI practices. The call for architectural knowledge and input into HCI research is reinforced by Fischer et al. [13] who claim that the architecture provides spatial understandings that can assist in the development of urban HCI systems. They argue that through an architectural approach public displays can be refocused *"for a city beyond information and utility"* [13: p. 39].

As the UK graffiti artist Banksy states, *"twisted little people ... go out everyday and deface this great city. Leaving their idiotic little scribblings, invading communities and making people feel dirty and used. They just take, take, take and they don't put anything back. They're mean and selfish and they make the world an ugly place to be. We call them advertising agencies and town planners"* (cited in 41: p. 78). As some like Banksy may think that media architecture – if not considered and appropriated properly – runs the risk of polluting the city with more advertising and media 'junk.'

We would like to ask how can media and architecture be combined to help people take control, appropriate place, and create communities. Acknowledging that media architecture is an emerging field that combines people, place, and technology in a similar way to related hybrid practices such as urban informatics [15], it has an effect on the way the city is experienced and how people come together. This paper seeks to question what role will it have in facilitating communication and the interaction of city inhabitants?

To explore this question we have identified existing examples of the ways in which media and architecture are currently combined to consider how they are communicating and interacting with the cities in which they exist. Based on works by Verhoeff [42], Arnstein [2] and Foth et al. [14], we revise Fritsch and Brynskov's scale of interactivity [18] by presenting attributes as independent qualities rather than a strict hierarchy. We further extend their work by proposing additional characteristics of media architecture, the notions of *performative* and *citizen controllable*. The attributes are not intended to be linear or progressive; they can be understood as qualities that can occur in parallel or alongside to one another.

☐Static ☐Dynamic ☐Reactive ☐Interactive ☐Participatory ☐ Communicative ☐*Performative* ☐*Controllable*

We employ these attributes of interactivity to assess the quality of select examples informing how they are used, to ultimately propose a variant approach to media architecture, that is, DIY Media Architecture. What can be learnt from these examples to identify opportunities for further development and ultimately push the boundaries to promote a higher level of community engagement through media architecture, one that is based on the appropriation of urban spaces by city dwellers?

The following sections examine a range of media architecture examples from across the world that range from large-scale buildings to small-scale installations; media façades, media structures, digital urban screens, media projections, and tangible media architecture interfaces.

5.1 Media Façades

The Star Place, Kaohsiung, Taiwan (Fig. 3), designed by UNStudio in 2008 is an example of a dynamic media façade. As described by Haeusler et al. [22] the Star Place façade is designed to reflect the luxury shopping experience offered by the building. The media façade is animated by coloured lights, *"that respond to the building's setting and purpose"* [22: p. 27]. Based on the interactivity scale this piece of media architecture is an example of a dynamic façade.

☐Static ☑**Dynamic** ☐Reactive ☐Interactive ☐Participatory ☐Communicative ☐Performative ☐Controllable

Figure 3. Star Place, Taiwan. [Mastahanky, Flickr CC]

The façade provides little opportunity for individuals to interact directly with it. The façade is used to attract the attention of people and to promote the status of the building and those that occupy it. The combination of media and architecture in the Star Place building is an example of a top-down approach where the property owners, architects, and designers direct the media onto the street and urban environment providing no possibilities for people to direct their own media or information onto the façade. The media façade was part of the initial design and integrated into the building's form and structure.

The Ars Electronica Center in Linz, Austria (Fig. 4), is an example of media architecture that reflects the meaning of the building itself through its dynamic and interactive façade.
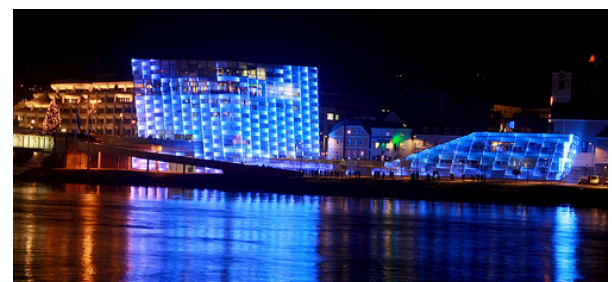
Figure 4. Ars Electronica Center. [Rubra, Flickr CC]

As stated on their website, *"The Ars Electronica Center is the architectural expression of what Ars Electronica is all about: a place of inquiry and discovery, experimentation and exploration, a place that has taken the world of tomorrow as its stage, and that assembles and presents influences from many different ways of thinking and of seeing things."* In keeping with the Ars Electronica festival, which combines art, technology and society, the building provides spaces for conferences, research, exhibitions, workshops, research and development [22]. The media façade consists of a glass skin with 40,000 LEDs that is

made available to designers, artists, and researchers. In some instances, it has been used to explore the interaction of people through mobile phones. This building has been designed and created to go beyond dynamic and encourage interaction and participation from the public.

