

**Artistic Prototypes:
From Laboratory Practices To
Curatorial Strategies**

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Abstract

My thesis introduces new kinds of understandings of artistic practice taking place in laboratories and engaging with the design, production and critique of technological artefacts. The recent spread of artworks based on physical computing widened and enhanced the role of prototyping in the making of new media art. Indeed prototyping can be now considered as a medium in its own right. My point of departure was an investigation of artists working in academic labs, which led me to question the relationship between research and aesthetic production. My initial argument was that the research process is having a specific impact on art practice, with artefacts understood at least by their makers as incomplete and expecting further manipulation. These artworks are open to transformation and collaborative intervention and refuse any form of material or conceptual black-boxing. The notion of artistic prototypes emerges to enrich the vocabulary to comprehend, evaluate and curate the outcomes of these practices. By analysing a range of artworks that could be conceptualised as prototypical, I soon realised that artistic prototypes are often created for activist purposes too, as a way to critique current behaviours and attitudes and to demonstrate that alternative ones are possible.

A major contribution of the thesis is a theoretical framework that outlines the behaviour of artistic prototypes. Openness and fictionality are introduced as key features and it is explained how they support both activism and research. The thesis also provides a contingent aesthetics of prototyping addressing both practitioners' choices and public reception. A further contribution comprises a number of curatorial projects that develop or respond to the framework. The latter can have an impact on creative practitioners, and on curators and heritage professionals, to the point of deeply affecting established principles of conservation and interpretation.

This thesis is dedicated to Tom, for always encouraging and believing in me, and to my parents, Luisa and Gianni.

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Thanks to the whole team involved in Connecting Cities. It would take too long to list all curators, artists and practitioners individually, but a few of them gave a special input on this thesis and deserve a special mention: Ana Botella, Susa Pop, Nerea Calvillo, Yannick Antoine.

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Publications

The research presented in this thesis has been disseminated through the following publications:

Journals

Gabriella Arrigoni, Brigitta Zics, 2016. Fiction and curatorial practice: developing alternative experiences for digital artistic prototypes. *International Journal of Performance Arts and Digital Media* DOI: 10.1080/14794713.2015.1133960

Gabriella Arrigoni, 2016. Epistemologies of prototyping: knowing in artistic research. *Digital Creativity* DOI: 10.1080/14626268.2016.1188119.

Conferences proceedings

Gabriella Arrigoni, Tom Schofield, 2015. Understanding artistic prototypes between activism and research. In: *xCoAx 2015: Proceedings of the Third Conference on Computation, Communication, Aesthetics and X*. Glasgow, p.24.

Gabriella Arrigoni, Tom Schofield, Tim Shaw, John Bowers, 2015. Prototyping Heritage: Collections, Materials and Emerging Approaches to Engagement In: *Proceedings of the 2nd Connected Communities Heritage Network Symposium*. University of Sheffield.

Teresa Almeida, Gabriella Arrigoni, 2014. Subjective Epistemologies: Inconsistent Artefacts in the Redesign of Medical Devices. In: *DRHA 2014 | Digital Research in the Humanities and Arts*. London.

Gabriella Arrigoni, Teresa Almeida, David Chatting, Ben Freeth, Annika Haas, Tom Schofield, Diego Trujillo-Pisanty, 2014. Betagrams: Maker Culture and the Aesthetics of Prototyping. In: *All Makers Now?* Falmouth University.

Gabriella Arrigoni, 2013. Speculative Culture: Design Fiction in User-Centred Innovation Labs. In: *Re:new: Conference Proceedings*. Copenhagen.

Gabriella Arrigoni, 2013. The Pointless chat-room: coping with absence in online performance. In: Cleland, K., Fisher, L. & Harley, R. (Eds.) *Proceedings of the 19th International Symposium on Electronic Art, ISEA2013*, Sydney.

Gabriella Arrigoni, 2013. Innovation, Collaboration, Education: Histories and Perspectives on Living Labs. In: *xCoAx 2013: Proceedings of the First Conference on Computation, Communication, Aesthetics and X*. Università di Bergamo. pp.215-224.

Talks

Gabriella Arrigoni, 2014. Meeting halfway: prototypical visual materials in interaction between artists and curators. In: *In Dialogue*. Nottingham.

Declaration about collaborative work

Most of the practical projects presented in this thesis have been developed working closely with other practitioners. Nevertheless, my role as curator and researcher has remained independent during these collaborations, therefore I declare the contributions to knowledge advanced in the thesis are independent too.

Below I list all my collaborative work with a more specific account of the nature of the collaboration.

Visualising the Future. The workshop was developed and run together with designers and researchers Tom Schofield, Marian Doerk and Bettina Nissen. The analysis of the project and the reflections reported in the thesis have been developed autonomously.

Project ICE. I was the initiator and co-organiser of the workshop. I invited designer Regina Peldszus and medical doctor Alex Salam to help me define a set of tasks for the participants and to facilitate the workshop. The analysis of the project and the reflections reported in the thesis have been developed autonomously.

WIP Show. I initiated and organised the exhibitions, inviting the artists/researchers to display their work and conducted the interviews which are discussed in the thesis.

Connecting Cities. This project has been initiated by Public Art Lab Berlin and co-curated by a number of cultural organisations across different countries. I contributed to the project as a consultant, writer, researcher and copy-editor for the final publication. The insights I developed from my participation in the project and the analysis I present in the thesis are my own independent work.

Betagrams. I initiated and curated the show, selecting and inviting the exhibiting artists. The analysis of the project presented in my thesis has been developed autonomously, on the basis of my conversations with the artists. This exhibition led to a publication which is co-authored by myself (first author) and the artists: *Gabriella Arrigoni, Teresa Almeida, David Chatting, Ben Freeth, Annika Haas, Tom Schofield, Diego Trujillo-Pisanty, 2014. Betagrams: Maker Culture and the Aesthetics of Prototyping. In: All Makers Now? Falmouth University.*

Eye Resonator Fictional Interludes. This project was developed in response to an invite from artist Brigitta Zics to develop a curatorial intervention around her work Eye Resonator. I suggested the idea of creating fictional scenarios and conceived of their content. The process involved a constant conversation with Zics, and a closer collaboration in co-developing the other aspects of the public event (visual arrangement of the gallery space, press release, communication and so forth). The analysis of the project in my thesis, and its relationship with the theoretical framework on artistic prototypes, is my independent work. This is also discussed in a publication co-authored with Zics (in which I am first author): *Gabriella Arrigoni, Brigitta Zics, 2016. Fiction and curatorial practice: developing alternative experiences for digital artistic prototypes. International Journal of Performance Arts and Digital Media.*

Under Black Carpets / Fabricating FACTS. I invited Ilona Gaynor to display her work Under Black Carpets at FACT (Liverpool) and curated the exhibition. I also invited designer Bettina Nissen to collaborate with me in the development of the engagement activities. These have been discussed together although more specifically I suggested the tasks based on the forensic report and the crime scene template, while Nissen had a stronger input on the activities involving the magnifier and the 3D printer. She also facilitated the activities in the gallery. The analysis of the whole project and the reflections reported in the thesis have been developed autonomously.

Unbound. I conceived the key principles of the project, selected and invited the participating artists, and independently analysed the project in my thesis.

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Chapter 1. Introduction

This thesis focuses on art practice taking place in laboratories. It investigates the notion of artistic prototypes to understand the work of artists engaging with research or activism and its implications for curation and preservation. In this chapter I introduce the cultural background surrounding my research topic and situate it in relation to multiple disciplines. I outline my research questions and briefly summarise the key contributions offered by the thesis. Finally, I describe my practice-led methodology and the thesis structure.

1.1 Prototyping Cultures

In June 2014 the Tate Modern, arguably the most prominent venue for mainstream contemporary art in the UK, hosted its first 24-hours hackathon. 140 creative practitioners and technologists were invited to develop artworks using any form of data, to promote the launch of a new online platform showcasing digital art, set up by the BBC and the Arts Council of England. Ideas were generated as a one-minute pitch and developed in less than one day by small teams formed around common interests and complementary skills (Ellis-Petersen 2014). As pointed out in the press, the event did not involve “illegally breaking through the firewalls of secret government databases”, but actually sanctioned a shift in the meanings associated with the word ‘hacker’ outside the software industry (ibid. 2014). Going beyond the controversial identity of the hacker subculture, always torn between non-authorized security breaking practices and the clever and playful exploitation of a system’s bugs, hackathons are re-fashioning the idea of the ‘hack’ as a public event bringing together some of today’s most noticeable tendencies in cultural life: collaboration, the emphasis on process, and the alliance between art and technology to produce innovation. This is not the only recent example of major exhibition venues bringing to the foreground practices emerged in the context of creative technology experimentation. Two issues are particularly relevant here. There is a focus on the different stages of objects’ life-cycles, turning the making process into something visible. In parallel, the idea that new devices come into being through participatory and open trajectories is increasingly commonplace. Just to limit our attention to the UK, the Design Museum (London) hosted two exhibitions that punctually epitomise these tendencies. *The Future is Here: a New Industrial Revolution* (Design Museum 2013) acknowledges the eroded distinction between designer, manufacturer and consumer and announces the promises of crowd-sourcing, customisation, and democratic innovation. *In the Making* (Moore 2014) explicitly showcases objects in the middle of their manufacturing process, suggesting an aesthetics of fragmented parts and unfinishedness.

When phenomena are presented to the public in major museums and galleries it often means that they reached a certain degree of maturity. The knots among making, participation and innovation are however only just starting to be effectively conceptualised, especially in reference to the fields of curation, museology and cultural studies. The expression ‘prototyping cultures’ (Calvillo et al. 2010) works well to describe the interrelated co-existence of a set of factors that I consider to be the background of my research project. The idea of ‘making things together’, collaboratively (such as in a hackathon), and opening up the production process to broader participation directly links to the possibility for makers or participants to take an existing artefact (or its template) and re-make it, modify it or expand it. In this context artefacts tend to be provisional, in ongoing transformation, and the accent is placed on the making process itself. Furthermore, a prototyping culture involves a speculative attitude insofar as some of the prototypes created by artists-technologists are intended as material ways to reflect on complex issues by suggesting proposals for future or hypothetical situations. Participation, remake, process and speculation are essential ideas in the set of discourses where I am situating my research. The following paragraphs adopt these four elements as coordinates to offer a synthetic account of such a cultural landscape.

Participation can be by now described as endemic in contemporary art, frequently reframed but still owing a lot to Bourriaud’s theory of relational aesthetics (2002b). The French theorist addressed a range of practices based on the production of new forms of sociability, with the artist often in the role of facilitator or catalyst of encounters. What is relevant here however is how the idea of prototyping as an environment for the involvement of more contributors in a design process, as happens in user-centred design (Schuler & Namioka 1993) has generated a new field of opportunities for participation. While creativity has come to be considered as a form of sociality in itself, terms like co-creation, co-production and decentralisation sit ambiguously between the realm of buzzwords and that of programmatic proposals. The notions of open innovation (Chesbrough 2003), lead-user (Von Hippel 1986) and minimal viable product (Ries 2009) suggest how collaboration and openness have transcended the realm of cultural engagement to manifest themselves as corporate principles. The collaborative dimension of prototyping has gained visibility through the Open Source (OS) movement. This does not exclusively concern software. However, the release of unstable versions of software is regularly cited as a case in point to highlight the relevance of large-scale user feedback in implementing new products. Another approach consists in the potential for customisation or personalisation suggested by digital fabrication technologies. Customisation can be seen as a form of co-creation where every end-user intervenes on an existing prototype. Finally, wider publics can take part in innovative projects

just by supporting them on crowd-sourcing platforms such as Kickstarter (Kickstarter 2016), where prototypes are launched in the public realm in the form of proposals, and rewards are offered to crowd-founders should the project achieve its target.

Remaking practices include various forms of remix, re-purposing, hacking, re-cycling or up-cycling, often associated with a DIY and grassroots ethos. This suggests the idea that products are intrinsically unstable, entitled to complex life-cycles, and constantly subject to transformation.

The concept of **process** was central to different historical tendencies in contemporary art, ranging from Minimalism to Conceptual and Performance Art. More recently, the spread of maker culture (Dougherty 2012) introduced a novel instantiation of the term. It is however the way process has gained prominence in the articulation of public cultural events that is central in my investigation. An expanded notion of the curatorial (von Bismarck et al. 2012) introduced in the past decades a variety of formats that turned processes and making into public events, as opposed to traditional exhibitions displaying finished, static artefacts. Workshops, hackathons, maker-fairs, demo sessions, presentations of work in progress, field-trips, either directly involve the public in the making, or turn the making into a (semi)public event in its own right.

A further group of factors can be gathered under the notion of **speculation**. Speculative and critical design (Dunne & Raby 2013a; Auger 2013) projects are commonly presented to the public as prototypes of possible future products, to encourage reflection on the social implications of technological innovation. Prototypes intended as an outcome in itself, rather than a step towards manufacture, are regularly generated within Research through Design (RtD) and Practice-based Research (PbR), as tangible instantiations of hypothesis or testing environments to explore and evaluate ideas.

1.2 The Problem with Innovation: a Speculative Drive

A particular approach to prototyping stems from artists' aspiration to engage with technology not just as a tool, but as a topic and cultural reference. Artists expressing a critique of technological change suggest its distance from 'real' human needs, or address the conflict between top-down innovation and bottom-up forms of empowerment and appropriation of new technologies.

The notion of innovation is increasingly perceived as problematic and associated with some of today's most pressing issues. It is claimed that the current hunt for sustainability is linked to a shift from a demand-driven to a supply-driven model of innovation where ever more competitive economies constantly need to introduce new products on the marketplace

not to succumb to competitors (van der Leeuw 2010, p.45). Innovation is frequently considered responsible for an alarming environmental crisis. Overpopulation, climate change and energy shortage are understood as the consequence of a series of ill-advised human actions involving our planet and its resources (ibid. 2010; Moore 2000). Van der Leeuw's argument that our inadequacy in dealing with such global crisis is for a significant part related to the legacy of the deterministic and reductionist principles of modern science (2010, p.49) is convincing. Indeed, a call for new ways of thinking and new kinds of knowledge is advanced to replace the focus on linear cause-effect dynamics and observable isolated phenomena. In this context, more holistic and complex approaches (Morin 2008) are emerging, able to address different timescales and to grasp the long-term consequences of human-interactions with the environment (van der Leeuw n.d.). The recent success of the term 'speculation' in contemporary culture could be interpreted as a response to this call. Speculative thinking adopts conjectures, scenario-building and foresight as tools of inquiry and values hypotheses more than evidence. Whereas Speculative Realism (Brassier et al. 2007; Bryant et al. 2011) has applied this attitude to the exploration of reality from the perspective of non-human objects, speculative design develops hypothetical products to materialize possible futures.

Against this background, artists are developing new roles for themselves, not just criticizing technology, but directly taking part in innovation. Industry and the marketplace are now seen as a battlefield where they can generate change and have a deeper impact than the elitist circles of contemporary art (Naimark 2003, p.9). Partly because of their need for alternative sources of financial support, partly because of a growing awareness in industry of the potential of creativity, lateral thinking and serendipity in innovation, artists are frequently incorporated in innovation policies as relevant contributors in techno-scientific R&D teams (Fantauzzacoffin 2011).

This ensemble of rather heterogeneous elements identifies a cultural framework where artists are exploring emerging territories and transforming their way of working. Here, the concept of prototype assumes novel, expanded connotations, with substantial bearings on artistic practice.

The concept of innovation was central to the original proposal associated with my Collaborative Doctoral Award. The project was advertised with the title of 'Living Laboratories: Enhancing Audience Engagement through Making and Curating Digital Art', and intended to

critically engage with digital art production, participatory forms and practices, current schemes and models of curatorial (institutional models) and production spaces (labs) of digital artworks. It aims to bridge practices and methodologies between the fields of art practice, audience research and human-computer interaction (HCI). (Newcastle University 2012).

A partnership between Newcastle University and FACT-Liverpool (a leading venue for media art in the UK) was also framed as an opportunity for the researcher to experiment with curatorial practices. The key idea in the proposal was to apply the concept of the living lab to engage audiences with technological artworks. Living labs are research environments to study emerging technologies in real-life settings, bringing the lab into everyday life (rather than observing the interaction between user and machine under artificial conditions). The idea originated in the field of Human Computer Interaction (HCI) and has been variously applied as a user-centred methodology for innovation (Eriksson et al. 2005; Dutilleul et al. 2010).

I felt that a substantial analysis of lab practices in the arts was a necessary step before undertaking the exploration of the living lab as a curatorial model. This step led me, however, towards a different direction so that the idea of the living lab has been pushed to the background in favour of a deeper understanding of the aesthetic artefacts generated in labs. Artists are generally involved in two main typologies of labs: research labs and media or hack labs, respectively devoted to activities of knowledge production and socio-technical change. What emerged during this preliminary research phase was the creation of prototypes as the most common and defining outcome in both kinds of lab, suggesting a rich but potentially problematic link between art making and innovation and disclosing a fertile territory of exploration. Yet, the notions of the prototype and artistic prototype are not offered as a given but will unfold progressively through the research process.

1.3 Across Disciplines

This research is aimed in the first instance at curators, museums and galleries professionals, media and cultural theorists, and creative practitioners. The contribution takes the form of an articulated understanding of the prototype as a paradigmatic entity in our culture and a key concept for the interpretation of the artistic object. My own background as art historian and curator has unmistakably influenced my approach and the disciplinary field I am primarily addressing. Nevertheless, this thesis draws on a composite range of disciplines and research areas that go beyond curatorial studies and new media art (NMA) theory. Design, and especially its research methodologies, has a prominent position. The focus on prototyping, labs and technology also led me to address the fields of HCI, innovation and future studies, Science and Technology Studies (STS), sociology and the history of science. The concept of the prototype itself belongs to more than one disciplinary field, moving across design, organizational studies, engineering, computer-supported cooperative work, art history, education and maker-culture.

Such transdisciplinarity is not uncommon nowadays, as proved by the abundance of terminology to describe different levels of working across disciplines (multi-, inter-, trans-, cross- and post-disciplinarity). By presupposing a condition of pre-disciplinarity (before knowledge became specialized), the notion of post-disciplinarity stresses the contingent nature of disciplinary boundaries. This notion is however still lacking a consensus definition. For instance, Jessop and Sum associate it with the rise of post-colonial studies, and intend it as a complete rejection of disciplinary boundaries (Jessop & Sum 2001, pp.89–90). Büscher and Cruickshank, by contrast, describe post-disciplinarity as a condition of ongoing negotiation and collaboration that does not eliminate, but only renegotiates, these boundaries (Büscher & Cruickshank 2009). The reason for spending a few words on this approach is not just to define the scope of this research project. Post-disciplinarity can also be useful to problematise the evolution of the artist's identity, whose work is increasingly expanding outside the realm of the visual arts (Wright 2013). This research project is therefore moving around an area of transgression and undefined boundaries, and potentially contributing to their new arrangement.

It will soon become evident to the reader that when I refer to artistic practices, especially when embedded in research activities, I am actually addressing works that demonstrate a strong overlapping between the fields of art and design. This space of convergence has been generated from multiple directions. While designers move towards more conceptual approaches, free from industrial and market constraints, contemporary artists adopt the vocabulary of design aiming at a stronger entanglement between art and everyday life. The exhibition *What if? Art on the Verge of Architecture and Design* (Moderna Museet 2000), curated by Maria Lind, was symptomatic of this tendency, and provides a source of examples through the work of Liam Gillick, Jorge Pardo, Andrea Zittel and others. A few years later, Alex Coles suggested the term of 'designart' to address hybrid works applying the characteristics of traditional art (such as uniqueness, autonomy, eccentricity) onto design (2012a, p.16). His publications (2005; 2007) situate the convergence of art and design in a broader historical perspective, with forerunners like the Bauhaus and Bruno Munari. Speculative design has adopted the language and channels of dissemination of contemporary art, while some artists create works often indistinguishable from design, even without labelling their work as such. While significant work in respectively art and design remains clearly outside this area of convergence, this doctoral project emphasises how research and activist approaches are contributing to the development of this common territory.

The post-disciplinary character of the project is also bound to the research environment I found myself in. Culture Lab is a research hub in digital creative practice

where artists, designers, musicians and performers critically engage with technology and maker culture. For the most part of my PhD my research group shared the building with a broader one focusing on HCI, social and ubiquitous computing in the School of Computing Science. The reciprocal influences and exchanges across these research communities have been significant, going beyond a standard collaborative model which would see the computer scientist writing the programme to satisfy the creative aims of the artist, or the artist illustrating a computational concept. The open space configuration of the working environment facilitates the mutual awareness of each others' work, so that it was easy for me to observe the making of artworks and informally discuss and investigate my colleagues' practices and be inspired, as a curator, towards certain direction of exploration. I also gained access to knowledge about cutting-edge technologies and current trends in the field of physical computing which enabled me not only to better understand related creative artefacts but also to develop a more critical and receptive look at innovation and related design issues.

1.4 Research Questions and Summary of Contribution

The initial question for this investigation concerned the specific approaches and outcomes developed by artists working in labs. A closer look at what might be called technologically engaged artistic research revealed that academic discussion was primarily focusing on the contributions to knowledge and methodologies implied in the field. Less attention was given to the qualities and typologies of artistic objects emerging from research. My initial question could be articulated as follow:

What happens when art practice is involved in research? What kind of aesthetic object emerges from artistic research? How is research influencing art practice?

The most notable characteristic identified in artworks produced in research and media labs consists in their prototypicality. Essentially, these artworks are presented in a state of constant suspension and becoming. They do not aim at a final arrangement but at transformation and proliferation, extending themselves into multiple versions. This led to a second set of questions:

Why are prototypes so frequently the outcome of artistic practice conducted in labs? Which are their specific features and behaviours? How can we talk about them?

These questions have been answered by articulating the concept of *artistic prototype* and developing a conceptual framework to analyse and interpret its behaviour and its aesthetic

dimensions. These contribute to a working definition of the artistic prototype to help distinguish it from both non-artistic prototypes and non-prototypical artworks. The framework is based on the investigation of a number of examples and case studies encountered through my curatorial practice. Beyond its role as an interpretative and critical tool, it is intended to support and inspire innovative curatorial strategies and methods, responding to a further research question:

How can curators respond to the notion of artistic prototypes? Are new potential avenues for practice being disclosed? How can a renewed understanding of prototyping influence the way artworks and collections are being presented to the public?

These last questions are answered through the analysis of three curatorial projects organised as part of my PhD, but also looking at current emerging tendencies advanced by other practitioners, and eventually suggesting further possibilities which have not been tested in practice yet. Overall, the thesis aims at enriching artists', curators' and researchers' conceptual equipment and vocabulary, but also to identify practical directions of innovation for curators and museum practitioners.

1.5 Methodology

This thesis employs a tailor-made combination of methods that evolved through practice by responding to specific needs. There are many takes on the relationship between practice and research. In a seminal paper published in 1993 Christopher Frayling set up the terms of the debate by identifying three ways of relating art or design with research: research into art and design; research through art and design; and research for art and design (1993). An example of how these categories have been rearticulated is the distinction made by Linda Candy between practice-based, where the creative artefact is the basis of the contribution to knowledge, and practice-led projects, where research leads primarily to new understandings about practice (Candy 2006, p.3).

1.5.1 Practice and research

In Chapter 2 I identify artistic research as a central topic in my PhD and introduce the debates concerning the interplay between knowledge and artefacts more extensively. Regarding my own approach though, each project feeds into the research in different ways and the relationship between theory and practice is accordingly recalibrated. Traditional theoretical investigation based on analysis of existing literature and argumentation is also deployed.

My practice is developed through a series of curatorial projects that lead to a deeper understanding of artistic practice in labs. Differently from a great deal of practice-based PhDs in the arts, the textual document presented with this thesis can be fully understood autonomously from the documentation of the practical projects undertaken. Curating is not the primary topic of this PhD, but rather a method to investigate artistic practice. The idea of curatorship as research is grounded in a tradition of art historical scholarship based on the practice of researching and interpreting collections. Nevertheless today it is possible to envision several different ways in which curatorship can generate knowledge. The exhibition itself can be advanced as a theoretical proposition, able to operate discursively and propose particular epistemological arrangements (Whitehead 2011, p.54), develop an argument or stage conflicting positions in a debate. Alternatively, curators can set up a situation where knowledge is coming directly from the experience of the exhibition or from the process of producing it. Curatorship has also been addressed as a research methodology in disciplines such as sociology or anthropology, enriching these practices with live, visual and collaborative methods (Puwar & Sharma 2012).

Curation served my own research agenda in different ways. Without limiting my practice to exhibition-making, but exploring various event-formats, I initially adopted curating as a way of maintaining a sustained relationship with creative artefacts and observing the social, material and practical arrangements inherent to lab-based artistic work. In the second part of my PhD curatorship produced material arrangements to present, develop and assess conceptual arguments or emerging practices. The interview, deployed at several stages of the research, became an integral part of the curatorial process not simply to extrapolate information from the artists and participants involved, but also to re-shape my approach during the process. Being based on negotiation and mediation, curatorial work already has a dialogical nature. However, exhibitions are sometimes built as univocal manifestations of a curatorial vision which is established from the beginning. By contrast, the intertwining of curatorship and research in my practice, and the method of the interview in particular, introduced a more inter-subjective dimension which simultaneously affected the production of knowledge and the development of the projects.

There are only few examples of curatorial PbR (relevant cases being Graham 1997; Muller 2008), usually anchoring their practical element and findings to the observation of audience behaviour. The focus of my research being on artistic practices, it was not possible to appropriate and adapt their methodologies. Muller's reflective curatorial practice (Muller 2008, chap.2) was structured as an iterative cycle of practice, reflection and evaluation to inform implemented practical activities. The way my research developed, by contrast,

involves a series of reciprocally independent projects, informed by different methods and aims, therefore eluding the logics of iteration. An iterative cycle would have been beneficial to achieve specific curatorial strategies to present prototypical artworks, or to evaluate best practices for curators or museum professionals. The aims of my projects being more oriented to a conceptual analysis, I opted for a range of methods that allowed me to develop a framework first, and test its applications subsequently. The drawback of this strategy is perhaps that its impact can be measured more through suggestion and inspiration and less as an accomplished toolkit for practitioners.

A point of contact with Muller is the adoption of the term artistic prototypes. She uses it to describe interactive artworks presented to the public at a prototyping stage, so that feedback from the public can be integrated in their final version. Therefore, she addresses artistic prototypes not as autonomous artworks, but as stages of development expecting a proper closure. Her main focus is on understanding audience experience of interactive art: the idea of artistic prototype remains only at the periphery of her investigation. Although it is worth noticing how by analysing *Very Nervous System* by David Rockeby she identifies digital art's tendency to extend across long and complex life-spans, so that artworks become ongoing processes of enquiry (Muller 2014).

A suitable source of methodological inspiration came from RtD where the concept of *annotation* has been advanced to account for a kind of design knowledge fundamentally embodied in artefacts (Gaver 2012; Bowers 2012). *Annotated portfolios* do not produce systematic theories but “point to features of artefacts of interest and connect those features to matters of further concern” (Bowers 2012, p.70). Similarly, this thesis provides ways of discussing and understanding values and behaviours of artistic prototypes, without extrapolating stable and unified definitions. The features of artistic prototypes articulated in Chapter 4 are intended as conceptual support to talk about these artefacts, and as contingent inspiration for further curatorial strategies. There is no suggestion that artistic prototypes always integrate all the features. By contrast, the implication is that they can include different ones that do not appear in the framework, as this is essentially emerging from the exploration of a collection of specific artefacts.

1.5.2 Hybrid Methodologies

This section provides a synthetic account of the individual methods associated with each project curated during my PhD. Rather than adopting precisely the same methodology across the whole PhD, my approach to practice developed through time, assigning different roles to curatorship in relation to research (which I summarise in the following paragraph).

Additionally, I characterise my methodology as hybrid because it combines a practice-based process alongside more traditional desk-based investigations and the outcomes are presented in a thesis which can be understood independently from the documentation of the practical projects.

The projects developed during the first year functioned essentially as explorations of issues and practices, ways to familiarise myself with them and let new questions emerge. The following ones (especially Betagrams) allowed me to visualise my research through a physical and public manifestation and to categorise practices towards the development of a conceptual framework. Finally, the last projects were developed in response to my first set of findings to assess their potential applications. Here I approach curation in more transformative ways and directly innovate my practice.

Visualising the Future / Project ICE @ the Big M

Both workshops explored the potential of prototyping in encouraging participants to reflect on technological innovation and in fostering collaboration. The evaluation involved the writing of reflective reports, interviews with facilitators and participants, and an examination of the physical outcomes produced.

Connecting Cities (CC)

This project was initiated and curated by an international network of organizations; I was involved as consultant, collaborator and observer. This allowed me to investigate the role of artistic prototypes within an activist perspective, aimed at introducing new urban practices and improving citizens' lives.

WIP (Work in Progress Show)

This exhibition constituted an explorative study on the role of research prototypes and investigated, through interviews, the benefits of sharing them across a research community.

Betagrams

This group show was a materialization of theoretical advancements on artistic prototypes. The process involved semi-structured interviews with the artists that helped me develop a list of features to articulate the behaviour of prototypical artefacts in artistic settings. The analysis of each work focused on the relationship between aesthetic choices and research aims.

Eye Resonator: Fictional Interludes

This project deployed an experimental curatorial strategy based on the framework on artistic prototypes advanced by this thesis. It was evaluated through observation and interviews.

Under Black Carpets

I curated the exhibition of this work by Ilona Gaynor in order to investigate an artwork epitomising some of the features of prototyping developed in the framework, particularly the relationship between objects, fiction and knowledge. The show was accompanied by a set of collateral activities and provided me with an experimental setting to evaluate the potential of working with prototypicality to engage the public. Evaluation was conducted through observation, informal conversation with the visitors, and the analysis of the textual and visual material produced by the participants.

Unbound

This project is an application of the framework to orchestrate new forms of creative collaboration. It focused on the social dimension of artistic prototypes and investigated how different interventions can take place around the same artefact. It was assessed through observation, documentation, informal interviews and collective discussion.

1.6 Thesis Structure

This section outlines the structure of the thesis and gives a brief summary of the content of the following chapters.

Chapter 2 - Curating Labs: Art Practice and Research

In Chapter 2 I offer an historical overview of the concept of lab and its recent adoption as a model for curatorial practice. I subsequently discuss the relationship between artistic practice, prototyping and research. Finally, I come back to the curatorial by reviewing literature on curating NMA and pointing at gaps that might be addressed by focusing on the concept of the prototype.

Chapter 3 – Prototyping: an Exploration

Chapter 3 introduces a set of projects undertaken to explore the role of prototyping in research, creative practice, and public engagement. The projects are compared with literature investigating different definitions and qualities of the prototype, and an initial understanding of artistic prototypes is sketched.

Chapter 4 – Artistic Prototypes: a Conceptual Framework

Chapter 4 articulates a framework to analyse the behaviour of artistic prototypes through the key features of openness and fictionality, in relation to the main fields of action where artistic prototypes are developed: activism and research.

Chapter 5 – Curatorial Strategies: New Perspectives

Chapter 5 focuses on the possible applications of the framework in curatorial practice and suggests a number of directions inspired by the understanding of artistic prototypes provided in the previous chapter.

Chapter 6 – Conclusions and Future Work

In Chapter 6 I summarise the results and contributions of the thesis, and address directions for further exploration. These include issues of authorship and ownership in prototyping; a problematisation of the notion and rhetoric of change associated with prototypes through the complementary idea of persistence; some final speculations on the attenuating distinction between artworks and everyday artefacts; a reconsideration of how post-disciplinarity might affect museums and heritage work.

Chapter 2. Laboratories, Sites of Knowledge Production, and Curation

This chapter establishes the areas of theoretical debate my thesis is concerned with. To do so I introduce a short history of the concept of lab to investigate how it has become a metaphor and a model for curatorial and artistic practice. Because of the identity of laboratories as research environments, I concentrate on the relationship between art practice and knowledge production. It is argued that the material outcome of artistic research is often a prototype, setting the terrain to introduce the notion of artistic prototype. Finally, I review literature on curating NMA and point out ways in which a focus on prototypes can redefine open questions in the field.

2.1 Introduction

We live in times of endemic participation. A steady transition from spectatorship to active involvement appears today ever more evident in the art world. Happenings, public art, community art, interactivity, discursive practices, all contributed to a tendency which experienced an incredible acceleration with the rise of the Web 2.0 and its possibilities in terms of sharing and networking. The dream of the democratisation of art merged with the development of new curatorial strategies and the creation of platforms for online collaborative curating or the collective production of artworks (Paul 2006). The concept of lab has emerged several times in the past century as a model for taking museums towards more participatory and open approaches. Noteworthy are the endeavours of Alexander Dorner, director of the Hannover ProvinzialMuseum in the 1920s, who wanted to set up “dynamic displays of a museum on the move” and defined the museum as *Kraftwerk* (power station) (Obrist 1998). Alfred H. Barr, first director of the Museum of Modern Art, is also frequently referenced for his claim in 1939 that “the Museum of Modern Art is a laboratory: in its experiments the public is invited to participate” (1939, p.15). Beyond these isolated examples in the first half of the XX Century, the development of strong intersections across art, science and technology (Wilson 2002) generated a proliferation of situations where laboratories were increasingly associated with art production and display.

The artistic practices examined in this thesis take place in different kinds of contemporary labs. More specifically, the project addresses the (overlapping) typologies of the research and innovation lab, media-lab, hack-lab and maker-spaces. The first part of this chapter explores the concept and history of the lab to identify the opportunities offered to

curation and draw meaningful correlations with the practice of prototyping. The wide range of disciplines, histories and debates surrounding the key subjects of this thesis (the lab, the prototype, the relationship between art and knowledge) prescribes a selective approach in reviewing the relevant literature. Hence, the reader will encounter only the most pertinent issues and experiences necessary to support the investigation of artistic practices developed in the following chapters.

2.2 Labs: Histories and Perspectives

There are two parallel histories of interest here, namely that of the lab itself, and that of the concept of lab as a metaphor to experiment with display conventions in curatorial practice. Where to start a history of the lab is not obvious. Despite its relevance in the 1970s and early 1980s within STS (with the seminal researches of Latour & Woolgar 1979; Knorr Cetina 1981; Shapin & Schaffer 1985), a comprehensive historical survey of the lab as socio-cultural institution is still missing (Kohler 2008). The dictionary can be a starting point to trace a synthetic overview of the evolution of the lab. Its main definition states:

Originally: a room or building for the practice of alchemy and the preparation of medicines.
Later: one equipped for carrying out scientific experiments or procedures, esp. for the purposes of research, teaching, or analysis; (also) one in which chemicals or drugs are manufactured.
(Oxford Dictionaries 2015b)

A line of demarcation seems to run between the pre-modern era and the invention of modern science. This line is marked by the introduction of the empirical method, based on induction and observation, and the idea of gaining knowledge from experience (Shapin & Schaffer 1985). The experiment is intended as a procedure aimed at validating hypotheses or exploring the development of a staged situation. Even if born in relation to the natural sciences, experiments are today a transdisciplinary device, adopted in various domains including the social sciences and creative PbR (Borgdorff 2006, pp.17–18). In the arts and design, the adjective experimental has a broader meaning, addressing a style that is still seeking to define itself or the use of innovative materials or techniques (Küçükşayrac & Er 2009). Curator Eva Diaz (2008) adopts the notion of experiment as a way of understanding art practices proposing new methodologies and new kinds of art objects, referring particularly to the activities of the Black Mountain College in the early 1950s. In this context, she frames the concept of experiment as a shared practice establishing a bridge between art and science. Moreover, she calls for an enriched definition of experimentation, encompassing both a look into past experiences and tradition, and testing the present to innovate.

A more rigorous way to speak of experiment in design could be to describe the cycle of building a prototypes, testing, evaluating and modifying it into a new version. The practice of prototyping integrates creative experimentation alongside more interpretative, analytic methods, structuring the process around ideas or hypotheses tested in practice.

2.2.1 Modern science

One step back is now needed to outline the previous stages in the history of labs. Alchemists were interested in the transmutation of matter. Their ultimate goal was to find the philosophers' stone, able to turn any metal into gold, and endowed with supernatural rejuvenating powers. Often indicated as a forerunner of modern chemistry and pharmacology, alchemic knowledge was bestowed through two kinds of manuscripts: the *practica*, featuring recipes and processes, and the *theorica*, on the theories behind alchemy. This conjunction of practice and theory is at the basis of alchemic laboratories: there was in fact “no real division between alchemy as an mystical endeavour, chemistry as a science, and metallurgy as a craft” (Pinkowski 2004, p.31).

Historians of science locate the Scientific Revolution around the seventeenth century, to identify the establishment of the conceptual, methodological and institutional foundations of modern science (Henry 1997b, p.1). The main drivers of change were experimental philosophy and the introduction of a range of new instruments to support the establishment of empiricism. The equipment of alchemical labs consisted essentially of a furnace, crucibles and vessels, to operate the transformation of metals and other materials or the distillation of medicines. Instead, the new devices, such as the telescope and the microscope, made visible what could not be previously seen to unaided senses, supporting a method of gaining knowledge about nature by means of observation. Some historians suggest a distinction between passive devices for measurement and observation, and active philosophical tools able to reproduce natural phenomena (Gooding, T. Pinch, et al. 1989, p.2). This discrimination partially reflects the existence of two kinds of experiment, those isolating and analysing phenomena, and those reproducing and imitating them. The second group epitomises the rhetorical value of experiments, frequently recreated in a public setting to better persuade the scientific community. In contrast with the secrecy of alchemic laboratories, the sites of experimentation in modern science needed to be as public as possible in order to give matters of facts their status as foundations of knowledge. In *Leviathan and the Air-Pump*, Shapin and Schaffer describe the technologies used by scientists to extend the experience of an experiment beyond those directly observing it in salons or lecture halls. A literary account of the experiment was crucial to enable readers to replicate it, but also to allow the phenomenon

of ‘virtual witnessing’: the production in a reader’s mind of an experimental event (Shapin & Schaffer 1985, chap.2).

The idea of modern science breaking with medieval religious and spiritual stances typical of the alchemic lab requires some reconsideration. Besides remarkable disputes such as those involving Galileo and Descartes (Biagioli 1993; Gaukroger 1995), most scientists continued to inscribe their discoveries and theories within an overarching religious system. The desire to support their theological views and explain God’s interaction with the physical world was often the motivation behind a great deal of scientific endeavour (Henry 1997a). Only gradually, throughout the course of the eighteenth century, the atheistic values of rationality and scepticism advanced by the Enlightenment became prominent in the lab. In the meantime, scientific laboratories became integrated in universities and other academic institutions.

Based on the examination of the use of the word ‘laboratory’ before the nineteenth century, Ursula Klein argues that two different typologies of lab coexisted in the early modern age. Besides the scientific institution, the term was frequently associated with shops, workshops and ateliers devoted to material and commercial production. These artisanal labs continued a tradition of alchemy and tinkering, and employed processes of combustion, dissolution or precipitation applied to mundane activities such as the production of gunpowder or the distillation of spirits. Hence the laboratory was not just a site of knowledge production, but also a place for technological innovation and production of artefacts. In parallel, scientific research was also taking place outside of the lab. In fact only chemists were required to constantly base their activities in a laboratory (because of the practicalities and dangers of their work). All other scientific investigations, from physiology to magnetism or electricity, tended to take place in any suitable room (Klein 2008, pp.771–773).

2.2.2 Contemporary laboratories

A commonly held inheritance of the Enlightenment is the growing specialisation of knowledge leading to a division of disciplines in education and research. The scientific developments of the nineteenth and twentieth centuries led to the contemporary distinction of specialised labs, differentiated by their specific equipment: chemistry, medical, computer, physics, space, engineering, biotechnology lab, just to name a few. Nevertheless, labs have in common the adoption of controlled conditions for operations and of regulated procedures and general norms. Safety issues, and the need to guarantee that knowledge production operations are protected and not accidentally altered, dictate a restricted accessibility, in a way that has deeply shaped the common imagination. International directives and standards provide

guidance and codes of practice to protect laboratory workers from risks related to exposure to biological agents. This includes training, hygiene recommendations, protective clothing, washing facilities and limited accessibility (European Agency for Safety and Health at Work 2000; World Health Organization 2004; ISO International Standards Association n.d.).

Another common trait across different labs is that they all employ the same practices and structures of dissemination: the publication of texts (reports, papers, articles, books) saturated with specialist language and cross-referencing other studies. The second half of the twentieth century was characterised by a series of capital interventions in the field of philosophy and sociology of science, questioning the monolithic, immutable and objective nature of scientific research, and looking at the relationship between lab practice and dissemination as the crucial site where science is revealed as a cultural, constructed and contingent system. In *The Structure of Scientific Revolutions* (1962) Thomas Kuhn challenged the established view of scientific progress intended as an accumulation of facts and theories, in favour of a paradigmatic model incorporating conflicts between dominant visions and anomalies. His theories influenced the Hungarian philosopher Imre Lakatos, whose conceptualisation of the research programme (Lakatos 1970) connected scientific advancements to the priority given to specific problems at specific times according to socio-cultural factors. Paul Feyerabend's anarchistic approach to science focused instead on the rejection of universal and stable methodologies for conducting research (1975). Finally, a number of publications in the field of STS unpacked laboratory practice from an anthropological perspective to re-discuss the foundations of scientific truths. In particular, Latour and Woolgar's *Laboratory Life* (1979) describes scientific facts as the outcome of complex relationships between channels of credit and prestige, the interpretative work associated with the use of inscription devices and academic writing. These investigations led to a view of reality as a consequence, rather than a cause, of the activity conducted in labs. Building on this body of work, Karin Knorr-Cetina describes the contemporary scientific laboratory as a reconfiguration of natural and social orders. She emphasises the discrepancy between natural objects and laboratory workable objects, where the latter are always a purified, translated version of the first. Consequently, experiments too only maintain an indirect relationship to reality (2009). Lately, Latour has suggested the notion of the World Wide Lab to address the recent expansion of scientific research to the whole planet, thanks to systems of global monitoring, virtual simulations and online collaboration. This relates to the increased size and complexity of the phenomena under scrutiny, and their overlapping with political issues (2003).

A recent conceptualisation of experiments and laboratory practices is offered by Karen Barad (1996). While rejecting the traditional discovery model of scientific research, characterised by passive observers focusing on autonomous natural phenomena, she tries to come to terms with “some extreme version of social constructivism that presents science as an arbitrary compendium of power-laden rhetorical moves” (ibid 1996, p.184). Her proposal goes under the name of agential realism and is inspired by Nils Bohr’s writings on issues of measurement in quantum physics. If the observer and the conditions of measurement influence the result of the experiment, it follows that object and agencies of observation cannot be separated (ibid 1996, p.170). Experiments are portrayed as intra-actions where the observed phenomena do not possess any independent status beyond human experimental exploration. The scientist participates in the reality under examination, and what scientific theories describe is agential reality, a material-cultural assemblage (ibid 1996). This idea of an experientially situated knowledge, and an essential entanglement of theory and practice, suggests a reintegration of the two ‘souls’ of the lab, *practica* and *theorica*, separated but evolved in parallel during the modern era.

2.2.3 Creative technologies in the lab

This convergence is crucial to understand a further incarnation of the lab, developed during the second half of the twentieth century around the creative exploration of technology, and established with the rise of digital culture in the form of media-labs, innovation labs, hack-labs or maker-spaces. These histories originate with the productive intersections of art, science and technology in the sixties. Michael Century (1999) provides an extensive overview of this matter introducing the definition of studio-lab, which significantly emphasises the merging of artistic and scientific research spaces. In a report for the Rockefeller Foundation, Century describes the gradually intensified communication between the scientific and humanistic sectors leading to hybrid institutions “where media technologies are designed and developed in co-evolution with their creative application” (ibid 1999, p.3). The author traces back the roots of this development in the early 20th Century avant-gardes, especially the Bauhaus. He subsequently identifies three phases in the historical evolution towards the studio-lab. 1) Art centres created during the 1960s and 1970s to support the artistic experimentation of emerging technologies. For instance: E.A.T. (Experiments in Art and Technology), IRCAM (Institut de Recherche et Coordination en Acoustique et Musique) and the Centre for Advanced Visual Studies at MIT. 2) Media centres interested in research but also in engaging the public with festivals and exhibitions, appeared in the 1980s and 1990s (ZKM and NTTInterCommunication Centre). 3) Studio-labs created in the 1990s and based

on strong partnerships with the industry or higher education: MIT Media Laboratory, Xerox Parc PAIR artist in residence program, and the Banff Centre.