☐Static ☑**Dynamic** ☑**Reactive** ☑**Interactive** ☑**Participatory** ☐Communicative ☐Performative ☐Controllable

In one example of its use, participants from the general public – via a digital music player – were able to plug into the building façade where it then reacted creating a lightshow performance based on the music the individual chose to play. Allowing users to plug into the façade and select music enables them to control the content of the façade. The media façade of this building was also an integrated part of the building design that informed its form, structure, and materiality.

5.2 Media Structures

D-Tower is an interactive public artwork created by architect Lars Spruybroek from NOX-architekten and artist Q.S Serafijn who were commissioned by the City of Doetinchem, The Netherlands in 1999 to 2004 (Fig. 5). The purpose of D-Tower is to record feelings of happiness, fear, love, and hate expressed by the city inhabitants through a web based questionnaire. The website collects answers from participants and calculates the overall mood of the city. The D-tower lights up at night to show the dominant feeling based on the colour displayed.

Figure 5. D-Tower. [Hugo-Photography, Flickr CC]

The D-Tower is dynamic by reacting to the information provided by the submissions collected on the website. The tower does not provide for direct interaction from people on the street but does call for a larger participation via the website which is then communicated back to the community.

☐Static ☑**Dynamic** ☑**Reactive** ☐Interactive ☑**Participatory** ☑**Communicative** ☐Performative ☐Controllable

The D-Tower was designed and constructed to specifically include media and technology in its architecture for the purpose of encouraging participation from the city community.

5.3 Urban Screens

Discussions in Space (DIS) is a situated engagement tool that promotes public participation through a digital public screen [40]. Users can send a message via SMS, Twitter, or a web based platform to the screen. The purpose of DIS is to expose context specific questions about place to encourage everyday people to be involved in the discussion regarding local issues and have their say. Discussions in Space has been used at Federation Square in Melbourne since 2011 (Fig. 6). It forms

part of the regular programming of their iconic big screen and engages with visitors during events such as Oprah's visit, New Year's Eve, Cadel Evans' 2011 Tour de France victory parade, the Queen's Royal Visit, and Thoughts for Molly Meldrum.

DIS is dynamic, it is constantly changing depending on the users and their interaction with it. It reacts to the amount of input provided and encourages interaction and participation by displaying the comments that are sent to it. DIS promotes communication by exposing a question that is important to the context in which it is located.

☐Static ☑**Dynamic** ☑**Reactive** ☑**Interactive** ☑**Participatory** ☑**Communicative** ☐Performative ☐Controllable
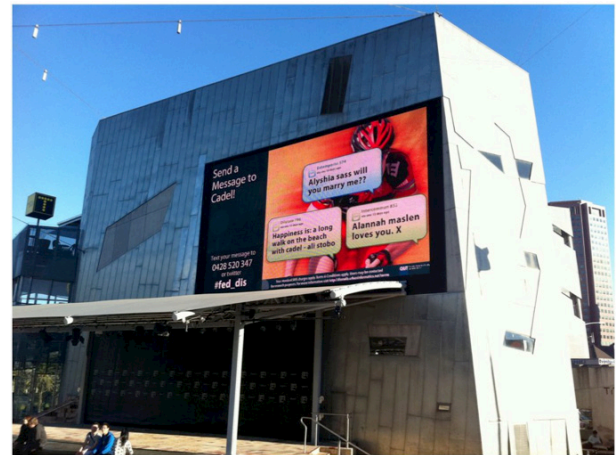

Figure 6. Discussions in Space, FedSquare Melbourne.

Discussions in Space is an application that was designed for use on large media screens which have typically been retrofitted onto building façades. This is the first example we discuss where the design of the media and the architecture were not part of the original architectural design. Discussions in Space can be run on any digital screen, therefore, there is no direct correlation between its design and the design of the architecture or urban space in which it is applied and used.

Figure 7. CubIT running on The Cube, Brisbane.

The Cube is part of Queensland University of Technology's Science and Engineering Centre (Fig. 7). It is currently one of the largest digital and interactive learning and research spaces in the world promoting explorative and participatory experiences to the university community and the public. It is composed of more than 40 multi-touch screens and 14 high definition projectors (thecube.qut.edu.au). The content that is created for display on The Cube is mainly based on STEM (science, technology, engineering and maths) research and artistic

practice. The Cube hosts a range of hands-on workshops for schools, provides residencies for artists and researchers, and a series of public events focused on engaging with the STEM disciplines of the university.

The purpose of The Cube is to engage with the learning of the STEM disciplines through an interactive and technologically based environment. The content on The Cube is designed to be highly dynamic and reactive to the user interaction and participation. Primarily, The Cube displays information or content, however, through one of the purpose-built applications called CubIT, registered users are able to display digital files on the interactive screens [36]. Through its residencies and workshops, people can create content to be displayed on The Cube, however, it is not something that anyone can do at any time, therefore it is participatory only to a degree.

☐Static ☑**Dynamic** ☑**Reactive** ☑**Interactive** ☑**Participatory** ☑**Communicative** ☐Performative ☐Controllable

The Cube is situated within a designed for purpose part of the Science and Engineering Centre. The design and placement of The Cube is intentional for the purpose of direct interaction and engagement with students, staff, and the public.

5.4 Media Projections

The project **Night Lights** created by YesYesNo Interactive Projects in collaboration with The Church, Inside Out Productions, and Electric Canvas, focused on turning *"the Auckland Ferry Building into an interactive playground"* (yesyesno.com/night-lights). YesYesNo Interactive Projects is a media collective based in New York City who focus on creating interactive media and magical, creative, artistic, technological installations.

Figure 8. Night Lights. [yesyesno.com/night-lights]

The purpose of the installation was to go beyond projection onto the façade of a building by allowing participants to become performers through the amplification of their movement onto the building (Fig. 8). Phone, hand and body interaction were incorporated into the performance and amplification on the building (yesyesno.com/night-lights). This project sits highly on the interactivity scale as it allows users to become the creators of the content that is projected onto the building through their performance. Night Lights is dynamic, reactive, and interactive promoting participation and performance from its users. The media façade does not communicate any semantic information.

☐Static ☑**Dynamic** ☑**Reactive** ☑**Interactive** ☑**Participatory** ☐Communicative ☑**Performative** ☐Controllable

Night Lights is an installation designed to be projected onto the existing façade of a building. In this case the media is not related to the design of the building.

5.5 Tangible Media Architecture Interfaces

The Smart Citizen Sentiment Dashboard is described by Behrens et al. as a Media Architecture Interface (MAI), *"the synthesis of situated 'tangible user interfaces' (TUIs) connected to media facades in urban space,"* [3: p. 2]. The dashboard was connected to the existing media façade of the FIESP building in São Paulo, Brazil, during a three week media arts festival in September 2013 (Fig. 9). The dashboard was situated across the street from the building and next to the transport entrance that allowed users the distance to see the full façade of the building. The dashboard employed RFID technology so users can interact with it using their transport RFID tags to indicate their mood and respond to issues regarding the use of technology in the city such as environment, transport, safety, public space, and housing [3]. The response from the users was then translated onto the media façade through animations including mood indicating colours and icons, for all else to see. Each response was aggregated to the existing responses indicating *"an overall 'sentiment' of the city towards its urban challenges"* [3: p. 4].

Figure 9. Smart Citizen Sentiment Dashboard in São Paulo, Brasil. [N Valkanova, Flickr CC]

The Smart Citizen Sentiment Dashboard encourages users to participate in the communication of the sentiment of the city. The media façade becomes interactive through the dashboard. Without the use of the dashboard users do not have the ability to interact with or communicate through the façade.

☐Static ☑**Dynamic** ☑**Reactive** ☑**Interactive** ☑**Participatory** ☑**Communicative** ☐Performative ☐Controllable

The design of the tangible component of the Smart Citizen Sentiment Dashboard is in direct response to the engagement it intends to solicit from its users. The application that connects the dashboard with the building is retrofitted onto the existing media façade of the FIESP building. Previously, the façade did not allow interaction from users on the street.