Century's account however does not problematise the political agenda of the idea of 'arts and technologies lab' and its ambivalent relationship with the military, industrial, corporate and educational sectors. More recent discourses on media labs are addressing this complexity and acknowledging how they sometimes align with neoliberal economic forces, producing frictions between artistic and economic drivers. For instance, the origin of the MIT Media Lab (archetype of many subsequent instantiations and first adopting the term media-lab) has been connected by Lori Emerson with Cold War military research (via its funder Jerome Wiesner) and government funding (via its other funder Nicholas Negroponte) framing in critical terms, and in relations to a set of power relations, the invocations for a better future at the core of its mission (Emerson et al. 2016).

The concept of media-lab however is fairly open and it is applied, today, to both grassroots, independent initiatives, and to technologically-focused research labs affiliated to academic institutions or industry. In an article commissioned by the Arts Council, Charlotte Frost outlines a brief history of media labs in the UK, and provides a working definition of these environments of creative experimentation with technology, described as

spaces — mostly physical but sometimes also virtual — for sharing technological resources like computers, software and even perhaps highly expensive 3D printers; offering training; and supporting the types of collaborative research that do not easily reside elsewhere (2012).

Great emphasis is also given to their Open Source ethos and their preference for collaboration and transdisciplinarity. Media-labs are frequently conceived as socio-technical projects addressing social needs and striving to engage ever larger communities, especially marginalised groups, with an open door approach that involves all participants in the maintenance of the space and its resources (ibid 2012).

It is not possible to describe the communities taking part in media-lab activities as audiences. All participants tend to be actively involved, at least on a project basis, and to gather around principles of accessibility and learning-by-doing. The opportunities offered span from tuitions on software packages and professional training for unemployed people, to creative prototyping sessions and workshops combining crafts and digital technologies¹. The relationship between media-labs and art is complex. Whereas some labs maintain a stronger research orientation or a pure attitude towards tinkering and making, others established

¹ The Zero Dollar Laptop project, for instance, consisted in a series of workshops to teach homeless people how to build a laptop using recycled hardware and open source software (Furtherfield 2010). Shrimping It introduce prototyping to various communities as a tool for education and empowerment (Shrimping it 2013).

themselves as leading venues for NMA: MediaLab Prado (Madrid), iMAL (Bruxelles), Ars Electronica Futurelab (Linz), Space (London) are great examples. Nevertheless they differ from museums and galleries primarily because they generally reject the format of the exhibition, in favour of activity-based events like workshops. Additionally, there is a tendency to avoid referring to art as the outcome of their production (Calvillo 2014). Frost stresses the importance of media-labs in addressing the special needs of digital art, often struggling to find an ideal context in traditional galleries because of its process-based nature. Media-labs offer platforms where the distinction between production and presentation to the public is abolished, and artists are not required to show a final product.

Besides media-labs, there are correlated entities such as fab-labs, equipped with tools for digital fabrication; hack-labs, hacker-spaces and maker-spaces, inspired by values of OS and open culture, and aimed at unconventional and creative uses of technology. Denisa Kera assembles heterogeneous types of labs under the definition of alternative R&Ds to identify a grassroots, non-institutional, global network of spaces where a low-tech approach to innovation is “becoming an active expression of citizenship” (2001, p.52). The potential of digital technology labs as sites of democratization and participatory decision-making (Sangüesa 2011) contributes to frame them within an activist perspective. In this light, prototypes are key agents of change, physical demonstrations that specific changes at social, political or economic level are possible. Prototyping can serve activist goals through supporting cooperative and shared practices, engendering critical attitudes towards the status quo and enabling citizens to experiment with new organizational forms.

From this brief historical overview the lab emerges as a versatile environment oriented to material and immaterial production, the making of things and the production of knowledge. Experimentation and repetition of established practices and techniques coexist. Finally, despite being commonly considered as enclosed environments where the wider public is denied access, labs are associated with a tradition of dissemination, sharing and staging of scientific and technological advancements; they are embedded in networks of institutions and communities in an effort to persuade and engage.

2.3 Labs, museums, curators

These features need to be borne in mind when exploring the history of the concept of lab in relation to artistic and curatorial practice. In this case too, finding a starting point is a challenging task. Renaissance artists used to work collectively in workshops or atelier, even though subject to a clear leadership and a precise hierarchy very different from the collaborative approaches common to contemporary art labs. It is only with the 20th century

Avant-gardes that experimentalism becomes the main characteristic of art production (Poggioli 1968). The traditional concept of the studio as site of art making is challenged by an attitude closer to interdisciplinary collaboration and industrial production able to introduce the laboratory paradigm in the history of art. The Bauhaus emphasis on the potential of creativity to encourage social change explains its influential role in shaping the imagination around so many future art school programs. Vkhutemas (Higher Art and Technical Studios) was established in Moscow by Lenin in 1920 as a series of workshops and courses including graphics, sculpture, architecture, printing, textiles, ceramics and metalworking. Animated by claims of utilitarianism in art to “respond to governmental pressures to re-invent art as labor and make it relevant to the working class” (Aristarkhova 2008a, p.168), it was the core of Russian Constructivism. Its stance against individualism in art making and elitism in its reception inspired a notion of collective experimental creativity that contributes to challenge the idea of artwork as a finished object, in favour of something able to change “the material conditions of everyday life” (Aristarkhova 2008b). This often resulted in the construction of prototypes applicable to concrete areas of production, as opposed to mere formal and compositional explorations.

The Constructivist approach resonates with the concept of lab not just in terms of artistic production, but also for what concerns its exhibition practices, inspired by the socialist principle of citizens’ agency. El Lissitzky was interested in public participation and issues of display. His *Demonstration Rooms* (1926-27) transcend the notion of individual artwork by exploring the potential of architecture to activate the role of the viewer. They employ lights and optical strategies to recall the typical locations of modernity, the city and the factory, and embrace a transformative understanding of materiality, resulting in dynamic arrangements of different objects (Löschke 2012).

The second half of the twentieth century was characterised by a series of experiences turning exhibitions into live events. Building on the legacy of the Avant-gardes, Happenings re-introduced everyday life and improvised action in the art world. The Institutional Critique (Fraser 2005) questioned the establishment represented by the studio and the gallery, opening the way for further curatorial experimentation. The rise of site-specific art significantly redefined the spaces of making and experiencing contemporary art. In *From Studio to Situation* Claire Doherty edits a collection of texts describing the ‘exteriorisation’ of the studio turned from private, inaccessible environment into a public mechanism of display (2004a). Andy Warhol’s *Factory* suggests instead a rather distinct interpretation of the lab, intended as a place of convergence between art practice and industrial processes (de Duve 1989).

2.3.1 *Metaphors of display*

There is a fundamental contradiction in the way the lab works as an analogy for the exhibition space. We will see how the rise of NMA is accompanied by a model of the lab as a platform for exchange and collaborative making. Prior to this however, the model of the white cube has been the dominant paradigm to display mainstream contemporary art.

A gallery is constructed along laws as rigorous as those for building a medieval church. The outside world must not come in, so windows are usually sealed off. Walls are painted white. The ceiling becomes the source of light. The wooden floor is polished so that you click along clinically, or carpeted so that you pad soundlessly, resting the feet while the eyes have at the wall (O'Doherty 1999, p.15).

The identity of the laboratory as a clinical, sanitized space, where leakages and contamination have to be avoided, and nature is examined outside its context, strongly resonate with the aseptic space of the white cube. This is similarly artificial, exclusive and committed to subtract anything that could interfere with the artwork, which needs to be isolated (ibid. 1999, p.14) exactly as if it were a phenomenon recreated and observed in the lab during an experiment. The etymology of the word laboratory is perhaps more in line with its recent metaphorical value as space of public making (Shaw & Bowers 2015). The Latin *laboratorium* simply indicated a place for work (*labor*). This suggests its interpretation, in relation to the exhibition space, as a site where work is exhibited, or where the public is invited to work (Steyerl 2012). The dismissal of the white cube brings back the attention on ideas of activity, making or doing.

In this framework, the lab has acquired new currency in discourses around the role of the museum as driver of change. Brian Holmes talks of museums as social laboratories where new behaviours can be experienced: a site of social evolution (2004). In a similar vein, Tony Bennett suggests a view of museums as civic laboratories to emphasise how the encounter between objects and people can promote cultural diversity (2005). The idea of the laboratory proves incredibly popular in the rhetoric developed around institutional redefinitions of museums and galleries. So-called New Institutionalism includes a series of curatorial practices taking place from the end of the nineties and aimed at reforming institutional activity from within, rather than through critical rejection (Kolb & Flückiger 2014). In this context, the museum was conceived as a space of production, debate and experimentation: “part community centre, part laboratory and part academy, with less need for the established showroom function” as in the words of one of its main proponents, Charles Esche (quoted in Doherty 2004b, p.2). Besides the uncertain success of this programme it is instructive to

notice how the idea of laboratory is used, once again, to recall the model of an operational and discursive space, where work happens rather than being displayed.

Science centres (such as the Exploratorium in San Francisco or the Dana Centre in London) have a long-standing history of involving artists in hybrid lab/exhibition settings. Nevertheless the role of the artist in these contexts tends to remain instrumental to public engagement with science and technology, exploiting the power of aesthetic languages to generate dialogue and participation.

The metaphor of the lab has been adopted in contemporary art in the last thirty years to inform both institutional programs and individual artworks. An example of the latter is *Makrolab* (Project Atol 1999), a mobile prototype of a futuristic research station conceived by Slovenian artist Marko Peljhan to investigate the fields of telecommunication systems, weather and migration. First set up in 1997 at Documenta X, the structure has been subsequently operating in Australia, Slovenia and Scotland. A centre for observation, capturing and processing data, *Makrolab* constitutes a micro-social environment where artists, scientists and researchers work in isolation, without any interaction with an audience. An interesting point that emerges from the analysis of this project is that a lab can be interpreted aesthetically as a performance in itself:

The performance dimension of the lab, then, requires learning the techniques of building isolated/insulated environments as a survival experiment in a narrow, concentrated workspace which at the same time functions as an independent communications organism designed to receive and transmit information (Birringer 1998).

Laboratorium, co-curated by Hans Ulrich Obrist and Barbara Vanderlinden in 1999 in Antwerp, constitutes perhaps the most emblematic manifestation of the laboratory paradigm in curatorial practice. The project explored the possibilities and the nature of sites of production of knowledge and investigated the meanings of experiment and the ways they are negotiated in the public realm. The exhibition involved the entire city by opening up existing labs and installing temporary ones, including a laboratory of doubt; a cognitive science laboratory; a highway for choreographic investigation (Obrist et al. 2003, p.151). In this case the lab is both the topic and medium of the investigation, and facilitates the transdisciplinary dimension of the project. Obrist reaffirms his idea of the museum as laboratory in his contribution to the publication *What do you expect from an art institution in the 21st Century?* (Sanchez & Sans 2002a) intended to provide a framework of inspiration for the Palais de Tokyo which was inaugurated in the same year. The book contains the answers given by a number of leading protagonists of contemporary art and works as a sort of manifesto for a

living museum, recurrently described by his funders as a ‘venue-laboratory’ (Sanchez & Sans 2002b) or a space of production (Bourriaud 2002a).

2.3.2 Modelling the lab in the museum

This chapter can only offer a partial, selective overview of the different incarnations that the concept of lab has taken in artistic and curatorial practice. A common model is that of a networked, distributed entity incorporating labs and projects across art and science, such as Foam (2014). A combination of residency, research and exhibition program is another possible solution, as adopted by the Swiss Artists-in-Labs Program, a collaboration between the Zurich University of the Arts, Institute for Cultural Studies in the Arts and the Federal Office for Culture (Swiss artists-in-labs 2004). Hybrid identities are a recurrent factor. For instance Le Laboratoire (2014) operates at the intersection between academia, entrepreneurship and humanitarian endeavour. Launched in Paris in 2007 by David Edwards and described as an incubator of ideas, it includes R&D capacities where artists experiment with science; an exhibition space where works in progress can benefit from the encounter with the public; and a retail shop where the innovative products created are on sale.

The experience of Beta_space (Muller & Edmonds 2006) in Sydney is particularly relevant to my research because of the primary role given to artistic prototypes. This experimental exhibition venue was created in 2004 in the context of research conducted at Creativity and Cognition Studios addressing the challenges of making and curating interactive art. Ernest Edmonds and his team identified in the human-centred approach to HCI a set of theoretical and practical tools suitable to their purposes (Edmonds et al. 2009a). Beta_space was conceived as a living lab where research, production and exhibition could happen simultaneously. Interactive artworks were approached as technologies whose effectiveness depends on human behaviour, and the idea was to set up a curatorial program where they could be tested at a prototyping stage, and implemented according to the audience feedback. In her doctoral thesis (2008) Muller reflects on her curatorial practice and analyses how it is transformed by the living lab context. A crucial task is to frame for the audience the value of the prototype not as something unfinished but as part of a conversation with the artist (2006). There is also the need for an evaluation of the artwork, especially focused on its interactivity (rather than on critical or conceptual issues). For this reason the curator is required to generate opportunities and methods to collect audience feedback. Finally, the curator collaborates with the artist in considering the complexities of audience experience to modify the work accordingly (Edmonds et al. 2009b). The result is not just a way to improve interactive art (or make it more user-friendly) but has a great potential in engaging the public for two reasons:

viewers can gather a deeper understanding of the scientific and technological dimension of the work; they can also feel empowered by the idea that their feedback will contribute to the development of the work itself.

The model of living and innovation labs has significantly influenced museum and gallery practice, as evident in a number of recent attempts to create a laboratory-space within established institutions. The Metropolitan Museum of Art recently inaugurated a Media Lab with the mandate to explore emerging technologies that could have an impact on the museum experience. The space offers opportunities to explore digital tools for creative production and promotes the DIY culture typical of hackers and makers (Undeed 2013). FACT in Liverpool turned the foyer of its building into an experimental space called FACT Connects to explore “new types of relationships between audiences and producers” (Taker 2014). Its program includes activities to involve the local community of artists, makers and creative businesses; workshops; short-residencies; testing of products or proposals; interactive exhibits; projects “seeking to actively engage visitors with developmental stages of the creative processes which usually take place behind closed doors” (ibid. 2014). FACT also has a Research & Innovation strand whose activities, in the fields of health, ageing and citizenship, can receive visibility in the Connects space. A further symptom of the global currency acquired by the concept of lab among museum professionals is represented by the joint initiative of American Alliance of Museums, EmcArts (a social enterprise for learning and innovation in the arts) and MetLife Foundation (an insurance provider) launched in 2012 as Innovation Lab for Museums. Articulated as a programme of coaching and group facilitation, the initiative is “designed to enable selected museums to design, research and prototype innovations, testing novel approaches to field-wide challenges in a laboratory-like setting” (EmcArts 2014). In this case the lab is not presented as an engagement tool, but rather as a vector of change for the museum itself, a sort of therapeutic innovation treatment where museums can be dissected and renewed.

Finally, the lab proves to be a successful model not only for museums, but for a broader range of cultural events. *FutureEverything* has been for 20 years a festival of culture and technology, with a program of talks, presentations and exhibits. Its 2015 edition was themed around the idea of the *Festival as Lab*, and claimed to adapt the model of the living lab to engage participants in processes of co-creation and work as an innovation ecosystem connecting creative communities, stakeholders and local citizens (Hemment 2014). Similar innovation oriented cultural festivals, linking creativity to speculative visions of the future, have proliferated in the last few years (Arizona State University 2013; NESTA 2014), and can

be equally referred to the paradigm of the lab because of their tendency to discuss the new in participatory and transdisciplinary contexts.

A last consideration concerns the notion of the studio, often contrasted to the lab as a private and individual environment. The studio itself, however, has undergone transformations towards more open forms making it often indistinguishable from what can be defined as lab. With his definition of *The Transdisciplinary Studio* (2012a) Alex Coles addresses the studio of a number of mainstream contemporary artists characterized by the interaction of several collaborators, so that transdisciplinarity becomes both an operative model and a theoretical framework. This approach is epitomized by the Studio Olafur Eliasson, whose staff includes artists, architects, designers, art historians, scientists, archivists, theorists and curators with the role of enhancing discourse around the artistic production taking place in the studio. The studio occupies a whole building and is articulated in seminar rooms, an archive, an art school, a *wunderkammer*, an administration area, a giant space for rehearsing installations, a production area, a metal workshop and Eliasson's personal space (ibid. 2012b). The transdisciplinary studio of contemporary art-stars is therefore a macro-space of production and collaboration, where projects need to be managed and theory is grounded in practice. Indeed it might be argued that the fact that it continues to be labelled as a studio could be just a way to ensure "that the miracle of authorship folds over every aspect of its activity" (Jones 2012, p.3010).

2.4 Sections 2 and 3 summary

Section 2 outlined the historical development of the concept of the lab from alchemic laboratories to contemporary specialised ones including media-labs experimenting with creative technologies. The overview highlighted the co-presence of theory and practice as a defining feature of the lab. This is an important point in supporting the idea that prototypes are natural and crucial outcomes of the activities conducted in labs. As physical instantiations of ideas and practical expressions of research, prototypes, like labs, integrate knowing and making.

Section 3 illustrated how the lab has worked as a model for a range of artistic, curatorial and cultural projects. In particular, such a model is adopted to emphasise the experimental drive of the project, or to represent specific environments (like art schools or museums) as agents of social change. In this case artworks can be conceived as prototypes able to reach everyday life, and cultural activities tend to become more participative and process-oriented.

2.5 Discussion

This review, even though inevitably selective, helps us in understanding why the concept of lab has been deployed so frequently in museum and curatorial discourses, with a programmatic intent. This resulted in a mix of effectively experimental projects and more traditional ones that were simply appropriating the appeal intrinsic to the lab label. Somehow paradoxically, if one thinks of its clinical and inaccessible nature, the lab has worked well as a model to look at to accommodate collaboration, interdisciplinarity, participation, hands-on activities, and to promote values of transparency, agency, innovation and social change. More participation and agency however necessarily translate into new barriers. These cultural forms can only be delivered to small-scale publics, and require specific literacies and more risk-taking on the part of the participating audience.

The lab is generally recognised as the site for experimentation par excellence. The adjective experimental has been used countless times in association with both artistic work and exhibitions. By recalling the familiarity of scientific experimenters with spectacle and drama, Macdonald and Basu suggest an analogy between experiments and exhibitions, both animated by a drive to display, to make visible the invisible. This is ever more true when exhibitions are not just intended as a showcase of pre-existing knowledge, but as a site of production of new knowledge and experience (Basu & Macdonald 2007, p.2). Elsewhere in the book this analogy is reinforced by the idea that:

both exhibition and experiment can be described as a process of discovery which comes from translating concepts into material form, in order to see how different aspects of this materiality may interact with each other in complex, not fully anticipated ways, and to thereby gain new insight into both these underlying concepts and the nature of immanent materiality itself (Lorimer 2007, p.215).

In another chapter of the volume, Latour and Weibel suggest a ‘performative turn’ in curating, turning exhibitions into spaces for enactment, rather than representation. The authors bring the examples of their own projects *Iconoclash* and *Making Things Public* to describe how the display is turned into a space of knowledge production by assembling ‘matters of concerns’, that raise questions whose answer is unknown before the public running of the show (Weibel & Latour 2007).

The experimentalism often associated with artistic work can be contrasted with the modern, industrial conception of labour: mechanical, repetitive, non-creative, fractionalised, alienating and oriented towards material production. Both share a strong relationship with technological tools and a potential for human emancipation. Nevertheless the artistic appropriation of the lab has always rejected its mechanical component, and praised instead the

characteristics of experimental work: creative, inventive, unpredictable, never done before. A prototypical paradigm, where aspects of repetition (with variations) and material production are re-inscribed within artistic work, can reformulate the definition of labour which goes alongside the metaphorical bearings of the laboratory. By doing so it reconsiders the socio-political dimension of making art.

Another element that emerged from the review is the association between exhibition and research. This is clear in museums devoted to public engagement with science and in the experiences of *Makrolab*, *Laboratorium* and *Beta_space*. The so called educational turn (O'Neill & Wilson 2010) in contemporary art offers a parallel perspective in exploring the potential of the exhibition in generating opportunities for the dissemination or production of knowledge. The expression refers to a series of heterogeneous experiences in the second half of the nineties, associated with the adoption of formats and methodologies typical of the educational infrastructure (seminars, classes, courses, research trips, workshops, lectures) within curatorial or artistic practice. This turned the exhibiting space into a site for discourse, but also expanded curatorial practice to alternative sites, outside the traditional gallery. While the educational turn can be viewed in the light of the broader trend of relational aesthetics (Bourriaud 2002b), it can be cast more specifically as a reaction against the standardisation and corporatisation of Higher Education across Europe established by the Bologna Accords in 1999. The same criticism was generally addressed at the idea of a hierarchical passing on of a pre-determined body of knowledge to the coming generations. Experimental schools wanted to undermine an idea of pedagogy as discipline and encourage instead an educational practice driven by emancipatory and liberative forces (Freire 1972; Ranciere 1991).

The idea of learning as a structure for inclusion typical of experimental art schools resonates with the ethos of media-labs and maker-spaces. The educational turn however remains primarily anchored to a repertoire of relational and dialogical forms that exclude practices of material production, and therefore cannot fully be recognised within the lab paradigm. Furthermore, artists working in media and research labs today do not reject the institution per se. Even when embracing a grassroots attitude, most of them behave as proper organisations and interact with other institutions.