The **SMSlingshot** is described by Fischer et al. as, *"a media façade system at the confluence of art, architecture, and technology design in the context of human computer interaction"* [13: p. 38]. The purpose of the SMSlingshot is to promote civic and social dialogue through a participatory approach. The SMSlingshot is a tangible device allowing users to type a text message that is 'shot' onto the media façade (Fig. 10). The process of shooting onto the screen is intended to *"evokes memories and feelings of childhood unruliness. This playful rebellion gives the slingshot a guerrilla-like quality, which fits with our overall vision of 'reclaiming the screens'"*

[13: p. 40]. The act of shooting is performed by the user creating a sense of control over the creation of content for the façade. Fischer et al. [13] argue that the ability to shoot across a long distance onto a large media façade heightens the user experience by bridging the gap between architectural and human scales.
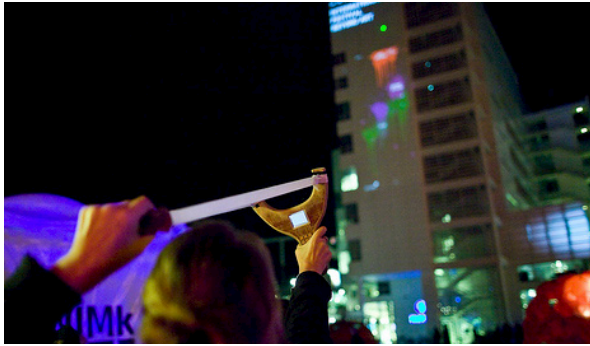

Figure 10. SMSlingshot at the TodaysArt Festival, The Hague, The Netherlands, 2011. [Haags Uitburo, Flickr CC]

The SMSlingshot provides the creation of a dynamic and responsive media façade that promotes participation and performance from the situated public as indicated on the interactivity scale.

☐Static ☑**Dynamic** ☑**Reactive** ☑**Interactive** ☑**Participatory** ☑**Communicative** ☑**Performative** ☐Controllable

The SMSlingshot media façade system can be categorised as a Media Architecture Interface, as it, too, has been designed to act as the mediator between the participation of the city users and the media façade. This system can operate on either a digital screen or through projection, therefore, the design of the building is not in direct response to the media.

6. DIY MEDIA ARCHITECTURE

In this section, we first review examples of nascent DIY Media Architecture. What sets these examples apart from those examined in previous sections is that these were not developed as media arts projects or installations for a client, a festival, or dedicated media façade or screen, they are created from the bottom up. These examples are the result of a need to communicate to a large audience. The creators had big ideas and messages they wanted to share with the general public and found that the built environment provided the best medium to do so.

Second, we look at the building blocks of DIY Media Architecture and review a number of 'kits,' prototyping tools and platforms to enable others to use and reuse some of the resources that were originally being created for a specific Media Architecture project. Such tools and platforms not only enable a reuse and recycle approach to the artefacts and building blocks, but also a remix culture that encourages adoptions, adaptations, and appropriations in the spirit of open source and DIY.

Third, we tentatively and carefully propose a number of additional areas of investigation to help create some more robust design strategies to enable true DIY Media Architecture to flourish.

6.1 Examples

The following two examples involve projection onto the built environment. They can be described as guerrilla projection which is a tactic contributed by Corbin and Read in the guerrilla handbook, "Beautiful Trouble" [10]. Guerrilla projections are used by activists as a medium to broadcast and deliver a message. The benefits of this tactic are the temporary reach that projection provides, by allowing the message to be placed on the façade of a building or an area that is not physically accessible [10]. This tactic is generally risk free and low cost while also visually appealing by casting light on the "opposition." The projection can be mobile, malleable, and interactive in combination with online tools that supporters can tweet or SMS messages displayed in real time.

The **SMS Guerrilla Projector** (Fig. 11), created by Troika in London, 2005, is a homemade projection device allowing users to project SMS text messages in public spaces including streets, signs, onto people, and buildings (troika.uk.com/project/sms-guerilla-projector). Troika is the name for the art and design studio of three artists who work together: Cony Freyer, Eva Rucki, and Sebastien Noel. They are the authors of the book "Digital by Design." As artists and designers, their work takes a creative approach to the use of technology to explore its impact, raise questions, and experiment with its potential [17].

Figure 11a and b. Troika Projection and the Troika Projector [troika.uk.com/project/sms-guerilla-projector]

Mark Read created the **Bat Signal Project** (Fig. 13 & 14), as a part of the Occupy Wall Street Movement in 2011, which included large-scale guerrilla projections onto buildings in New York City [26]. The projection displayed the 99% image along with a series of quotes that were chanted by the tens of thousands of protestors walking across the Brooklyn Bridge with LED candles.

Figure 13. Bat Signal, NYC. [Joe Lustri, Flickr CC]

The power of guerrilla projection is described by Corbin and Read: *"Projections help us upend the power dynamic. The buildings of the powerful can feel so big and our voices and protest signs so small. But when a huge '99%' bat signal lights up the sky, or you see your own handwriting scrawled across a coporate HQ in real time, it begins to level the playing field. Small voices are writ large."* [10: p. 113].

The issue of scale is made clear by this statement where individuals often feel small in comparison to tall buildings that are representative of large organisations or corporations. By projecting onto a building façade, the size of the statement is in direct response to the size of the building and the size of the corporation. Although the activists may feel small in physical stature, the projection medium allows their voices to be largely visible to a greater portion of the audience and increasing the reach, size, and perhaps value of their message.

Figure 14. Guerrilla Projection, Occupy Wall St movement. Image Credit: Brennan Cavanaugh via Flickr CC

Understanding the basis for DIY and DIWO cultures is an important aspect to the development of DIY Media Architecture. Examples of DIY Media Architecture not only possess a ground up outcome, it is the process, the design, and development that entails a DIY approach and fundamentally seeks to provide a voice or communication means for the local community or the public at large.

Figure 15. 3D Print Canal House. [Andrew Sides, Flickr CC]

The **3D Print Canal House** (Fig. 15) is a form of DIY Media Architecture where 3D printing technology is being developed to print a canal house in Amsterdam as part of a collaborative research and building project connecting design, technology, science, and the community (3dprintcanalhouse.com).

The project intends to explore the benefits and challenges of 3D printing technology for the construction industry. One of the strengths of 3D printing is the ability to create customisable and detailed artefacts. The project aims to use sustainable materials to create low-impact housing solutions for any global location. The fundamental design, research and production of the 3D Print Canal House relies on the open sourcing of information, *"What makes the 3D Print Canal House special is that it is a project which is 'open' in every way: The initiators, designers and builders (DUS architects) are the client: the focus is on research, experimentation and development, instead of finishing a house"* (3dprintcanalhouse.com). Some of the components are made of translucent plastic and when experimented with different lighting options the building becomes an example of DIY Media Architecture.

6.2 Prototyping tools, kits, and platforms
Inspired by the success of the DIY, DIWO, and tinkering platforms that we briefly introduced above, such as Arduino, Raspberry Pi, and MakeyMakey, media architects have started to devise their own custom-made prototyping tools, kits, and platforms. Hoggenmüller and Wiethoff [23], for example, presented *LightSet* as a way to enable urban prototyping of interactive media façades. Their work extends and integrates the *LightBox* previously discussed by Wiethoff and Blöckner [43] as well as research by Korsgaard et al. [28] on the *Odenplan*.

Tools and platforms such as these, are essential to enable more sophisticated, advanced and complex creations, an upscaling of situated media architecture design interventions, better collaborations, as well as to avoid reinventing the wheel. However, one of the key self-acknowledged issues with many such tools and platforms remains the expert level technical knowledge and know-how required in order to master them for both laypeople and novice media architects trying to become productive and create impact.

Working on improving both accessibility as well as useability of prototyping tools, kits, and platforms is currently a significant endeavour in media architecture, as can be seen by the diversity of workshops held at this year's Media Architecture Biennale with not less than four of them focussing on issues related to themes of prototyping and open source:

- Tools, Services and Building Blocks for Creating Media Architecture;
- Prototyping Interactions with Media Façades;
- Open Source Media Architecture;
- Fingies Toolbox for Media Architecture.

We believe it is useful to review and reflect on the experience in other domains and disciplines in order to leapfrog our own undertakings.