2.6 Art and Research

The traditional separation between theory and practice, researching and doing, was questioned by Donald Schön's account of the reflective practitioner and his argument that knowledge is produced in action (1983). His studies became an incentive towards new forms of learning by doing in schools, and for the introduction of practice in art and design doctoral programs. The

first practice-based PhDs were introduced in Australia and the UK, when artefacts began to be included alongside a written dissertation as part of the submission (Candy 2006, p.4). PbR is considered a suitable methodology for creative practitioners because of its emphasis on making as the key driver of analysis and reflection. Yet, there is no universally accepted definition for it and debates are still ongoing about the relationships between artwork and knowledge.

Stephen Scrivener (2000) is among the firsts to attempt a clarification on the basis of his own experience as supervisor of PbR PhDs. His observations result in a distinction between two different kinds of research generating artefacts, both ruled by specific requirements. Technological or design research is framed as ‘problem-solving research’ whose artefacts are just an example, and remain less important than the knowledge itself. This knowledge is widely transferable and applicable to other domains. In reporting this kind of research, the focus goes on demonstrating effective and abstractable solutions to a problem. The artefacts generated from ‘creative-production research’ instead are intended as objects of experience and have value in their own right. They are the main outcome of the research, while knowledge emerges as a sort of by-product, unlikely to be applicable elsewhere. These projects should be communicated by rooting them in cultural concerns and focusing on a continuous reflection on practice. Even though Scrivener specifies how such division is more porous than it looks, it is symptomatic of the uncomfortable relationship between art practice and academic definitions of knowledge, especially during the first years of PbR.

In the past decade many authors collected experiences of PbR to offer descriptions of how knowledge is produced in such contexts. Conferences such as *Sensuous Knowledge* (Bergen Academy of Art and Design 2013) in 2004 opened the discussion by inviting practitioner-researchers to share experiences and critical issues. Publications by Schatzki et al. (2001) and Carter (2004) also contributed to fuel the debate by providing a philosophical and transdisciplinary background to more specific accounts of PbR. Whereas the first is not particularly focused on art practice though, the latter will influence future argumentations by defining material thinking as localised, anchored to the place and the situation of a specific process (ibid. 2004, p.185). Studies conducted at the Creativity and Cognition Studios developed an insight into the methodology of PbR and advanced the relevance of evaluation as a paramount phase in the process (Edmonds & Candy 2010).

2.6.1 The problem with knowing and making

One of the main problems addressed by proponents of artistic research concerns the relationship between theory and practice. A common approach abolishes their traditional

opposition by focusing on the critical and interpretative act of the aesthetic experience to describe theory and practice as mutually enriching (Macleod & Holdridge 2006). This focus on interpretation however implies that anyone experiencing the artwork could be the researcher. This contradicts one of the essential premises of PbR: that artists have access to a special knowledge precisely in virtue of their primary role in making the artefact. Knowles & Cole (2007) place artistic practice alongside a number of methodologies including the use of visual images or literary fiction, blogs, video, exhibition making and performance. The problem of knowledge is addressed in the first chapter of the same volume, by Elliott Eisner, where dynamic and non-discursive definitions of knowledge are advanced to accommodate practice as a site of research. The contribution offered by the arts, however, is framed in fairly reductive terms as a way to materialise feelings and provide evocative and emphatic forms of knowledge (Eisner 2008). Barrett and Bolt's approach similarly emphasises subjective and situated knowledge. Their focus goes to the transdisciplinary nature of PbR, and its hybridity of methodologies that challenges the separation between sciences and humanities (Barrett & Bolt 2010). Sullivan articulates a historical background for art practice and research and provides a theoretical framework that includes three possible research approaches: interpretivist, empiricist and critical (Sullivan 2005). Other writers point to the importance of spaces for collective and transdisciplinary experimentation like labs as indispensable for conducting PbR (Šmite et al. 2011).

One of the distinguishing characteristics of PbR is the identity between researcher and research subject (Sullivan 2009, p.51). This self-centred approach however is a double-edged sword. Most literature on art as research, reflecting the prevailing methods based on autobiographical writing and personal logs, has a tendency to the anecdotal and does not go beyond the description of specific projects. The recurrent questions delve into methodologies, new definitions of knowledge and the contributions that art can bring to it; and approaches to evaluation (as still evident in the most recent publications of Biggs & Karlsson 2010; Borgdorff 2012). Although the dialectic between writing and doing is frequently explored, less so are the ways in which artistic practice is influenced by the research context. In other words, writers have addressed mainly what art can do for research, focusing on knowledge production as the key factor at stake. This can be easily explained by the fact that it has taken a long time for artists to see their work acknowledged within a research framework. Issues of regulations, submissions, assessment and equivalence with conventional doctorates have been perceived as more urgent. Hence most publications in the field are attempts to reinforce the idea itself of art as research; to legitimise it in front of funding bodies and make it accountable for the rules of the University (e.g. so as to conform to 'Key Performance Indicators'). By

contrast, one of the aims of this thesis is to investigate how artistic production as research is different from that taking place in different environments (the studio primarily) and communities. An inquiry on the impact of research itself on artistic practice, able to go beyond individual accounts and to identify aesthetic and conceptual issues, is indeed still missing from this body of literature.

2.6.2 Artistic research and new media art

Further publications identify a strong tie between NMA and research. *Art Practice in a Digital Culture* (2010), edited by Hazel Gardiner and Charlie Gere, offers a number of perspectives that corroborate this consideration. In his own chapter, Gere places artistic practice not in antithesis with science, but rather as part of a common and broader experimental culture. Even though experimentalism can be identified in the arts in different historical moments, the author points out how they are especially typical of NMA, therefore suggesting it as inherently research-oriented (2010). In the second chapter Scrivener and Clements outline the respective relationships between the world of the art academy, the gallery and NMA. They argue for a greater coherence and stronger historical ties between the academy and NMA, whereas the gallery struggles in accommodating both NMA and artworks produced within academia (Scrivener & Clements 2010, p.9). In particular, the growth of research in the art academy, previously mainly focused on teaching, contributed to diverging discourses with the gallery world, not concerned with issues of art as knowledge (ibid. 2010, pp.11–13). New media and academy share similar approaches to dissemination and common values in terms of financial reward and freedom from commercial constraints (ibid. 2010, p.22). Furthermore, NMA provides a model for the development of new definitions and discourses in the arts, and resonates with research practices because of its scientific and technological orientation (ibid. 2010, p.20). In the same volume, Janis Jefferies advances the notion of artist as researcher as typical of a computer mediated-culture (2010).

Michael Naimark identifies in the proof of concept, something very close to a prototype, a crucial connection between tech-based art and research, and explains in these terms their complementarity:

much of the new tech-based art today is incomplete, unstable and temporary, while much of research, particularly if it's media-related, must be experienced as much as described. The convergence comes from opposite poles. In research labs, proofs of concept make physical something otherwise left to words alone. At places like the MIT Media Lab "the demo" is the currency for success, often in terms of funding as well as coolness among peers. In the arts, proofs of concept represent the end of an investigation that, for many tech-based artists, is enough. Any further work would be considered productization, not as interesting as exploring something else. This convergence helps to blur the line between artist and researcher (2003, p.11).

Naimark's words establish incompleteness as common to both NMA and research and cast finalisation in a negative light. What counts, in both fields, is in fact experimentation and the pursuit of the new, while finalising and concluding such processes in a fixed state is associated with the idea of making a product. Thus, the idea of prototypicality surfaces as a way of discussing the value of creative digital artefacts in contexts of innovation and research.

2.6.3 Designing artefacts for research

It is possible to observe a similar entanglement between making and research also in the field of design. RtD, a fairly established methodology to conduct research in the fields of Interaction Design and HCI, is centred on the making of artefacts that embody theories and technological opportunities, explore human behaviour and contribute to the framing of new problems (Zimmerman et al. 2007). The world of design has also been invested by debates about the role of artefacts in relation to knowledge production. Conflicting positions go from those addressing design research as mere product development (Zimmerman et al. 2007, p.493) to those emphasising a stronger tie between making and knowledge. Further controversies concern the intended outcomes of RtD. Responding to call towards protocols, standards and general guidelines in RtD, Gaver suggests that,

rather than aiming to develop increasingly comprehensive theories of design, practice based research might better view theory as annotation of realised design examples, and particularly portfolios of related pieces (2012, p.937).

In other words, he advocates for RtD a role in the production of a situated, contingent, provisional knowledge, not always generalisable or formalised in comprehensive theories, but generative, inspirational and operational.

Common to discourses of art as research and RtD is the argument towards a new definition of knowledge to accompany these emerging practices. Referring to RtD, Buchanan argues that a new kind of research requires a new balance between theory, practice and production (2001b, p.7). What is specific to this design knowledge is a "greater recognition of the extent to which products are situated in the lives of individuals and in society and culture" (ibid. 2001b, p.14). Similarly, by examining the work of contemporary artists and their emphasis on processes of creation and reception, Sutherland and Acord suggest a notion of experiential and distributed knowledge, understood as an (inter)action between people and situations:

Knowledge in creative practice is increasingly seen through the process of creating, mediating and encountering art rather than in any perceived final form (Sutherland & Acord 2006, p.125).

As opposed to an absolute, authoritative idea of knowledge, they talk of an embodied, contextual and subjective one, socially and materially arranged. Borgdorff, similarly, assimilates knowledge to thinking, and describe the outcomes of artistic research as pre-reflective and non-conceptual. Rather than producing knowledge, artistic research invites ‘unfinished thinking’, or, more simply put, sets thinking in motion (Borgdorff 2011).

Bush is also concerned by the growing entanglement between art and theory. Rather than a redefinition of knowledge, she proposes a categorisation of four different approaches to artistic research. The first one has a long history and consists in the use of scientific or theoretical knowledge to develop artworks; the second one addresses art thematically focused on research; the third one takes place when scientific processes are deployed in art making, therefore the artwork itself is intended as research; the last one concerns art as an academic discipline (2009, pp.2–3). The author criticizes the diffused attitude of idealising science, leading art to be considered knowledge only when adopting a scientific method. In reaction to this she advances the proposal for a form of artistic research engaged in critiquing, rather than assimilating, the processes of knowledge production in science. The capacity of art to express the inexpressible and reveal the concealed is promoted as a way to disrupt the power dynamics implicit in the existing knowledge production apparatus (2009, p.4). Once again the knowledge associated with art practice is led back to the unfathomable and the subjective, and situated in clear opposition to science. Its potential for critique is also highlighted, so that knowledge emerging from artistic research can be related to an innovative drive, dismantling traditional and institutional approaches.

Indeed, these discourses are affirming their value through the rejection of definitions of knowledge as static, stable and definitive, and defend emerging research practices against more established traditions. Beyond individual specificities, the new approaches to knowledge all share an idea of provisionality and contingency, and an awareness of dynamic material and social situations. I argue that such new conception of knowledge goes hand in hand with a particular kind of objects. The emerging key role of prototypes at the crossroad between art and research, investigated in this thesis, can be interpreted in this light.

2.6.4 Prototypes: unfolding artefacts and epistemic objects

Prototypes are frequently mentioned in discourses on RtD or PbR as the usual physical creative outcome of the research. Smith and Dean point out that a distinguishing characteristics of PbR is the adoption of cyclical processes of idea generation, experimentation and theorisation; this maintains a constant feedback between the developing

artefact and the researcher (Smith & Dean 2009, pp.19–25). This resonates with the framework developed by Edmonds and Candy to describe the dynamics of PbR as a set of different trajectories involving practice, theory and evaluation. The artefacts created are part of a process of progressive refinement where the evaluation informs new implemented versions of the prototype (Edmonds & Candy 2010). The outcomes are prototypes precisely because of this dynamic cycle that makes them constantly subject to further modification depending on the research development; they are steps on a path of experimentation. In RtD prototypes can demonstrate a research contribution by materialising the researcher’s ideas (Fallman 2008, p.15). They allow the dissemination and sharing of knowledge, become “the conduit for the transfer of HCI research to the practice community” (Zimmerman et al. 2007, p.498), and remain open to the possibility of further implementations in different research groups.

Beta_space provides a rare example of artistic prototypes being displayed in a public setting. The reason to show prototypes was strongly connected to the research process. Different researchers were involved in the project with different, but complementary, research aims. Muller’s research questions, in particular, concerned the contribution that both HCI methodologies and the analysis of audience experience could give to the understanding and curating of interactive art (2008, p.17). The idea to use prototypes came from the concept of living lab and turned from an HCI approach to study technological artefacts into a model for exhibition making. Prototypes were necessary to include audience feedback in the process. The display of finished artworks would be perceived as a statement not admitting any further intervention and, therefore, not encouraging the audience response in a comparable way. Furthermore, only prototypes come with the inherent expectation of being open to modifications and implementations, instigating a collaborative attitude between artists, audience and curator, and turning the gallery into a forum for discussion and participation. As objects of research, prototypes can be conceptualised as epistemic objects, following the definition advanced by Knorr-Cetina to describe objects of knowledge, at the centre of scientific research activity. These are complex entities that, like prototypes, possess both a material and immaterial nature: physical instantiations but also problems or ideas. The primary feature of epistemic object is described by Knorr-Cetina in terms of unfixedness and the capacity of unfold indefinitely:

The lack of completeness of being of knowledge objects goes hand in hand with the dynamism of research. Only incomplete objects pose further questions, and only in considering objects as incomplete do scientists move forward with their work (2001, p.185).

I suggest that addressing the prototypical status of certain artworks could contribute to a less reductive definition of the knowledge emerging from processes of PbR. As I outlined in section 2.4.1, advocates of PbR often support their claims by redefining knowledge in terms of affection and subjectivity. Looking at prototypicality can pluralise these views and reposition the knowledge emerging from artistic research within broader criteria of validity and applicability. Since prototypicality is only loosely defined here, one might ask whether all artworks might be prototypes (when appropriated by others for instance) or when is an artwork not a prototype. The concept of the prototype will be extensively unpacked in Chapter 3 but the reader will not find a clear-cut and conclusive ontological criterion to distinguish artistic prototypes from non prototypical artworks. Nevertheless, artistic prototypes belong to a specific set of discourses and socio-historical contexts (described in the Introduction) that allows a certain kind of dissemination for material or digital artefacts. I argue that artistic prototypes require a conscious approach on the part of their makers in not closing the creative process and maintaining the object in a state of suspension, according to determined cultural beliefs such as, for instance, the demotion of a traditional approach to authorship. Ergo, for example, I would not consider the *Gioconda* an artistic prototype even though it has been transformed into a different artwork by Duchamp in *L.H.O.O.Q.* (1919).

2.7 Prototypes and NMA Curating

Despite their relevance in literature on art as research, and the acknowledgement of the special bond between NMA and academia, prototypes are generally absent or marginal in discourses on curating, historicising and theorising NMA.

2.7.1 Materiality

A substantial body of literature on NMA curating developed during the 2000s, often building on theories of conceptual and technological art of the sixties, and focused primarily on what was radically different from the rest of contemporary art. Immateriality became a leitmotif, a recurrent feature to address the use of digital technologies and describe the shift from object to process typical of NMA and its networked models of distribution (Paul 2008, chap.6–7). There is an insistence on categories such as interactivity, connectivity and computability (Dietz 1999) as opposed to matter and form. Graham and Cook, among the most influential authors in the field, describe NMA as intangible, non-medium specific and distributed across virtual spaces (Graham & Cook 2010). Immateriality has also been addressed to understand the social and political dimension of NMA, by referring to immaterial labour and self-organising systems (Krysa 2006). Internet art in particular was often created as a clear

rejection of the gallery system and the process of commercialization that the internet itself was undergoing (Stallabrass 2002, p.26). The web, at least during its first decade of diffusion, was seen as a space of democratisation and a way to bypass cultural gatekeepers (Tribe 2002, p.138).

Despite a general difficulty in solidly defining NMA (Paul 2008; Graham & Cook 2010, p.2), there was a tendency to identify it with screen-based or computer-based works. This, together with the desire to understand what was disruptive and innovative about it, is responsible for the insistence on its de-objectified and de-materialised dimension. Until recently, only sporadic attempts have been made to address the residual or inevitable materiality of digital systems (Fuller 2005; Lillemose 2006; Munster 2011; Guriunova 2013). Besides the materiality of the infrastructure (cables, servers, electricity, computer cases and monitors...), always present even in the most ephemeral web-based works, most NMA maintains a physical nature constituted by elements of installation and environment. In the last decade however, in parallel with a renewed interest in materiality across a range of disciplines including media theory, archaeology, anthropology and semiotics (Miller 2005), a shift took place from the virtual and graphical spaces of the first wave of NMA, towards works based on coding and experienced as objects with their own behaviour, rather than through computer screens. This return to materiality is concerned by a complex blending of analogue and digital. In absence of a better one, the term Post-digital (Cramer 2014) is effective in addressing this interplay between physical and digital, corresponding to visions of ubiquitous computing, migrating out of the screen towards diffused and invisible infrastructures embedded in our surroundings (Greenfield 2010). Hence, there is a tendency towards hybridization and a desire to humanize, question or resist technology. Indeed, in my experience, a recent strand of NMA is questioning the social implications of emerging technologies by adopting a speculative attitude and mimicking the processes of innovation by adopting the methods and languages of design practice and research.

A new attention to materiality has only recently appeared in curatorial discourses accounting for 'the embeddedness of the digital' in objects increasingly endowed with their own agency (Paul 2015, p.2; Muller & Langill 2015). This thesis contributes new insights on the materiality of NMA and its critical stance towards technology. This happens by focusing on the notion of the prototype as a way to conceptualise emergent practices.

2.7.2 Collaboration and instability

There are a number of themes emerging in existing literature that in many ways announce this development towards prototypical objects. Collaboration, for instance, is another key idea in

understanding NMA, intended as an inherent property of network culture, but also associated to the necessity for curators to work more closely with artists (Paul 2008). Sarah Diamond pays attention to NMA strategies of production based on dialogue and collaboration and resulting in a redistribution of the authorship that becomes collective and generally less important (Diamond 2008). Cook and Graham enumerate participative practices of remake, cut'n'paste, hacking, recontextualisation, folksonomies and user generated content as typically enabled by digital technologies (Graham & Cook 2010, chap.2). Logics of decentralisation, peer to peer, OS and interactivity are also part of the same collaborative drive (ibid. 2010, chap.5). Furthermore the role of the curator is redefined as mediator or node in a network (ibid. 2010, chap.6). Collaboration and collective authorship are indeed defining attributes of prototyping, related to its suitability in enabling teamwork and opening artefacts to transformations engendered by different actors.

Prototypes are objects in flux, predisposed to evolution and change. Even if not intended specifically in these terms, instability goes alongside immateriality and collaboration as a defining feature of NMA. Alternatively described as variable, fluid, dynamic, unstable, non-linear, generative (Paul 2008; Graham & Cook 2010), NMA is associated with constant change also because of its intimate relationship with emerging technologies. This is reflected in the difficulties of applying traditional methods of conservation to NMA, and the search for approaches better suited to respond to its mutable nature (V2 Institute for the Unstable Media 2003; Graham 2014).

Recognising the problematic adoption of the term 'media', Cook and Graham suggest the concept of behaviour to analyse the aesthetics of NMA (2010, pp.5–6), shifting the focus from "how it looks" to "what it does" (ibid. 2010, p.295), its ways of responding to the environment or the audience, its capacity of performing actions according to instructions contained in the code. The relevance attributed to behaviour is an instructive point in the perspective of artistic prototypes, increasingly similar to Interaction Design artefacts or machines, suggesting or criticising new daily practices. An aesthetics based on behaviour is a promising step towards new paradigms looking at the performativity of the artwork and its propensity to overflow outside the artworld.

2.7.3 From exhibition to demonstration

A final point recurrent in the reviewed literature is the difficult relationship between NMA and museums or galleries. It is precisely the immaterial, unstable nature of NMA that may render it unsuitable for standard gallery environments (Graham & Cook 2010; Paul 2008). Besides the brief fortune of the model of the media lounge, where computer-based works

were confined in a devoted room, curators started experimenting with dynamic exhibition formats. The idea of exhibition as software, tradeshow and broadcast has been suggested to adapt curatorial practice to the iterative, modular and distributed nature of NMA (Graham & Cook 2010, chap.6). Temporary and hybrid platforms such as festivals, conferences and symposia have been proposed as better containers to present work in progress or research vision, blending discursive events and display (ibid. 2010, chap.9). The concept of the lab frequently appears as a model to accommodate the convergence of production (or process) and distribution (or presentation) typical of NMA, as well as its emphasis on active participants and experimentation. Furthermore, the connections of NMA with science and technology contribute to its appropriateness for the lab format (ibid. 2010, chap.9). Lunenfeld goes a step further by defining the demonstration (demo) as “the defining moment of the digital artist’ practice at the turn of the millennium” (2001a, p.13). The ‘demo or die aesthetics’, defines the presentation of a work as a space of performance where the artist has a similar role to the engineer showing a prototype to an audience of peers. This implies a rhetoric and discursive dimension, where the work cannot be left to “speak by itself” (Lunenfeld 2001b) but needs to be articulated and discussed, even in theatrical ways to bring the attention away from bugs and towards an illusion of seamless performance (ibid. 2001b). Nevertheless, the lab remains a source of inspiration for new forms of curation, however too often purely on a programmatic level. The lab is mostly presented as something to bring into the exhibition space or the public venue, a structure to build ad hoc for a specific event. Despite this being a valuable idea, another possibility has been overlooked: that of focusing on existing labs where artistic work engaging with technology takes place on a regular basis (media and research labs for instance), and opening this to curatorial explorations.

2.8 Sections 6 and 7 summary and conclusion

Section 6 reviewed the main debates around PbR, especially focused on the role of the artefact in the research process, and the conceptualisation of knowledge associated with this kind of research. RtD was introduced as a recent but already established example of conducting research grounded in practice. Although its contributions to knowledge tend to be more clearly design-oriented and operational, RtD brings about a set of discourses and perspectives that might enrich the discussion around the question of knowledge in artistic research. Section 7 emphasises the ties between NMA and research. Both are inherently experimental and interested in technological innovation, thus distancing themselves from the world of art galleries and mainstream contemporary art.