6.3 Strategies
We finally seek to tentatively propose a number of areas for further investigation in order for us as a community of practice to eventually come up with more robust design strategies and recommendations. This section is meant to stimulate and continue a broader discussion not only of what it means and what it takes to enable DIY Media Architecture, but also what impact it may have – both good and bad.

Mostly used in the context of community consultation in urban planning, the highest level in Arnstein's Ladder of Citizen Participation is 'citizen control' or 'empowerment' [2]. Similar

taxonomies have been adopted by the *International Association for Public Participation* in their IAP2 Framework and Toolkit (iap2.org). We argue that enabling users, i.e., residents, citizens, people, of media architecture to not only 'use' – even in the most participatory manner – but also to become DIY designers and creators in their own right, may lead to citizen control. In order to foster design approaches and strategies that lead to citizen control, we propose five areas for further work and investigation. In our view, DIY Media Architecture requires:

1. Transdisciplinary teams with expertise that covers social, spatial and technical research and design domains;

2. Participatory approaches and methodologies – not just for the artefact at the end, but also the design process (e.g. Participatory Design, Participatory Action Research);

3. Open source repositories of code and documentation;

4. Creative commons licensing;

5. Design strategies that allow for future tinkering, expansions, appropriations, and remixes, and for those DIY and DIWO activities to be documented, too, in a similar fashion to Brand's famous work in architecture itself [5]. Brand [5] famously encouraged architects to embrace the fact that the designer's intent is not always identical with the way people use, perceive, or appropriate an artifact.

7. CONCLUSIONS
Learning from existing activist cultures and the DIY movements, the solution for media architecture in engaging with communities successfully will be in taking a meta-design approach. Designers in this field will have to use their expertise and professional knowledge to set up the opportunities and provide the tools for society to take control and combine media and architecture for their own purposes.

Schneider and Till argue that architects have the choice to be a spatial agent, *"one who effects change through the empowerment of others. Empowerment here stands for allowing others to 'take control' over their environment, for something that is participative without being opportunistic, for something that is pro-active instead of re-active"* [39: p. 99]. It is in this vein of pro-activity and open sourcing of information that we aspire for a higher level of application for media architecture, where the boundaries of HCI, interaction design, media, and architecture can be pushed and woven together to allow for DIY Media Architecture to continue to occur.

When considering how to promote DIY Media Architecture, we need to question how such interventions would be governed and how they would be designed? How can spaces and technologies be made available and open to the public so that they can create their own interventions? Do designers and property owners provide the framework and toolkits for DIY Media Architecture to be developed upon? What are novel components and platforms that are needed to create a DIY Media Architecture intervention?

One approach would be *plug & play*, as in the Ars Electronica Center, where a façade is ready for anyone to take control of the content by plugging in their smart device or computer. Another approach similar to the SMSlinghot, is to have a tangible device that acts as the mediator between the façade or projection and the public user. Could property owners and city councils allow façades and public spaces to be "checked out" like the process of borrowing books from a library?

We learn from the examples discussed in this paper that designing for interaction, appropriation, and communication, are critical aspects of DIY Media Architecture. The answers to the questions raised need to be considered from all parts of city makers including planning authorities, councils, architects, designers, property owners, developers, and city inhabitants. A successful urban environment is one that elicits participation from its users, highlighting the powerful combination of media and architecture to provide a voice for the people that will continue to attract interaction in their own right.

As far as we can ascertain, there has not been any research to differentiate between successful community engagement from integrated architectural designs of media architecture versus retrofitted media onto existing architecture. This is an area which needs further investigation to understand the effectiveness of design in the implementation of media architecture.

8. ACKNOWLEDGEMENTS

9. REFERENCES
1. Anderson, C. (2012). *Makers: The New Industrial Revolution.* New York: Random House.

2. Arnstein, S. R. (1969). A Ladder of Citizen Participation. J of the American Planning Association, 35(4), 216-224.

3. Behrens, M., Valkanova, N., Fatah Gen. Schieck, A., & Brumby, D. P. (2014). Smart Citizen Sentiment Dashboard: A Case Study Into Media Architectural Interfaces. In *Proc. 3rd International Symposium on Pervasive Displays (PerDis'14).* New York, NY: ACM.