Many perspectives on PbR focus on defending its right to exist and the validity of its contribution to knowledge. Recognising this allowed me to identify a gap in the literature, as there is a scarcity investigations on the impact of research itself on artistic practice. My attention to prototypes responds to a question concerning the kind of aesthetic object generated within artistic research. The chapter concluded by looking at a set of key topics in literature on NMA. The focus on prototypicality is associated with a recent ‘turn’ to materiality, opposing the strong emphasis given to immateriality as a defining feature of digital artworks in the nineties. Issues of collaboration, instability and behaviour, also generally associated with NMA, are recognised as useful points in linking such discourses to the concept of the prototype.

Indeed, it is suggested that a focus on prototypes as a way to conceptualise and curate technologically engaged art, taking place in labs, can contribute to the following:

- 1) A reconsideration of the kind of knowledge generated from artistic research, by demonstrating its potential to go beyond the subjective and the emotional, towards determinations of proposals, inventions and opportunities.
- 2) An advancement in literature on curating and theorizing NMA, by accounting for its materiality.
- 3) An implementation of the model of the lab in curatorial practice that looks not only at reproducing a lab structure in the exhibition space, but focuses on artistic practice regularly taking place in existing labs.

In the following chapter, I look closely at specific cases of artistic work developed within temporary or established lab environments. Through my direct curatorial engagement with these practices I come to focus on prototypical artefacts and therefore respond to my initial research question concerning the impact of research on the artistic object. Further curatorial projects provide the basis for an analytical and conceptual discussion of the notion of the artistic prototype.

Chapter 3. Prototyping: an Exploration

This chapter introduces nuances and complexities surrounding the concept of the prototype. To do so it first outlines the earliest practical projects undertaken during my PhD, which helped me understand how prototyping is embraced by artists-researchers. These preliminary explorations demonstrate the potential of prototypes for engagement, co-creativity and debate, and their association with fictional or hypothetical situations. Artistic prototypes are then identified as a relevant area of further investigation. Subsequently, different meanings of the prototypes are extracted from literature, with a special focus on design. The result is not a stable, accomplished definition of the prototype, but a set of notes and indications, useful to identify artistic prototypes and describe their behaviour and areas of application. The analysis of two more projects reinforces the notion of artistic prototypes and enriches it with a set of features and annotations.

3.1 Introduction

Chapter 1 introduced a set of tendencies and phenomena contributing to a culture of prototyping, and highlighted how this practice has been embraced by artists, designers and makers as a medium in its own right, often to engage with technological innovation. Prototyping emerges as a hybrid process, with meanings and standards that vary significantly in different fields. Nevertheless, it results in something broader than a stage in the manufacturing process. Particularly, as something crucially valuable for understanding emerging artistic practices. In this chapter I address the concept of the prototype in greater depth, structuring the analysis around four curatorial projects that allowed me to explore uses and potentials of prototyping as both an engagement tool and a medium for artist-researchers and activists. The first projects were not intentionally conceived as explorations of prototyping, but as attempts to stage lab-like contexts for artistic practice. The idea of engaging with prototypes emerged in concert with practitioner-collaborators as an optimal solution to integrate critical use of technology and creativity in short and accessible event formats. Then, from an opportunistic and instrumental solution, I came to shift my focus to the prototype as the crucial and primary concept of my investigation.

3.2 Building Futures: Prototyping Workshops at the Big M

The Big M is an inflatable, mobile exhibition venue produced by Newcastle based organisation Isis Arts to deliver digital artworks in diverse locations. As part of a wider programme of events spread across summer 2013, I was invited to organise two workshops in

the venue, with the very loose aim to engage participants with technology. The context was a project curated by Kelly Richardson under the title of *On the Precipice*, encompassing a multi-screen film installation exploring human relationships with landscape and the problematic impact of humans on their environment (Isis Arts 2013).



Figure 1. Big M: exterior. Copyright Bettina Nissen

To respond to the environmental concerns advanced by *On the Precipice* and to the ephemerality of the Big M, I wanted participants to address the cultures of foresight and speculation introduced in Chapter 1. At the time of ideating the project I had recently come across Design Fiction (Bleecker 2009, henceforth DF): an experimental methodology adopting fictional scenarios to explore the impact of emerging technologies and the social practices that might originate around the introduction of new devices in everyday life. This made me think of prototyping as an effective way to practically engage people around issues related to a society affected by multiple crises, uncertainty and technological change. Envisaged as a way to identify future needs and emphasise the connections between people's value and innovation, DF was here applied outside any design-oriented logic, but as an autonomous process aimed at public engagement.

3.2.1 Visualising the Future

The first workshop was conceived in collaboration with three colleagues from Culture Lab (Tom Schofield, Marian Dörk and Bettina Nissen) interested in investigating the potential of visualisation in linking personal values to visions of the future. The workshop comprised two distinct activities. The first task involved the sketching of visions of the future according to a specific facet of choice (social relationships, economic transactions, resources distribution, mobility and so forth). In the second task, the thirteen participants used paper and found objects to visually materialise some of these sketches in groups, aggregating individual visions in more articulated ones represented by a prototype.

The workshop was therefore grounded in the adoption of two techniques common in design work: data visualisation and prototyping. This was a natural consequence of bringing part of our research lab (people, research interests and tools) into a public setting. During the event it soon became clear however that it was difficult for participants with various backgrounds to properly embrace the principles of data visualisation. By contrast, paper prototyping resulted an immediately accessible way to develop shareable models of personal utopias.



Figure 2. Visualising the Future: facets of future experience

The outcomes included both utopian and dystopian visions, mostly set in very distant futures and centred on technological progress. Technology was addressed without any

particular knowledge of current research and without any effort towards plausibility or feasibility.



Figure 3. Visualising the Future: working with plasticine

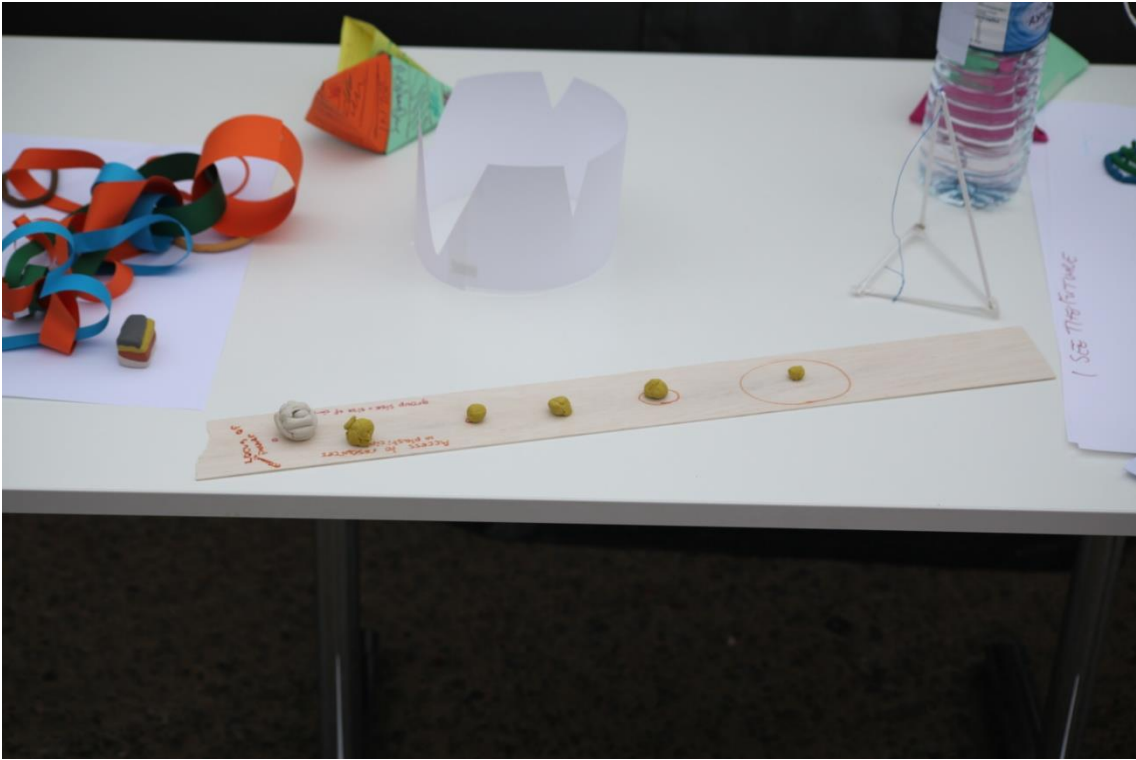


Figure 4. Visualising the Future: final display

Some prototypes were inspired by already existing technologies, such as augmented glasses or body implants; others from stereotypical science-fiction tropes (jet-packs and virtual mobility to rearrange travelling systems); finally, a number of prototypes focused on current issues of social media, attributing them a negative role, disruptive of social relationships. In this case, dystopian visions radicalised this trend depicting subjugating systems that produce isolation and control. Utopian visions suggested instead new community models reinforcing occasions for face-to-face encounters.

3.2.2 Project ICE: Isolated, Confined and Extreme Environments

The second workshop attempted to establish a stronger relationship with the context of the Big M, engaging with its iconic, sci-fi-esque shape and its sense of separation from the outside world.



Figure 5. Project ICE: a group of participants

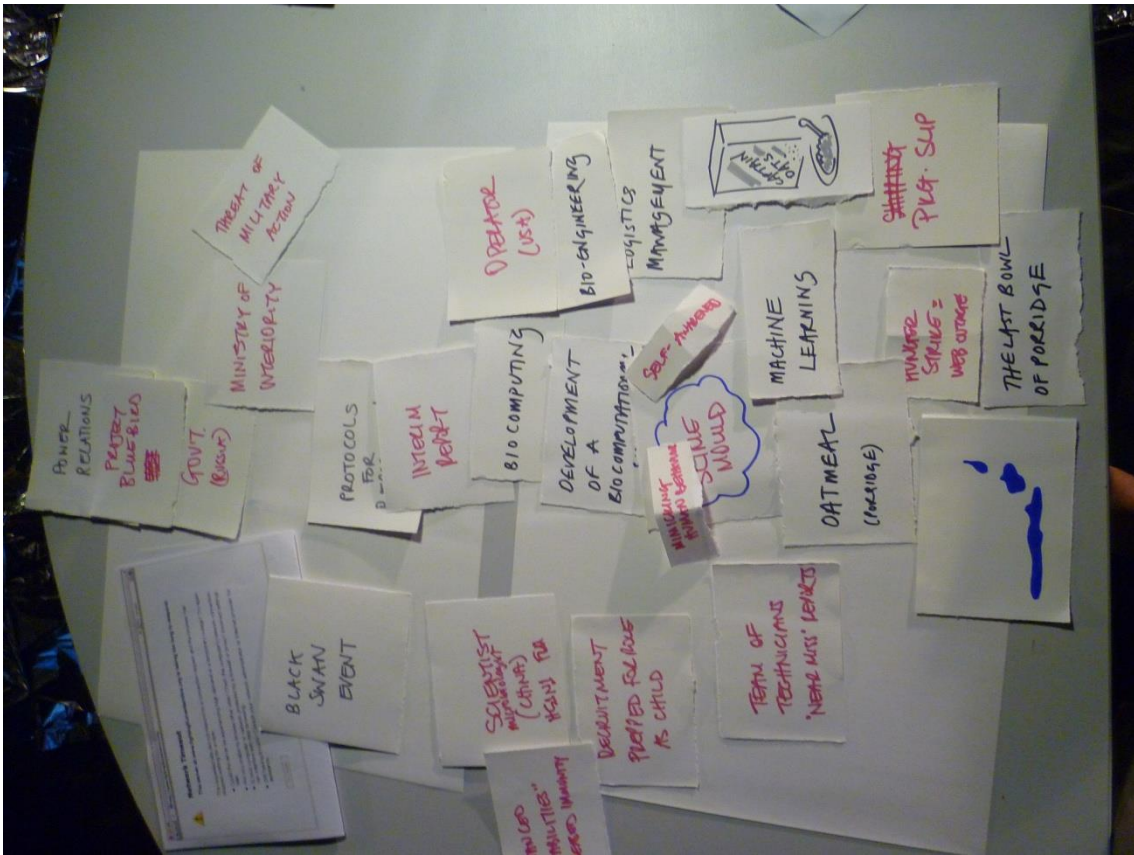


Figure 6. Project ICE: brainstorming



Figure 7. Project ICE: paper prototyping. Copyright Ben Freeth

The workshop was based on a fictional premise inspired by the affinity of the inflatable with images of capsule habitats for survival in hostile environmental conditions. My initial idea

was to imagine that the Big M was a post-disaster shelter-unit for survivors. To develop this concept further and facilitate the workshop I invited two collaborators with highly specialised knowledge in the field. Regina Peldszus is a design researcher focusing on human-technology interaction in space missions and other extreme environments. Alex Salam is an infectious diseases doctor who spent 13 months as European Space Agency Human Spaceflight Medicine Research MD at Concordia station on the Antarctic plateau in 2008. They had previously worked together on other projects at the intersection of art, design and public engagement, and I originally discovered their practice through readings in the field of DF. As my curatorial experiences were mainly based on exhibition making, I realised collaboration was crucial to hybridise my practice with designerly approaches to orchestrate activities and participation. The suggestions of Peldszus and Salam resulted in a partial modification of the initial scenario, which was eventually advertised in the call for participants as follows:

The goal of the workshop is to discuss and determine design requirements for a high security, rapid deployment, life sciences laboratory for remote polar environments in anticipation of a possible global pandemic. Participants will convene inside a prototype of the structure and assume the perspectives of representatives of a consortium of corporate and governmental stakeholders who will operate the research facility. The group will devise conceptual systems, products or services to support a small crew of scientists and technicians to live and work on site long-term without direct outside support or contact. The emphasis of their engagement will be placed on human needs in extreme, isolated settings, and reconciling psychological and ethical issues within the constraints of a remote and extreme environmental context (Arrigoni et al. 2013).

Prior to the workshop, participants were asked to familiarise themselves with official regulations concerning bio-safety in laboratories dealing with infectious materials. On the day of the workshop, they were divided into three groups and invited to take on the fictional roles of scientists, government representatives and corporate operators, in order to stimulate each group to consider different and possibly conflicting perspectives. Two tasks were devised. The first one consisted in the identification of requirements for the lab, and was accomplished by participants through mind-maps, architectural models and annotations as a way to translate brainstorming into something tangible. Each group decided to focus on particular issues, such as the psychological dimension of life in the lab (Group 1), training and profile of the crew (Group 2), sustainability and energy sources (Group 3). The second tasks involved developing prototypes to respond to one of three different scenarios assigned to each group, expanding the narrative in ways consistent with the outcomes of task 1. These scenarios were semi-fictional documents, inspired by real articles or events, partially modified by Peldszus and Salam. These were: i) a medical officer log reporting the mysterious death of a crew member; ii) a newspaper article containing the complaints of a doctor frustrated by the behaviour of his

colleagues; and iii) the screenshot of a network timeout for the fictional website related to the project mission. The workshop concluded with each group presenting their outcomes to each other and a collective discussion. Group 3 adopted typical science-fiction tropes to develop a narrative around the death of the crew member. This involved the presence of a spy and a virus inadvertently transported to Earth from a space station where the deceased was previously on a mission. The narrative was presented through a theatrical performance enacting the interrogations conducted by the government agent to investigate the case. Tangible traces of the work included a script, a storyboard and a short video. Group 1 interpreted the scenario concerning the frustrated doctor as a sign of bad personal relationships and psychological discomfort among the team. This was addressed in ironical terms by developing a set of solutions to improve the morale in the lab, involving a well-being mentor, a logo depicting people holding hands, and an overly cheerful jingle. Group 2 explained the network timeout as the degeneration of a research project around slime mould-based bioengineered computers. The outcome was presented through a forensic display including documents and fragmentary evidences that would support the viewer in interpreting the event.

3.2.3 Sites of impermanence

Inflatable, mobile structures such as the Big M belong to a tradition of architectural exercises exploring ideas of dwelling to engender or discuss socio-political transformations (think for instance of Archigram nomadic pods: Cook 1999). Besides the analogy between the Big M's shape and utopian architecture, there is a deeper interplay between the venue and my interest in prototypes. By removing specific conventions proper to traditional exhibition spaces, the Big M suggests new approaches to bringing art to the public informed by ideas of impermanence and change (typical of a prototyping culture). First of all, the venue removes all the administrative parts that in museum buildings inevitably identify as staff-only areas (offices, workspaces, storage rooms). This might be seen as an incentive towards accessibility, openness and participation, as the environment is deprived of signs alluding to the presence of cultural gatekeepers. Furthermore, museums and galleries are perceived as immutable and somehow authoritarian repositories of objects endowed with permanent value, to be preserved through time. A temporary venue instead embraces versatility, instability and adaptability to different contexts and values. In many ways, I came to view the Big M as a prototype space where recent tendencies that assign more participatory and active roles to the audience (Hooper-Greenhill 2000; Bourriaud 2002b) are materialised in the features of a physical environment. In the second part of this chapter I discuss how prototypes are

associated with dynamics of collaboration, participation, proneness to transformation and materialisation of ideas. A more specific account of the potential of prototyping within museums and cultural venues is also offered in Chapter 5, where the contrast between change and immutable authority is explicitly addressed.

3.2.4 Prototyping as a world-making tool

The workshops were documented and evaluated through direct observation, field notes, video and still images, the analysis of the artefacts produced by participants, and informal interviews with participants and collaborators. My initial intentions were to find new ways to apply the model of the lab to curatorial practice; and consequently to develop a toolkit for linking research environments and art-spaces. I was intrigued by the idea of using fiction to trigger the public's creativity. Prototyping was proposed as a medium, a creative language to communicate ideas or develop narratives. I found this idea reinforced by the fact that most of the participants in *Visualising Utopia* mentioned their intention to acquire new means of expression for their creative practice as the main motivation in their expressions of interest. Nevertheless, as emerged interviewing the participants, the lack of real technological tools, the time constraints and the requirement to only use paper or found materials removed all pressure to make the prototypes look good or professional. This contributed to a stronger focus on narrative and critical issues, rather than on the design itself. DF was transformed from a method that sees fiction as supporting design research, towards one where design becomes somehow instrumental to building narratives.

None of the prototypes created in the workshops could have been considered as the initial stage in the development of an innovative product or service. Rather, they worked as props to construct scenarios and articulate visions. Furthermore, prototyping in this context helped making design and innovation processes accessible to non-professionals, disclosing its potential in empowering people to think critically about technological change.

Prototyping was also crucial in establishing a collaborative environment. Its unfinished character encourages different people to intervene in the realisation of the same artefact. Differently from individual processes of ideation, it is easily associated with ideas emerging from discussion, as a way to accommodate a number of desires or needs. As outlined in the second part of this chapter, prototypes are traditionally used in design to involve different members of a team in the process and for tangibly sharing ideas with collaborators or stakeholders (Brodersen et al. 2008; Seravalli 2013).

If in *Project ICE* the division in groups and the attribution of fictional roles worked well in encouraging dialogue and playfulness, in *Visualising Utopia* the emphasis placed on

personal values turned out to be problematic. Some of the participants developed a strong sense of authorship towards their own utopias, and this made the shift from individual to shared visions embodied by prototypes difficult. Even if different visions appeared complementary and suitable to be combined together, participants struggled to give up specific details or narrative elements they developed in the first task, or to embrace elements suggested by their partners. For instance, some participants wanted their visions to be plausible, and refused to relate to ideas from other participants that they considered too farfetched. Mostly, however, the difficulties in collaboration depended on inadequacies in the workshop structure: the excessive openness in the initial task, where participants were able to tackle any issue, rather than respond to more specific questions; the lack of a meaningful goal, beyond the creation of the prototype itself; the insufficient time allocated to discussion and planning in the second task, that led to a rush to build artefacts without negotiating priorities and preferences first.

The two workshops also differ insofar as *Visualising Utopia* resulted in a problem-solving activity, building utopias as improvements of current reality. Instead in *Project ICE* instead design could be seen as a way to problem-finding. The task of identifying requirements for the lab led participants to think about the specific difficulties and problems that may arise in such extreme situation. In *Visualising Utopia* the fiction had to be built during the process, while in *Project ICE* participants were immersed inside it since the beginning. The adoption of a fictional (but plausible) scenario as a starting point was more effective in stimulating inventive and critical thinking. The interplay between fiction and reality in *Project ICE* is further articulated through the succession of information resources that participants were asked to engage with during the different stages of the workshops. The guidelines concerning safety standards in laboratories assigned for reading beforehand were entirely real, existing documents. The three documents submitted to each group to initiate the prototyping activity (concerning the frustrated doctor, the network failure and the mysterious death) were half real and half fictional, being re-worked versions of true events. Finally, the outcomes produced by the groups to make sense and provide an explanation of these semi-fictional events, were completely fictional.

3.2.5 Workshops at the Big M: summary

Through recreating or simulating a laboratory as a setting for creative practice, the workshops at the Big M pinpointed the potential of prototyping as a tool for public engagement that can support collaboration and discussion. Prototypes have been deployed by artists and participants as conduits for building the future and turning ideas and visions into something

tangible. This led to my understanding of prototyping as an emerging medium of creativity. More specifically, I reflected on three fundamental points:

- 1) Laboratory settings are congenial to artistic practices permeable to non-humanistic fields (innovation, biology, medicine and so forth).
- 2) Prototypes suggest a particular synthesis of thinking and making.
- 3) The project identifies a multidimensional relationship between fiction and prototypes: prototypes in the workshops appeared as props for fictional accounts, embodiments of fictional elements, and responses to problems set up in a fictional context.

3.3 *WIP*: the Work in Progress Show

The *WIP* show was a one-day exhibition featuring ongoing creative projects undertaken by Culture Lab artist-researchers. It comprised a range of data visualisations, sound installations, responsive environments, interactive works and performances, at different stages of development, from early explorations to almost finished versions. I curated two editions of the show, in 2012 and 2013. My role was essentially that of a coordinator (collecting the projects together, liaising with the technical support staff, and devising the installation layout), as the principle was to be entirely inclusive, with no selection process.