4. Bilandzic, M. (2013, online first). Connected learning in the library as a product of hacking, making, social diversity and messiness. *Interactive Learning Environments.* DOI: 10.1080/10494820.2013.825811

5. Brand, S. (1997). *How Buildings Learn: What Happens After They're Built* (Rev. ed.). London: Phoenix Illustrated.

6. Brynskov, M., Dalsgaard, P., Halskov, K. (2013). Understanding Media Architecture (Better): One Space, Three Cases. In *Proc. of the Workshop on Interactive City Lighting*, CHI 2013. ACM, New York.

7. Caldwell, G. (2013). Hybrid Place: Blurring the Edge Between the Digital and Physical Layers of Urban Environments. In *Proceedings 20th International Seminar on Urban Form,* 17-20 July 2013, Brisbane Australia.

8. Caldwell, G. A., Osborne, L., Mewburn, I., & Crowther, P. (2014, in press). Guerrillas in the [urban] midst: Developing and using creative research methods-guerrilla research tactics. *Journal of Urban Technology.*

9. Corbett, S., & Housley, S. (2011). The Craftivist Collective Guide to Craftivism. *Utopian Studies*, 22(2), 344-351.

10. Corbin, S., & Read, M. (2012). Guerrilla Projection. In A. Boyd, A., & D. O. Mitchell (Eds.) *Beautiful Trouble: A Toolbox for Revolution.* New York: OR Books.

11. Dade-Robertson, M. (2013). Architectural User Interfaces: Themes, Trends and Directions in the Evolution of Architectural Design and Human Computer Interaction. *International J of Architectural Computing*, 11(1), 1-19.

12. Dovey, K., Wollan, S. & Woodcock, I. (2012). Placing Graffiti. *Journal of Urban Design*, 17(1), 21-41.

13. Fischer, P. T., Zollner, C., Hoffmann, T., Piatza, S., & Hornecker, E. (2013). Beyond Information and Utility: Transforming Public Spaces with Media Facades. *IEEE Computer Graphics and Applications*, 33(2), 38-46. DOI: 10.1109/MCG.2012.126

14. Foth, M., Fischer, F., & Satchell, C. (2013, May 3-5). From Movie Screens to Moving Screens: Mapping Qualities of New Urban Interactions. In J. Geiger, O. Khan, M. Shepard (Eds.), *Proceedings of the 4th MediaCities conference* (pp. 194-204). Buffalo, NY.

15. Foth, M., Choi, J. H., & Satchell, C. (2011). Urban Informatics. In *Proc. Computer Supported Cooperative Work (CSCW'11)* (pp. 1-8). New York, NY: ACM. DOI: 10.1145/1958824.1958826

16. Francisco, S. (2007). The Way We Do Things Around Here: Specification Versus Craft Culture in the History of Building. *American Behavioral Scientist*, 50(7), 970-988.

17. Freyer, C., Noel, S., & Rucki, E. (2008). *Digital by Design.* London, UK: Thames & Hudson.

18. Fritsch, J. & Brynskov, M. (2011). Between Experience, Affect, and Information: Experimental Urban Interfaces in the Climate Change Debate. In M. Foth, L. Forlano, C. Satchell, & M. Gibbs (Eds.), *From Social Butterfly to Engaged Citizen* (pp. 115-134). Cambridge, MA: MITP.

19. Gauntlett, D. (2011). *Making is Connecting.* Cambridge, UK: Polity.

20. Gilsenan, P. (2011, Apr). Guerrilla Gardening. *Listen Magazine,* 64(8), 12.

21. Gordon, E., & de Souza e Silva, A. (2011). *Net Locality: Why Location Matters in a Networked World.* Chichester, UK: Wiley-Blackwell.

22. Haeusler, M., Tomitsch, M., & Tscherteu, G. (2012). *Media Facades – A Global Survey.* Ludwigsburg, Germany: avedition.

23. Hoggenmüller, M., & Wiethoff, A. (2014). LightSet: enabling urban prototyping of interactive media façades. In Proceedings of the 2014 conference on Designing interactive systems (DIS'14) (pp. 925-934). New York: ACM. DOI=10.1145/2598510.2598551

24. Iveson, K. (2010). Some critical reflections on being critical: Reading for deviance, dominance or difference? *City*, 14(4), 434-441.