The *WIP* show can be seen as an adaptation of the more common ‘crit’ that takes place in design and fine art departments, essentially aimed at the progression of students. The *WIP* show is more open-ended and presupposes a variety of aims and benefits for the researchers that will be illustrated in the next paragraphs. Also, while ‘crits’ present the works in a classic demonstration format, and feedback is given by a panel, the structure of the *WIP* show was much more informal, with feedback provided by everyone in impromptu conversations. The downside was that exhibitors often needed to make a greater effort to solicit comments and maintain the discussion focused on their piece. Furthermore exhibitions, differently from ‘crits’, place works in context and dialogue between each other, and allow artists to test the behaviour of their prototypes in a more articulated space.

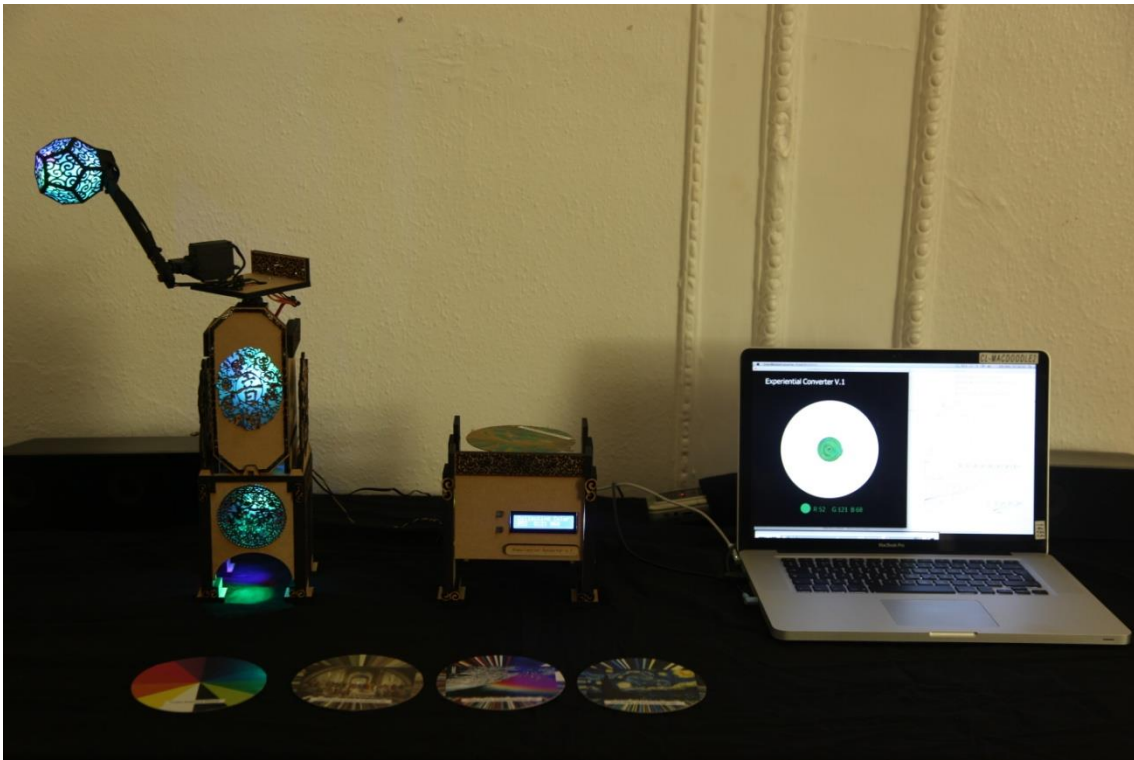


Figure 8. WIP 2013: Ping Yeh Li, *Experiential Converter*



Figure 9. WIP 2013: setting up



Figure 10. WIP 2013: a participant tries the *Reversed Eyes* by Jiun-Shian Lin. Copyright Tom Schofield

With this project I was interested in combining exhibiting and research space. The show however was installed in a specific room in the Culture Lab building, usually devoted to public events, therefore different from the usual working environment of the researchers. The show was not open to the general public, but only to a community of peers, colleagues, stakeholders. This choice depended on the rationale of the project itself, whose objectives were not to generate an encounter between art and public, but to provide informed feedback to the exhibitors; encourage collaborations and exchange across the research community; and develop the identity of the lab emphasising the creative side of some of the research conducted here. My intention was to investigate the work of a heterogeneous set of practitioners making creative artefacts within a research environment. My attention was already directed at prototypes, but with the WIP I wanted to focus on the benefits of showing and sharing them across a research community. The curatorial process offered me a context to discuss these issues with the researchers in semi-structured interviews focusing on approaches and definitions of prototyping.

3.3.1 Findings: prototypes in artistic research environments

My interviews with exhibitors to the WIP show 2013 centred around three questions: motivations for taking part in the event, personal definitions of the prototype, benefits and feedback received during the show. Most interviewees confirmed that they took part in order

to get feedback from peers. Some of them just aimed at general comments, while others have more specific questions in mind: “My project is about making sound from images and I know there are a lot of projects based on the same principle that other people might have seen, so I wanted to see what people could associate my work with and learn about similar projects”. Prototypes of performances or interactive systems were exhibited to test their behaviour with users. A recurrent reason to take part was also the opportunity to have a deadline to motivate them accomplishing a phase of the project. Finally, there was a social dimension to the event: “Since I’m quite new to the lab part of the reason was to share some ideas and what I’m doing with people I might not have talked to yet”, “I used the display as a catalyst for conversation”. All interviewees gained some benefit from the show. This included new ways of conceptualising their work or relating it to theoretical frameworks, further directions of development and identification of weaknesses. Some also mentioned the opportunity to discuss uncertainties and take decisions between conflicting options in the development of the piece. More generally, the experience boosted their confidence and self-awareness.

Even though not all researchers stated that they used prototyping or considered the artefact displayed a prototype, the definitions of prototype they provided were significantly similar. The ideas of testing and a focus on behaviour and technological feasibility recurred several times: “it is something, as part of design process, to test and iterate”, “it is functional, is related to testing a specific question or performance or to explore a number of them. It’s about the behaviour of the device in a broad sense”, “it is like a proof of concept, a demonstration that something works”, “prototypes are about functionality and behaviour of the piece”, “maybe just a thought that you need to try out and test”. Some highlighted the generative potential of prototyping, considered as an integral part of the creative process, but also its newness and originality: “trying something never done before”. These discussions helped me to reflect around the differences between simply unfinished artefacts and prototypes, emerging as strongly associated to ideas of testing and sharing.

3.4 Prototypes: Unpacking the Concept

The Big M workshops and the *WIP* shows highlighted some of the aspects of prototyping that might be relevant to artists and curators. I will now draw on a transdisciplinary body of literature to introduce a more holistic understanding of the prototype and the different forms and meanings it assumes in different contexts. This section extends the discussion in Chapter 2 by stepping back from discussions born in the context of NMA, and addressing the prototype independently from current artistic practice. The goal is not to reach a stable

definition, but to highlight key features and issues that will become useful for developing a framework for understanding the behaviours of artistic prototypes.

The Oxford Dictionary provides the following definition of the term:

The first or primary type of a person or thing; an original on which something is modelled or from which it is derived; an exemplar, an archetype. (Oxford Dictionaries 2015a)

This immediately relates to the way prototyping is intended in design: a way to embody and test ideas in the world or the first physical manifestation of a product. A prototype is frequently defined as a tool for thinking by doing, supporting a reflective practice that includes evaluation and analysis, a site of interconnection between physical and cognitive space (Hartmann et al. 2006, p.299). Even though an exhaustive review of literature on prototypes in the manufacturing industry and design would exceed the scope of the research, the next paragraphs outlines some of the most salient debates and approaches around the topic. Specifically, I will look at different forms, kinds and aims of prototyping; its role in the innovation process; its relationship with issues of participation and collaboration; the affinities between prototypes and other design methods such as cultural probes and critical design; and the rhetorical and performative value of a prototype.

3.4.1 Prototypes in the design process

Prototypes allow designers to explore a range of possibilities: in fact they tend to make several prototypes during the same project, to evaluate different solutions and focus on different issues. A way of characterising prototypes could be to focus on what they are made for. They can address technical feasibility, aesthetic issues, usability or experience (Visser 2014, p.5); or, with a slightly different terminology: role, look and feel and implementation (Houde & Hill 1997, p.369). These aspects can be integrated in one prototype or explored separately, depending on the purpose of the demonstration: to externalise and develop an idea, to promote the project within the organisation, to assess user experience, to evaluate its potential success on the market. This also means that designers build different kinds of prototypes according to the audience to whom they will be presented: intended users, collaborators, organisations (ibid. 1997, p.368).

One of the central debates concerning different kinds of prototypes focuses on their fidelity: how complete, functioning and realistic prototypes should be. Low fidelity prototypes are limited function and limited interaction depictions of concept used at the early stages of a design cycle to communicate and inform about the project, but not to test it. They are cheap and quickly made, but do not demonstrate feasibility and provide little error checking. Also, they need a facilitator. High fidelity prototypes are fully interactive

representations of the core functionalities of the device. They are time consuming and expensive, not suitable to determine conceptual approaches and requirements, but much more so for user-driven investigations (Rudd et al. 1996). A sensible position within the debate seems to suggest the adoption of either low or high fidelity prototypes depending on the stage of development and the specific purposes of the prototype (1996, p. *ibid.*). By contrast, Lim et al. consider prototypes as filters, and interpret their incompleteness as their main strength, because it makes possible to focus on specific qualities of interest and discover problems (2008).

Related discussions address the prototype format choice. The medium or material used in prototyping (from storyboard or video to foam, paper or wood) strongly influences the viewer response and elicits different feedback (Sellen et al. 2009). In the meantime, emerging design areas such as mobile and ubiquitous computing have generated new prototyping techniques attributing a stronger focus on experiential and environmental factors (Buchenau & Suri 2000; Abowd et al. 2005).

3.4.2 Prototypes and innovation

Prototypes have a generative and creative power, and have frequently been addressed as catalysts for innovation. Tom Kelley, partner at the design and innovation consultancy IDEO, highlights the playful dimension of prototyping, able to generate further inspiration and serendipitous discoveries simply by moving an idea out in the world (Kelley 2001, p.38). Their role within an organisation is crucial particularly because of their persuasive power: their tangible presence can win managerial support around an idea, much more than a text or an oral presentation would do (*ibid.* 2001, p.39). Schrage identifies IDEO as an example of prototype-driven organisation and of prototyping culture. The scholar opposes this model to a specification-driven one, which relies on more predictable innovation paths. In prototype-driven organisations, the prototype is the essential medium for information, interaction, integration and collaboration (Schrage 1993).

Prototyping is also commonly held as a way to materialise visions for the future, and its deployment at early stages of innovation has been pointed out in the field of foresight engineering (Carleton & Cockayne 2009) or business management (Bell et al. 2013). In industry-research practices aiming at devising products or strategies for a long-term future, prototypes help connecting vision with action and understanding future possibilities in greater complexity (Carleton & Cockayne 2009).

Finally, prototypes play a key role within paradigms of open and democratised innovation (Von Hippel 1986; Chesbrough 2003). This can happen in a variety of ways, often

supported by the sharing possibilities offered by information technologies. A recent tendency sees a number of corporations organising hackathons to engage independent creative technologists, artists and designers in quick, intense and inspirational innovation sessions (Rosell et al. 2014; Briscoe & Mulligan 2014).

3.4.3 Agents of participation

I have already mentioned the role of prototypes in fostering communication and collaboration within an organisation (Schrage 1993). They can elicit discussion, support the confrontation of different perspectives and contribute to the articulation and sharing of knowledge around a project. For their role not only as a design technique, but also as a management tool to improve team experience and converge thinking, they have been interpreted as boundary objects (Rhinow et al. 2012). The concept of boundary object emerged in studies on cooperative work to explain how conflicting perspectives are managed maintaining cooperation possible between co-workers with different backgrounds and expertise. These objects are essentially understood in partially divergent ways by different participants in a project, while still maintaining enough compatibility of meanings in order to make cooperation possible (Star & Griesemer 1989; Star 2010). Most design processes involve different contributors and require the construction of a common ground and shared representations of the product designed. In this context Subrahmanian et al. associate prototypes with the notion of boundary object to explain how they inhabit a space where non-coincident goals and meanings are negotiated (2003). Their paper points out the stronger dynamism of prototypes in comparison to normal boundary objects. In a way, prototypes can be considered as a special kind of boundary object, constantly changing their status during the design process, towards an increased shared understanding. They are therefore not just a static means of translation, but instead act as evolving mediators. Prototypes need to be malleable enough to record the different stages of conflict and consensus that constitute intermediate representations of a product (ibid. 2003). A similar concern is shared by Boujut and Blanco who suggest the term intermediary object to differentiate these artefacts in flux from the more stable boundary objects (2003). These approaches do not just refer to prototypes in a narrow sense, but address a heterogeneous range of artefacts generated as externalisations of ideas and incarnations of future products:

We use the word prototype in this paper to signify cognitive structures – verbal, gestural and virtual representations and models, protocols, process graphs, physical artifacts – that serve as partial or complete representation(s) and/or classification(s) of the “contractual” descriptions of the product or the process, which is being produced. (Subrahmanian et al. 2003, p.188)

Lucy Suchman's account of prototypes is influenced by her view of information technologies as socio-cultural configurations. She describes the design process for making technologies as

a practice of configuring new alignments between the social and the material that are both localized and able to travel, stable and reconfigurable, intelligibly familiar and recognizably new (2002, p.164).

In her view, prototypes have a performative quality precisely because they determine alignments of multiple social worlds. The inclusion of ethnographic methods as part of the research and development process, implies that the meaning of prototypes is not predetermined, but unfolds while the artefact is tested in use (Suchman et al. 2002). Indeed, user-centred and Participatory Design attribute to prototypes a relevant role in supporting the involvement of intended users in the process (Bødker & Grønbæk 1991; Greenbaum & Kyng 1991). PD originated with a political dimension in Scandinavia with the intent of engaging employees in the design of their own working environments. Because it was focused on understanding users' desires and needs, the role of the designer blurs with that of researcher/facilitator. Such democratisation of the design process involves a range of activities and performances to enact and trial possible experiences with the designed product or system. This contributed to expand the notion of prototyping as a way of accessing and developing experiences collectively and as a tool for empowerment.

Participation through prototyping can also achieve more complex forms, not just limiting participants in the role of users, but as co-creators in grassroots DIY communities and maker-spaces. In these contexts prototypes are not the first instances of a product that will be mass produced, but unique artefacts made for learning by doing, engaging in making and expressing creativity. For instance, Seravalli advances the idea of prototyping as a way of opening production towards a model of 'making together' (Seravalli 2013). She illustrates her argument with the example of Fabriken, a maker-space part of the network of Malmö Living Labs informed by values of openness and inclusion in research and development. The activity of the space is based on freely accessible workshops conceived as opportunities for mutual learning and small scale interventions. These activities also contribute to shape the space itself, considered as a permanent prototype that can be constantly redefined. In this sense, prototyping also assumes the value of an infrastructuring tool (ibid. 2013). Denisa Kera attributes an even more radical value to prototypes generated in grassroots R&D environments. In her view, they are a means for citizens to engage in the development and regulation of new technologies, rather than passively accept them in their everyday lives. Prototyping can empower citizens to negotiate and deliberate on social, political and

technological challenges, by directly involving them in micro-innovation processes that merge learning, thinking and doing (Kera 2013).

3.4.4 Objects for understanding and critique: probes and critical artefacts

There is a range of objects used in design as a method to understand people that share some characteristics of prototypes. However, they tend to be ways of opening up new directions for design, rather than early stages of a designed object itself. Like prototypes, they can be open-ended, undefined, and provocative, and work as props to elicit a variety of responses.

Cultural Probes (Gaver et al. 1999; Gaver et al. 2004) belong to this kind of ‘objects for exploration and feedback’. In their original formulation, they are packages of materials and tasks designed to stimulate responses and narratives from users. Their outcomes are meant to be subjectively interpreted by the designer, and to generate empathy among designers and users.

Critical approaches to design manifest in unfamiliar, provocative or satirical objects aimed at stimulating debate and subvert cultures of consumption towards a more ethical role for the designer (Dunne 2008). I already mentioned how the outcome of critical design projects is usually a prototype exploring a proposal, a hypothesis or a fiction. These prototypes do not need to be fully functioning, but, to achieve their goal, they need to be perceived as feasible, grounded in real technological possibilities. Their aesthetic look is in fact very carefully crafted. Their appeal as contemporary industrial products makes them simultaneously more disturbing and more easily connected with the everyday. If in critical design this can be valuable in itself, there are also experiences of using criticality in more instrumental ways to engage stakeholders in creative thinking around new product ideas (Bowen 2007). Critical artefacts in this case can be seen as a prelude to a prototype or a new design cycle.

3.4.5 Rhetoric and performativity

The critical potential of prototypes can also be understood as the capacity to convey an argument or suggest a theoretical perspective. Galey and Ruecker (2010) advance this hypothesis for experimental prototypes in the field of the Digital Humanities, proposing that they can be subject to peer review just like an essay, and providing examples to illustrate how digital artefacts can express critical interpretations about designing interfaces. The idea of design as a rhetorical tool is not new (Buchanan 1985; Bowers & Pycok 1993; Buchanan 2001a): designers employ rhetorical strategies to take a position about a technological question, and persuade intended users to adopt a certain attitude towards their proposal. The

capacity of prototypes to persuade and embody values and visions for the future is also connected with their performativity. Danholt (2005) describes prototypes as performative because they produce subjectivities and agencies. His argument is primarily based on what happens during the design cycle when intended users interact with a prototype and are affected by it in their own subjectivities and actions. At the same time, users also have a transformative effect on the prototype. It becomes clear then how prototypes can be regarded as more than representations of ideas or final objects, but as autonomous entities linking the abstract realm of ideas, visions and rhetoric, to the concrete one of materiality and action. Another interpretation of the performativity of prototypes views the prototype as an event or act in itself. Borrowing the Deleuzian term ‘objectile’ (1993), Bayliss et al. describe a number of research-driven artistic prototypes as emerging objects, “a continuous variation of matter and development form [...] always in the process of becoming through interaction” (2007, pp.269–270). Their approach, focused on implementing design methodologies through performances involving interactive systems and the body, frame the performativity of prototypes precisely in their capacity to evolve and unfold.

3.4.6 Prototypes across disciplines

So far I have analysed different theories on prototypes specific to the field of design. This subsection explores meanings and associations that the concept assumes in semantics, anthropology, and art history.

Prototype theory is an approach to categorisation in cognitive semantics, attributing a more central role to certain members of a category than others. The typical example sees *chair* as more prototypical than *stool* within the category of furniture (Rosch & Mervis 1975). This notion of prototype is close to its meaning of archetype, an exemplary and persistent idea commonly shared by a cultural community. This interpretation is close to the way prototypes indicate, in anthropology, a divine presence embodied in artistic and religious artefacts. In early Christian icons the prototype is the immaterial that needs to be manifested and grasped visually through material artefacts (Buchli 2010). Icons do not contain nor represent or signify the divine prototype though. They are simultaneously originals and copies: they replicate the prototype but also they are in direct contact with it, like extensions or relics. Buchli defines icons as technologies of presencing the divine and compares them to rapid prototyping technologies reading them both as processes of universalisation through material reproduction. Similarly to divine prototypes, a CAD file can be created and printed anywhere in the world and is identified as a prototype in itself. They both redefine the relationship between tangible and intangible, thought and thing, because of the way artefacts result

distributed in spatial and temporal contexts, and challenge the notion of presence now better understood as propinquity: a link with the original based on analogy and nearness (ibid. 2010).

In traditional art the concept of the prototype can be associated with models and preparatory studies, even if these mainly address questions of scale or look and feel. Unfinished works also occupy a special place in the history of art. Michelangelo is famous for his *non-finito*, still considered a controversial issue among art historians. Some interpret it as dictated by contingent reasons leading sculptural projects to be abandoned before their accomplishment. Others suggest an intended expressive value for the *non-finito*, to visualise the struggle of the artist against matter, or alluding to the universal by avoiding details and specific features in the representation of the characters (Schulz 1975; Gilbert 2003). Whichever the case, studies of Michelangelo often describe his creative process as a subtractive endeavour that frees the ideal enclosed in the marble block. Such characterisation has been addressed by Ingold as hylomorphism and questioned in relation to accounts of making more exploratory and entangled with the energies and propensities of the materials (Ingold 2012). Indeed the notion of prototypicality I am unfolding in this thesis is at odds with a vision of the creative process as the imposition of an ideal form on passive matter. In artistic prototypes the construction of meaning goes alongside the material development, and the initial idea in the mind of the artist is only a contingent point of departure. Furthermore, even if intentionally left unfinished though, incomplete works cannot be considered prototypes, as they do not imply the possibility of deriving further exemplars or types.

There is a more recent history however where the physical model manufactured to visualise the final appearance of an artwork is replaced by conceptual models for serial reproduction. Küchler identifies the origin of 'prototypical art' in limited editions and multiples produced by artists in the 20th century, particularly since the avant-gardes. These works reject mimesis and representation in favour of an exploration of ordering principles, new materials and abstract forms of knowledge (Küchler 2010). Küchler's article suggests a viable perspective, but her focus on the shift towards conceptuality and immateriality in art neglect other important aspects. For instance, I would emphasise how the emergence of prototypes in artistic practice is connected with movements that value the potential of creativity in encouraging social change.

Russian Constructivists in particular, and artists associated with the Bauhaus and Vkhutemas, both strongly influenced by the former, developed an interest in merging craftsmanship and technology to integrate art and mass production. The Russian Revolution in 1917 engendered a climate of transformation and inspired the idea of reforming society

through the creation of new everyday objects able to embody Communist values.

Constructivism originated an idea of artist-constructor or artist-engineer, inspiring his work to principles of simplicity, rationality, impersonality, and committed to working for industrial production and utilitarian purposes. The relationship with industry was more an ideal and never really turned into actual production-art. The new objects, from furniture to graphic pieces, were mainly disseminated through prototypes included in exhibitions, films and plays (Margolin 1997). It is possible to identify certain parallels with the way prototypes are used by contemporary artists-designers to encourage societal change and analyse the relationship between objects and values. Nevertheless, while Constructivism aimed to promote a clearly identifiable set of values, today's neoliberal consumerism is able to market both mainstream and alternative lifestyles. Claiming the capacity of designed objects to encourage personal values and freedom is therefore a complicated matter since even counter-hegemonic action has become a market construction. What is significant however is the association between artistic prototypes and a conscious plan of societal change driven by everyday objects. It is possible to identify the same alliance between prototypes and the proposal not just for new objects, but for an entire new way of life, in other historical movements adopting forms of design, craft or architecture detached from production, including Italian and British Radical Design groups (Sanders 1998; Rossi 2013).

Outside these movements, it is certainly possible to occasionally identify prototypical artworks across the second half of the last century, such as in the case of Panamarenko's utopian flying machines (Millar 2014), or some of the numerous experiments across art and technology characterising the Sixties and Seventies. It would be a pointless effort however, for the sake of this research, to provide a more exhaustive review and to establish criteria to distinguish what, within the broader field of historical mechanic art, could also figure as a prototype. The purpose of these paragraphs was instead to suggest a rationale for the adoption of prototypes in artistic practice. This relates to an ideological approach that sees objects as tools to reform society and promote new value systems.

3.5 Activism and Prototyping

Through the *WIP* show and an analysis of existing literature, the relationship between artistic prototypes and research has been discussed and the argument has been advanced that prototypes, differently from other kinds of artwork, are particularly suitable to develop and disseminate knowledge. They are used in research because they can support an analysis of the making process and suggest new fields of exploration or application. There is another field where artistic prototypes are commonplace, which could be described as a technologically-

engaged activism, connected with the cultures of making typical of media and hack-labs. There is a tendency here to creatively question patterns of innovation. Even though these labs might partially differ from research labs affiliated to Universities, they provide a context where production and dissemination are strongly interlaced.

The links between NMA and activism is strongly related to the potential offered by digital technologies in promoting alternative models of production and distribution. An articulated review of this topic is offered by Ele Carpenter, covering practices of hactivism and craftivism, tactical media and cultural-jamming, and the OS movements (Carpenter 2008). Leah Lievrouw specifically talks of ‘activist new media’ and provides a classification of genres comprising: culture jamming, alternative computing, participatory journalism, mediated mobilization and knowledge commons (Lievrouw 2011, p.19). Reorienting technology towards transformational goals, these practices challenge mainstream culture and attitudes, contribute to building communities, support marginal views, and structure participation (ibid. 2011, p.2).

Activism is commonly intended as an effort to produce change in social, political, economic or environmental domains. Theorists of social movements identify a shift in the Sixties from forms of antagonism based on class opposition to mobilisations concerning identity, cultural values and lifestyles (Edwards 2014b, p.112). Women’s liberation, gay liberation and environmentalism are classic examples of a battleground primarily connected with personal and cultural values such as equality, individual freedom and anti-consumerism. This shift also implies the possibility for individuals to do collective action ‘on their own’, by shaping their everyday lives and “contributing towards the construction of a wider collective identity” (Edwards 2014b). These approaches, defined by Haenfler et al. as ‘lifestyle movements’, adopt alternative behaviours (for instance veganism or communal living) as tactics, with the understanding that others are taking similar action, challenging predominant cultural norms (2012). This is where artistic prototypes can play an activist role: they introduce the possibility of alternative habits. Their dissemination, both through cultural events and the material reproduction of the device, can be interpreted as a form of tactical innovation (Edwards 2014a) and analysed by looking at the social ties present across networks of diffusion from source to adapters. Lievrouw discusses the ‘prefigurative’ quality of activist media, modelling “the desired or ideal social conditions for others in society” (2011, p.53). By materialising future possibilities in the present, prototypes make the experience of change tangible and real. They can also be considered as resources that can be mobilised to enable collective action (Edwards 2014b). Beyond grievances and shared beliefs, collective action requires means of support (money, organisational infrastructure, skills, and

so forth). The concrete existence and functioning of artistic prototypes can be compared to other resources sustaining the spread of new collective initiatives.

Media-labs² share an activist ethos, evident both in the way they are structured and in their activities. Their open-door approach, involving participants in the maintenance of the space, is often described as ways to reduce hierarchies, encourage collaboration, and promote accessibility of technological resources together with a sense of ownership and responsibility. Most labs adopt a strong drive towards community engagement and promote social inclusion by generating educational opportunities for marginalised groups, such as training programmes and software packages tuition for unemployed people. OS approaches are embraced not just through the adoption of specific software and hardware resources, but through a more general tendency towards the free sharing of knowledge. In parallel, media-labs favour practices of recycling and re-use as part of a pursuit for sustainability and environmentally-friendly solutions. Finally, innovation through experimentation with emerging technologies is pursued as a tool for empowerment and to address social needs (Frost 2012).

Prototyping is a common activity in media-labs, adopted to develop technological competency by making and as a platform for collaborative work where people with different expertise can join forces to achieve a shared goal. Prototyping workshops are a common event-format to reach and engage non-specialist participants and diffuse practices of maker culture (see for instance Shrimping it, 2013). Furthermore, prototyping is seen as a vehicle for open and grassroots innovation (Chesbrough 2003). It is claimed that making and tinkering can empower citizens in negotiating the value of emerging technologies in a bottom-up manner of co-creation, resisting top-down impositions of innovative devices (Kera 2001; Kera 2013).

Prototypes' capacity to elicit discussion, stimulate responses and facilitate the comparison of different perspectives offers a further asset to activism, insofar they can be used for advocacy, to challenge authority and subvert a passive acceptance of the status quo. This is what critical design prototypes usually do by presenting themselves as provocations (Dunne 2008; Gaver et al. 2008).

Not all prototyping taking place in media-labs can be described as artistic, but some projects have a distinctive creative value, conceptual cohesiveness and might be led by artists as part of cultural initiatives, often in collaboration with art organisations. More specifically, the potential of artistic prototypes within activist approaches is to demonstrate how change is possible by proposing tangible and feasible alternatives to established, dominant practices.

² I am adopting this term as a generic one to include also akin environments like maker-spaces, hack-labs and fab-labs.

3.5.1 *Connecting Cities: prototyping urban practices*

A closer look to the way artistic prototypes can support activist goals came from my involvement in *Connecting Cities*, an international network of media facades and urban screens aiming at replacing their usual commercial content with a socio-cultural infrastructure. Founded by the European Union and developed between 2012 and 2015, the project involves eighteen core cultural organisations, and a number of additional partners extending its scope from Europe to Canada, South America and Australia. The opportunity to take part in the project came thanks to the role of FACT, partner in my CDA, as one of the leading organisations. My interest in *CC* was originally associated with the idea of the city itself as an open lab where to experiment emerging urban practices empower citizens through the creative use of urban media and question existing paradigms of urban innovation, such as that of the smart city (Hollands 2008). The citizen-centred approach of the project, calling for the direct involvement of the public around issues of collective relevance, and the emphasis on innovation as both a modality of intervention and object of critique, were the key assets that *CC* could bring to my doctoral endeavour. At the time of this decision the project was just at the beginning, and the artistic works to be produced were yet to be selected. Proceeded by two pilot events (*Media Façade Festival*) in 2008 and 2010, *CC* is articulated into three annual editions, each one focusing on a different theme: the Networked (2013), Participatory (2014), and Visible City (2015), spreading along the entire duration of my PhD. Throughout this period I was involved in a number of meetings and workshops with the curatorial team to develop the calls for artworks, discuss the proposals, and negotiate pre-production issues with the artists. Rather than curatorial, my role resembled that of a consultant, in charge of deepening or expanding the debate through research inputs, and often tasked with the writing of texts and essays variously aimed at the network itself, or the general public. Among the works produced, some fit better than others within my idea of artistic prototype, but the project in its entirety can be conceptualised as a framework for prototyping new urban practices. Additionally, a couple of collateral events have been developed with a stronger emphasis on prototypes: an Urban Media Lab in Brussels, a Design Fiction and Narrative Prototyping workshop in Wuhan (China) and a Prototyping Lab in Berlin. The following paragraphs focus on a few examples particularly emblematic of the activist potential of artistic prototypes.

During the *Media Façade Festival*, Julian Oliver introduced *The Advertiser*³ (2008), a hand-held augmented reality device enabling people to replace street advertisement with

³ Artworks are referenced in a List of Artworks at the end of this thesis.

artistic, non-proprietary content in real time. The software works by recognising advertisements so that billboards in the urban environment can be transformed into public art platforms, even though the ‘improved reality’ is only visible through custom-made digital binoculars, or on the screen of a smart-phone. The piece can be considered a prototype in the first place because it does something no pre-existing device can do. It establishes a new practice and a new way of relating to the public space. Additionally, instructions and code to build *The Artvertiser* are freely available on a Github repository. A dedicated website explicitly invites developers to download the code and help improve it, but also informs that “the software is stable and works quite well” (ibid. 2008).



Figure 11. *The Artvertiser*. Copyright Julian Oliver

By doing so, Oliver adopts the typical strategy of OS software prototyping, breaking down the constraints of authorship and generating a community around the device. Because of its anti-consumerist and anti-commercial approach, it is easy to understand how the work reflects activist values. The intention is to enable citizens to gain control of the public space. At a more general level, hacking the urban media sphere is presented as an example of empowerment through technical intervention, which subverts the traditional gap between producers and consumers. This is in line with the principles expressed in the *Critical Engineering Manifesto*, calling for a constant questioning and repurposing of technological systems (Oliver et al. 2011). The text describes engineering as the “most transformative language of our time” and notes the impact of code on human behaviour and its potential in supporting social action (ibid. 2011).

A more recent project, produced for the Participatory City and presented in San Paolo, Berlin and Linz, functions as an interface to visualise issues and debates relevant to the local

citizenship. The *Smart Citizen Sentiment Dashboard* (2014)(Behrens et al. 2014) translates instant citizen feedback into a playful visual language based on emoticons, projecting people's mood onto big urban screens. The device reads citizens' travel cards using RFID (Radio-frequency identification) technology and enables them to express happiness, indifference or sadness on five different topics: environment, mobility, security, public space and housing. Despite its naïve and intentionally reductive approach of dealing with complex issues through basic, clear-cut emoticons (evocative of other quantitative survey interfaces in public contexts such as airports or toilets), the presence of the *Dashboard* in the public space aims at eliciting discussion and opportunities for encounter and debate among active participants and passers-by.



Figure 12. Smart Citizen Sentiment Dashboard. Copyright Behrens and Valkanova

This motivated the artists' preference for a device with a tangible, physical presence, as opposed to a mobile phone app that could have supported similar functions except the gathering of a forum in the public space. Once again, we are in front of a prototype because of the innovative behaviours and perceptions engendered, but also because it poses questions on the relationships between built environment and social behaviour. Its activist 'take' clearly concerns the possibility to provide the citizenship with alternative ways of expressing dissensus, and offers a glimpse into potentially emerging approaches to citizens' decision making on matters of collective interest.

The Urban Media Lab organised by iMal (Brussels), one of the partners in the *CC* network, was explicitly conceived as a prototyping activity, collateral to the Participatory City edition. The lab was originally aimed at producing a tool-kit gathering best practices in urban innovation to influence policy-making. It soon became clear to the curators that this goal was

unrealistic and relationships with policy-makers not developed enough. The event was then structured as a six days prototyping lab, where creative practitioners, selected through an open call, were invited to produce working prototypes “exploring new forms of urban participation, using existing mobile technologies and custom DIY devices” (iMAL 2014). The call for participants specifically stated that the prototypes should have been ready to be presented and deployed in a public event at the end of the week of production, and stressed the project-based nature of the activity. The participants could however benefit from technical support and advice from two workshop leaders (artists-technologists themselves) and take the opportunity to experiment with new (to them) technological resources. The focus on prototypes was due to pragmatic reasons: the short duration of the lab made it unrealistic to expect more finished artworks. Furthermore, there was a desire to encourage risk-taking and to explore how original proposals might become flexible to change to incorporate inputs from the local environment and collaborations encountered during the lab. This last aspect was, according to the organisers, fairly disappointing, as “the outcomes were barely different from their original propositions” and most of the participants were more interested in the technical development of their projects, rather than open to conceptual or aesthetic influences (Antoine 2015).

The works created ranged from rather traditional public art installations (a sonic environment based on the amplification of web radio signals; a memory tree where citizens can leave their own memories, or listen to other people’s stories) to devices more easily conceivable as prototypes. Among these, *Superforager* is emblematic of the possibility to develop and spread new habits and practices through open artistic prototypes. The system promotes the collection and use of alternative, free nutritional resources available in the urban environment. It comprises a mobile app, a wearable device that vibrates to alert the user of the presence of food resources or other foragers nearby, and an online database hosting information on local resources, recipes, and knowledge on the nutritional and medical properties of unusual ingredients. A prototype was trialled in a public exploration in Parc Brussels. The result was a meal comprising tempered hop pesto parches with oregano jelly and lime leaves. The project is ongoing and the next step will be the production of modular OS kits for everyone to make and use, and to enrich the database of learning materials to support ‘superforaging’ practices. In line with the notion of artistic prototype proposed in this thesis then, *Superforager* is an innovative device engendering new behaviours, and intended to be adopted and replicated by a community expanding far beyond the small team of artists originally developing it. Its activist approach is visible in the way it supports sustainable and cooperative action. The presence of a wearable garment alerting the user of nearby foragers is specifically aimed at community building and sharing of knowledge and skills. A vibrating

belt is instead what connects the user to the environment, stimulating a novel way of navigating it, valuing biodiversity, wellbeing and forms of sustainment completely outside the market and its system of processed, industrialised food.



Figure 13. A meal made with 'superforaged' food. Copyright Jones, Pullig and Winterburn

Projects like *Superforager* are not just practical tools, but embody a vision directed at generating new everyday practices, critiquing established ones and impacting the real world. Thanks to their identity as prototype, they become an exportable model carrying the expectation to be shared, appropriated, used and modified by contributors other than the initiators. This transferability is what differentiates artistic prototypes from more traditional artworks. At the same time, artistic approaches and channels of dissemination are integrated within a process of grassroots innovation inspired by values like resistance to consumerism, respect for the environment, sustainability, localism, and communitarianism.

The DF workshop and the Prototyping Lab were structured along similar lines, involving creative practitioners in the collaborative development of technological and creative tools for the near-future city. The main difference from the Urban Media Lab being a shorter duration of a couple of days only, the outcomes were rather conceptual models and mock-ups, instead of working prototypes. More specifically, the DF event in China was directed at developing technologies able to simultaneously connect two or more cities. The outcomes, fabricated with rapid prototyping tools, were presented through short videos aimed at contextualising them within fictional scenarios. The Prototyping Lab in Berlin, by contrast,

had a focus on sensor technologies and applications to collect and visualise urban data around the topics of safety, climate change, and energy consumption.

The relevance of *CC* in my research depends on its hybrid nature across cultural and civic interests, half artistic programme and half platform for urban experimentation.

Anthropologist Alberto Corsi establishes an instructive association between open source urbanism and prototyping, addressing a range of creative projects populating emerging urban ecologies or inspiring new forms of governance.

Central to this idea of open source urban hardware projects as expressive of a right to infrastructure is their status as ‘prototypes’. The prototype, as I shall refer to it here, is an emerging socio-material design for our contemporary whose main quality is its permanent ‘beta’ condition; that is, whose social and material components retrofit each other as being in mutual suspension (2014, pp.3–4).

The suspended status of prototypes offers new ways of thinking socio-technical assemblages as prone to extension and proliferation, thus mobilising “operational frameworks” rather than spectators, so that cities can constantly be collectively deconstructed and reassembled (ibid. 2014, p.14). Corsi is aware that the citizen intervention through prototyping would be only one among many actors and agencies shaping the complexity of the city. In fact, he frames this activity as a way “to escape the human-nonhuman / epistemology-ontology dichotomy altogether by opening-up the agential work of infrastructures” (ibid. 2014, p.3) which brings together a range of social, material and technical forces.

3.6 Betagrams: the Behaviour of Artistic Prototypes

The overview in section 3.4 has provided a range of heterogeneous definitions for the prototype: filter, representation, mediator, boundary object, externalisation of thought, platform for cooperation, embodied argument, prop for action, rhetoric device, performative and polysemous object, proof of concept, archetype and so forth. Nevertheless I soon realised that this list could become meaningful to my investigation only if compared with current practice. *CC* offered a context to analyse a specific operational field for artistic prototypes, suggesting their activist potential in the context of urban practices. The subsequent project allowed me much more autonomy and the opportunity to gather together different approaches. Taking the qualities and meanings of the prototype emerged from literature as a starting point, I identified a number of projects from six artists-researchers at Culture Lab and presented them in an exhibition, *Betagrams*. These works either challenged or exemplified what a prototype could be, and their analysis led me to identify a set of behaviours and ways to describe artistic prototypes.

The show took place at the NewBridge Project Space in Newcastle, in May 2014, in the context of the *Thinking Digital Conference* (TDC) and its collateral arts programme. It was open to the public for four days and included a symposium involving artists and curators in a discussion around the aesthetics of prototyping and the interplay between practice and research. The Newbridge Project is an artist-run initiative comprising studios and an exhibition space in a former office block. The aim of forming and supporting the local artistic community through a shared working space and display opportunities made it particularly receptive to connections with other Newcastle-based organisations and events. TDC is an annual meeting for innovators, inventors and industry representatives with a focus on digital technologies. I conceived *Betagrams* having both these identities in mind and developed a project that could suit Newbridge's attitude towards a co-operative artistic community and TDC's focus on innovation.

Most of the works have been created in the context of academia, the artists being either PhD students or Researchers at Culture Lab. I wanted to explore further the hypothesis that when artists operate within a research framework their creative outcomes tend to be prototypical, because of the greater potential of prototypes to embody and communicate knowledge, and to adapt to evolving research directions. *Betagrams* allowed me to investigate these works outside the lab, in an environment where they could be experienced independently from their research projects. This helped me to identify the specificities of art practice when integrated as methodology and outcome of research, as opposed to art explicitly made for the gallery space. At the same time, the curatorial process itself generated the opportunity for an ongoing conversation with the artists, shaped around informal meetings and semi-structured interviews. The exhibition was not only a way to materialise my own hypothesis about what an aesthetic of prototyping might be, but also the setting for a closer observation and understanding of artistic practice.

The next paragraphs offer a description of each of the works and point at the connection between specific aesthetic solutions and related features and potentials of prototypes. I am anticipating here how they can be described as objects for improvisation, testing, fictionality, research, iteration, critique, customisation, re-making.

3.6.1 Pelvics

Teresa Almeida's PhD project addresses the potential of design and electronic textiles to promote women's pelvic fitness. The idea is to design wearable technologies to support learning about the body and preventive health practices such as pelvic floor muscle exercise. The first phase of the project consisted in a reconsideration of existing medical devices for the

assessment and care of the pelvic floor. This was motivated by perceived inadequacies of these tools in supporting self-esteem and a comfortable experience of care. Her intent is to re-design these devices and associate them with new values. “It is about reinforcing the idea that you have ownership on the device that has been designed in response to what you are”. The critique implicit in this approach addresses not only the devices themselves, but the broader foundations of testing and assessing in medical practice.



Figure 14. Teresa Almeida, *Pelvics*. Copyright Karolina Maciagowska

A shift is suggested from an approach grounded in measurable and objective parameters, to one that privileges subjectivity, experiential factors and direct contact with the self and the body; “I am looking into the idea of esteem as a major quality of intimate care”. The artefacts presented in *Betagrams* were deconstructed, disassembled devices, literally broken down into their smaller parts and displayed in a traditional museum cabinet, reframing them as found objects of anthropological interest belonging to a foreign cultural system. The cabinet also contained Almeida’s embroideries inspired from a series of participative workshops conducted with women to explore, through craft activities, their knowledge of the pelvic floor.

At the time of the exhibition, *Pelvics* was still at an early stage of development. My motivation to select it for the show relates to the way it could illustrate different stages in the process of design and re-design, in particular through artefacts which are not prototypes but anticipating possible ones. I understood the act of critiquing and re-designing established products which have been on the marketplace for a long time as connected with an ongoing

cycle of transformation, dismissal and appropriation. This suggests how products might be seen as permanent prototypes of their own future versions, prone to be constantly assigned new values and interpretative frameworks. The entire process is grounded in involving participants in questioning existing practices and expressing inclinations and sensitivities to engender more personal ones. Hence *Pelvics* became in my view an example of the potential of prototyping for critique and customisation.



Figure 15. *Pelvics*. Copyright Karolina Maciagowska

With *Pelvics* the nature of prototypes as intermediary steps of development was addressed in strong relationship to the inscription of values and visions embodied by technological devices (Akrich 1992). The notion of inscription in relation to designing technologies will be addressed in the next chapter. For the moment it suffices to say that value inscription is a particular way to associate a narrative to material artefacts.

3.6.2 *Corrugations*

Corrugations (2014) by David Chatting is a prototype repackaging and altering the functionality of an old mobile phone. The phone is hidden in a cardboard spherical container and activates a segmented fan which opens a greater or lesser degree depending on the number of GPS satellites it detects. This results in its different appearance when moved to different locations indoor or outdoor. The piece was conceived as part of a series of prototypes to be used as cultural probes (Gaver et al. 1999) in a research project exploring

“the ways in which technology can facilitate mobile workers’ engagement in family rituals during the times in which they are spatially distant from home” (Kirk 2013).