25. Iveson, K. (2013). Cities within the City: Do-It-Yourself Urbanism and the Right to the City. *International Journal of Urban and Regional Research*, 37(3), 941-956.

26. Jardin, X. (2011). Interview with creator of Occupy Wall Street "bat-signal" projections during Brooklyn Bridge #N17 march. boingboing.net/2011/11/17/interview-with-the-occupy-wall.html (accessed 17 July 2014)

27. Kolbitsch, J., & Maurer, H. (2006). The Transformation of the Web: How Emerging Communities Shape the Information we Consume. *Journal of Universal Computer Science*, 12(2), 187-213.

28. Korsgaard, H., Brodersen Hansen, N., Basballe, D., Dalsgaard, P., & Halskov, K. (2012). Odenplan: a media façade design process. In *Proceedings of the 4th Media Architecture Biennale Conference (MAB'12)* (pp. 23-32). New York: ACM. DOI=10.1145/2421076.2421081

29. Milberry, K. (2014). (Re)making the Internet: Free Software and the Social Factory Hack. In M. Ratto & M. Boler (Eds.), *DIY Citizenship: Critical Making and Social Media* (pp. 53-64). Cambridge, MA: MIT Press.

30. Mota, C. (2011). The Rise of Personal Fabrication. In *Proceedings of the 8th ACM conference on Creativity and Cognition (C&C'11)* (pp. 279-288). New York, NY: ACM. DOI: 10.1145/2069618.2069665

31. Orton-Johnson, K. (2014). DIY Citizenship, Critical Making, and Community. In M. Ratto & M. Boler (Eds.), *DIY Citizenship: Critical Making and Social Media* (pp. 141-156). Cambridge, MA: MIT Press.

32. Paulos, E. (2012). You amateur! *ACM interactions*, 19(1), 52-57. DOI: 10.1145/2065327.2065338

33. Paulos, E. (2013). The rise of the expert amateur: DIY culture and the evolution of computer science. In *Proceedings of the 18th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'13)* (pp. 153-154). New York, NY: ACM. DOI: 10.1145/2451116.2451133

34. Ratto, M., & Boler, M. (Eds.) (2014). *DIY Citizenship: Critical Making and Social Media.* Cambridge, MA: MITP.

35. Rawlinson, C., & Guaralda, M. (2012). Chaos and Creativity of Play: Designing Emotional Engagement in Public Spaces. In J. Brassett, P. Hekkert, G. Ludden, M. Malpass, & J. McDonnell, (Eds.), *Proc. 8th International Design and Emotion Conference*, London, UK.

36. Rittenbruch, M. (2014). Evaluating the use of a very large-scale presentation and collaboration framework. In *Proc. 3rd International Symposium on Pervasive Displays (PerDis'14)*. New York, NY: ACM.

37. Rowe, M., & Hutton, F. (2012). 'Is your city pretty anyway?' Perspectives on graffiti and the urban landscape. *Australian & NZ Journal of Criminology*, 45(1), 66-86.

38. Schacter, R. (2008.) An ethnography of iconclash: an investigation into the production, Consumption and destruction of street-art in London. *Journal of Material Culture* 13(1), 35-61.

39. Schneider, T., & Till, J. (2009). Beyond Discourse. Notes on Spatial Agency. *Footprint*, 4, 97-111.

40. Schroeter, R., Foth, M., & Satchell, C. (2012). People, content, location: sweet spotting urban screens for situated engagement. In *Proc. Designing Interactive Systems (DIS'12)* (pp. 146-155). New York, NY: ACM. DOI: 10.1145/2317956.2317980

41. Sliwa, M., & Cairns, G. (2007). Exploring Narratives and Antenarratives of Graffiti Artists: Beyond Dichotomies of Commitment and Detachment. Culture and Organization, 13(1), 73-82. DOI: 10.1080/14759550601167321

42. Verhoeff, N. (2012). Navigating Screenspace: Towards Performative Cartography. In P. Snickars & P. Vonderau (Eds.), *Moving Data: The iPhone and My Media* (pp. 33-49). New York: Columbia University Press.

43. Wiethoff, A., & Blöckner, M. (2010). LightBox: Exploring interaction modalities with colored light. In Proceedings of the fifth international conference on Tangible, embedded, and embodied interaction (TEI'11) (pp. 399-400). New York: ACM. DOI=10.1145/1935701.1935799