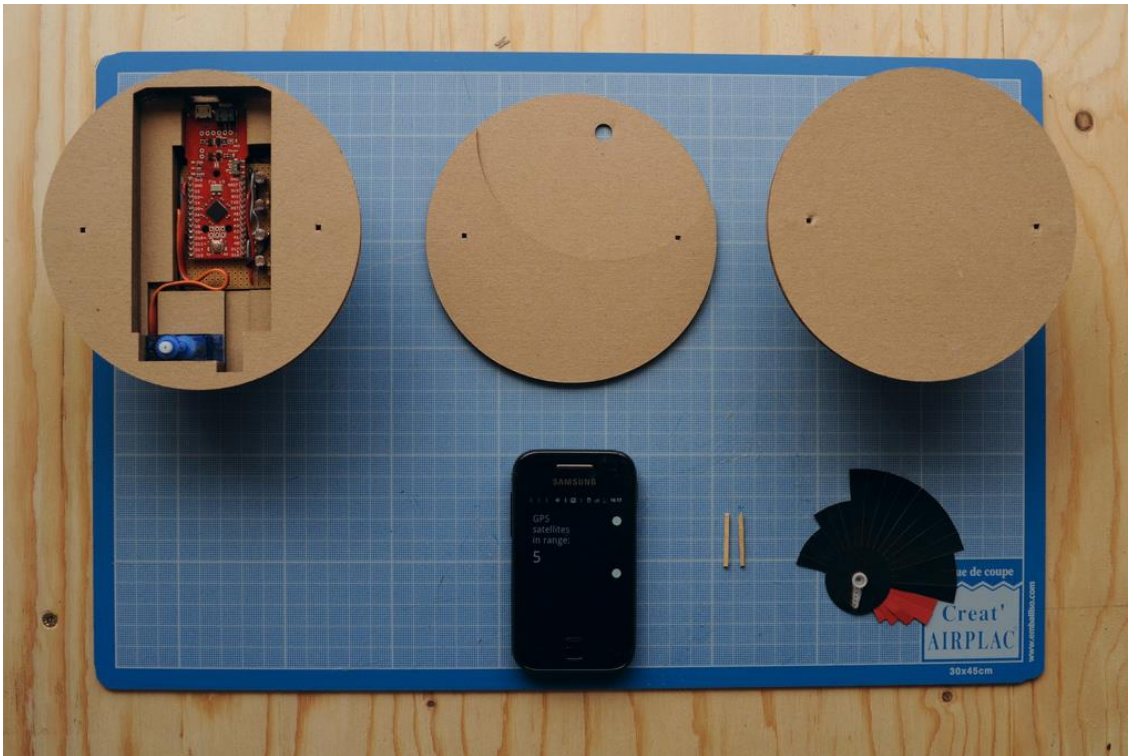


Figure 16. *Corrugation*: components. Copyright David Chatting

These prototypes are artistic objects but were created to be assigned to families volunteering in Chatting’s study, to elicit unguided behaviours that the researcher would observe through ethnographic studies. Deprived of an immediately clear functionality, the devices require the family members to improvise or invent new practices and habits around them. Within the logic of cultural probes, this could provide some understanding of the ways in which ritual behaviours are influenced by digital technologies. The prototypes in this case are not intended as intermediary stages towards an implemented device. Rather, they are tools for discovery and understanding, already accomplished and autonomous in their own right. The research outcome might include indications and guidelines towards further design, based on the knowledge of people attitudes and behaviours generated by their interaction with the probes-prototypes.

Made of meticulously laser-cut cardboard, *Corrugations* exploits the aesthetic qualities of a typical prototyping material to provoke a specific mind-set in the viewer. “On a material level, using cardboard is unusual and puts people in a different frame of mind. Prototypes can be finished objects, but their function involves some sort of dialogue about what it could become. Everything about it should operate properly, but through its form and material it should offer people a space to think around it, to integrate it into their own world, their own interpretation”. The careful and precise manufacture of the sphere contrasts with the

idea of cheap and temporary associated with cardboard, generating ambiguity and puzzlement. The effect is intended to remove conventions in using or addressing the device, and establishes a blank space of improvisation. Here, I discovered how prototyping can be seen not only as a constructive process, but also as a subtractive one, able to suspend prescribed standard practices to introduce spontaneous and ingenious stimulus to action. In other words, besides materially building artefacts and their associated practices, prototypes can simultaneously de-construct existing ones, by creating a sort of tabula rasa where habits and behaviours are yet to be established.

According to Chatting, in the household the ambiguity of the device is balanced by the fact that users are able to move it around and see the consequent changes in the fan. This enables them to speculate on its behaviour, even without being told about the phone hiding inside, nor its connection to the GPS. This presented a challenge for its adaptation to a gallery space, where the piece was constrained to a fixed location, on a plinth. It was decided to reveal the normal behaviour of the object through a video, showing different statuses of the sphere in a variety of places (from domestic lounges to open-air locations). This solution was preferred to a text-based explanation because it made it possible to divulge only what is strictly necessary and maintain a good degree of mystery and uncertainty around the object. It is important to underline that ambiguity is the key factor that guarantees openness to improvisation and multiple interpretations and therefore support the researcher's investigation into people's socio-psychological orientation to technology. The ambiguity originates both in the aesthetics of the object and in its nature of prototype: by definition undetermined and subject to transformation. During an interview Chatting revealed the centrality of 'objects for improvisation' in his practice. In previous projects for instance he drew on methods rooted in improvisational theatre where cardboard prototypes were used as props. Professional actors were engaged in interpretative exercises (inspired by the tradition of theatresports (Engelberts 2004)) to develop meanings and scenarios around the prototypes (Chatting 2014).



Figure 17 David Chatting, *Corrugation*. Copyright David Chatting

Corrugations led me to identify two interrelated features of prototypes: their ability to support improvisation and to be associated with imagined narratives or scenarios. It also

provided me with an instructive example to explore the relationship between aesthetics and research. The adoption of specific aesthetic choices, namely the combination of cardboard and precise, meticulous manufacture, was in fact supportive of the research aims of the project. It was this calibrated dialectic between ambiguity and precision that engaged the viewer in the meaning-making activity necessary for the researcher to understand more about potential users' attitudes, rituals and subjectivities.

3.6.3 *The Consolidator*

Ben Freeth's project included prototyping as a catalyst for discussion and resulted in outcomes that are not prototypes, but, in part, expressions of an aesthetics typically associated with prototyping, because it is manufactured with a 3D printer. *The Consolidator* (2014) involved a two-day workshop and the display of the workshop outcomes in the exhibition. The title is inspired by the eponymous literary work by Daniel Defoe, a fictional account of inventions and discoveries that would demonstrate the superiority of China and the World of the Moon on the British nation. Among them, the description of a pair of glasses able to visualise the wind reminded Freeth of Google Glasses and inspired a reflection around wearable devices.

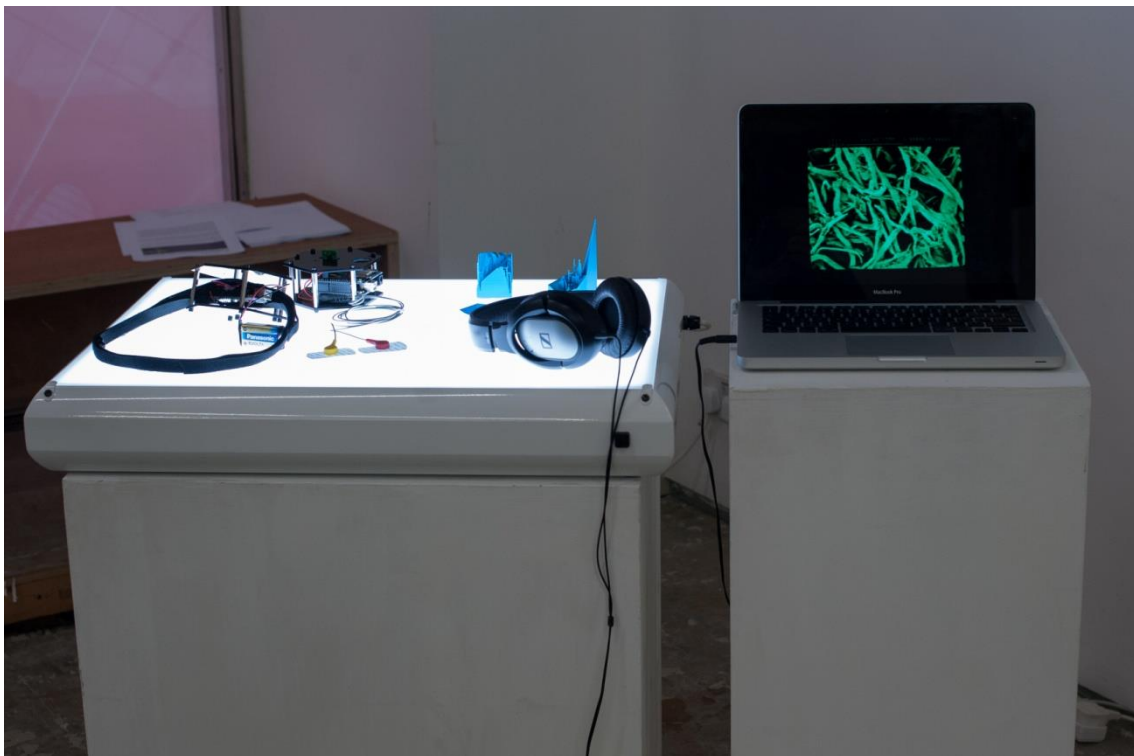


Figure 18. Ben Freeth, *The Consolidator*. Copyright Katarina Maciagowska

The workshop focused on the meanings and values of data collection and its potentials as a collective experience. A pair of augmented reality goggles was used as a starting point to speculate on their possible functions and, subsequently, to assemble prototypes of wearable

data loggers featuring bio sensors and way finders. These were used in a psycho-geographic walk across Newcastle to collect data that became the material of examination and further processes of translations through mapping, sonification and digital fabrication.

The installation in *Betagrams* included the data-loggers, an audio piece and a few small 3D printed artefacts generated as physical representations of the data collected during the workshop. The latter immediately appeared problematic to me in their relationship with the notion of the prototype: indeed they were not intended as a stage in the development of something else, but rather accomplished and autonomous objects, abstract landscapes to be regarded as an alternative topology of the places visited during the walk. Paradoxically however their monochrome blue plastic look and the deployment of only one material is typically associated with prototyping using manufacturing tools, a process increasingly adopted by artists to create sculptural works (Labaco 2013)⁴. This suggested to me a possible split between aesthetics and operative qualities of prototyping that might happen when prototyping tools are used in artistic practice. Among the various possibilities offered to artists by rapid prototyping there is the materialisation of datasets to give forms new meanings and interpretative frameworks.

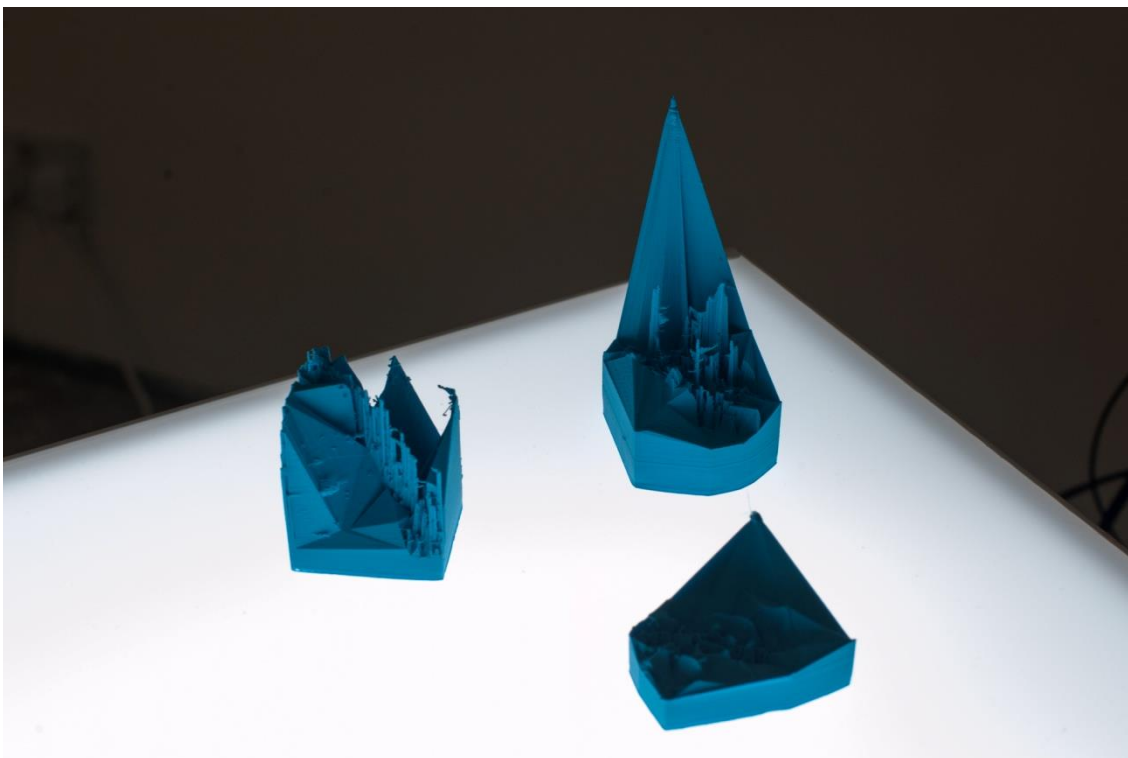


Figure 19. *The Consolidator*: 3D printed artefacts. Copyright Katarina Maciagowska

⁴Nevertheless this aesthetic feel is shared also by handmade artworks such as Stephanie Syjuko's 'thingies', retranslations of objects designed by users of the free 3-D modelling program Google SketchUp.

In *The Consolidator*, the relationship between artefacts and the data they are intended to represent is difficult to read for the gallery viewer. By presenting them as cryptic presences Freeth consciously meant to address the process of translation that takes place when the material traces of scientific experiments are turned into diagrammatic forms, first, and written publications later, as described by Latour through his notion of inscription (Latour 1986). Scientific inscriptions indeed do not support, alone, their contextualisation and interpretation as facts. We realised how the gallery replicates the same removal of context with which the dissemination of scientific knowledge is concerned. In both cases the public is only offered an abstract representation of reality. By articulating its project across workshop and display, Freeth confronted the different dynamics that belong to prototyping as collectively developing and analysing new devices (in the workshop), and prototyping as a medium of representation (in the gallery). While prototyping embedded in a social dimension elicited critical reflection on the meanings and values of data collection, the abstracted dimension of exhibiting digitally manufactured representations worked as a metaphor for the discontinuities proper of the transition from data to knowledge.

The Consolidator contributed to my research by requiring me to observe the dichotomies inherent to the practice of prototyping: prototyping as supporting cooperation and critical reflection (in this case both on data collection and on the mechanisms of scientific dissemination), as opposed to prototyping as artistic medium or tool. In the latter case, there is a complex relationship between its appearance, its origin and its life cycle, as its links with data or further developments might be just illusory.

3.6.4 Sound Object

Annika Haas built the *Sound Object* (2013) as a material and conceptual framework to explore the potential of touch in music performance. In the first instance then, it is a space and a tool for research, rather than an outcome. However, it can also be viewed as something on the way of becoming a musical instrument, an ‘almost-prototype’, and a structure to perform with. The *SO* is an assemblage of heterogeneous elements that can be rearranged or removed at any time, since nothing is glued or soldered, but simply juxtaposed within a basic wooden structure. The sound is produced through loudspeaker transducers that channel vibrations coming from both the performer’s touch and the environment. The wooden base is circular, as well as the Petri dishes that it contains, and that can swing or bump against each other. The key feature of the *SO* is its proneness to be manipulated and modified. I have mentioned earlier that designers employ prototypes to test specific things at a time, or to confront and evaluate different solutions. During the course of discussion with Haas we agreed that the *SO*

differs from prototypes because it is even less defined, and maintains almost all possibilities open and integrated in the same artefact. “I do not have specific aims in mind; I am taking the materials and see what I can do with them.” Like prototypes, it can be seen as a transient object that will eventually find a stable arrangement or will lead to a proper new musical instrument. By incarnating a much wider variety of directions and possibilities though, it might sit better as something located at an earlier stage, where no specification has been defined yet.



Figure 20. Visitors playing with the SO. Copyright Katarina Maciagowska

Similarly to *Corrugations*, the *SO* prompts other people’s action and supports improvisation, as there are no prescribed ways of playing with it, and any kind of interaction might lead to a discovery in terms of sound and performance strategies. For Haas, the process of building it, re-assembling and modifying it, is an essential part of the performance itself and represent an interesting synthesis of practice and research.

The refusal of a fixed structure and the appearance of the *SO* as a temporary assemblage of found objects also make its building process visible and explicit. Its aesthetics aims to bring to the foreground the correspondence between maker and materiality. In this intent, Haas has been influenced by Tim Ingold’s interpretation of creativity and making as responsive to materials and tools at disposal, rather than the imposition of a mental plan upon passive matter (2013). This emphasis on making and on the possibility to constantly go back and forth between building and deconstructing, avoiding a definitive arrangement, contradicts the idea of progressive development typical of prototypes. The *SO* has been described as an

attempt to *un-creation*, a co-presence of parts refusing any stable organising principle and avoiding to be incorporated into an integral entity (Bowers & Haas 2014). Ergo I would locate it around the borders of the notion of the prototype. The idea of a trajectory towards implementation or improvement is questioned and replaced by a design space, a permanently open area of activity and trial, an interstice between materials and instruments.

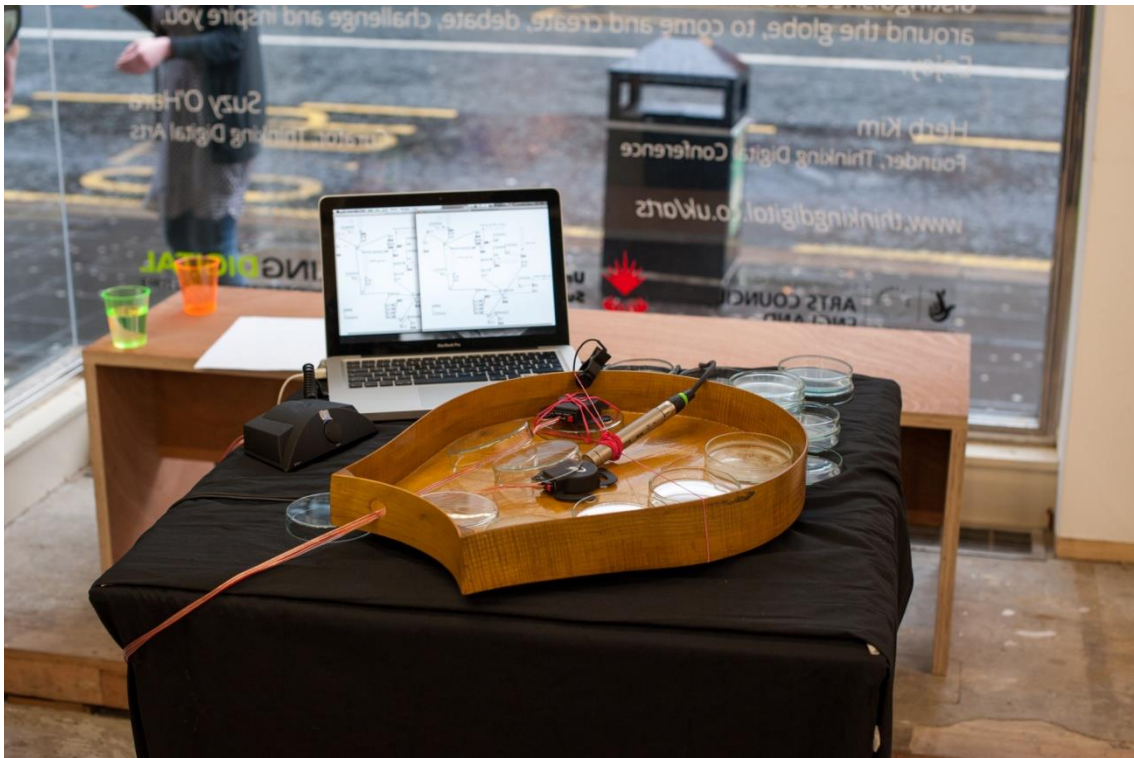


Figure 21. Annika Haas, *Sound Object*. Copyright Katarina Maciagowska

To summarise, the *SO* provided me with a further example of an object for improvisation, and with a new vocabulary to understand the relationship between raw materials and prototypes. Additionally, it showed how the concept can be challenged by creating a design and exploration framework that precludes, but differs from what we usually address as prototype.

3.6.5 Neurotic Armageddon Indicator

Tom Schofield built the *Neurotic Armageddon Indicator* (2012)(2012) as part of his practice-based PhD investigating the materiality of technological artefacts. The piece originated as a small wall mounted LED display visualising the Doomsday Clock, a symbolic clock maintained by an academic journal ('The Bulletin of Atomic Scientists') to indicate our proximity to the end of the world expressed in minutes to midnight. The functioning of the device is intended to emphasise the material nature of networks by scraping the content of the Bulletin's website home-page as often as possible, and sending the result to the display. Because the Doomsday Clock is only rarely updated, this act of verification comes to be

redundant and pointless. A second indicator has been created to link the proximity to Armageddon to a different metric, in this case sourced through the intervention of the public expressing its own estimate on a web platform. The second indicator displays the most recent update to the participatory clock, and the corresponding motivation indicated by the participant. With these two versions being just the first of a potentially longer series of indicators, I was interested in the *NAI* as an approach to artistic production based on iteration. Multiple versions of the same device are made to explore different possibilities, and the potentiality for extending the series is unlimited. This resonates with the ways different prototypes are made to evaluate different design ideas for the same product.



Figure 22. *NAI*. Copyright Tom Schofield

The frantic assessment of the Doomsday Clock performed by the *NAI* seems to respond to a compulsive need for verification. The result however is almost always a lack of updates, or an endless repetition. During our interview I explained to Schofield how this systematic reiteration reminded me of scientific tests, which need to be repeated several times to acquire validity. At the same time, experimental truth is today recognised as provisional (Kuhn 1962; Stengers 2000), always subject to be contradicted, refuted or made obsolete by subsequent tests and new theories. The neurotic behaviour of the Indicator resonates with Avital Ronell's conceptualisation of the *test drive* as our society most emblematic obsessive compulsive disorder and primary source of knowledge and sense of security (Ronell 2005).



Figure 23. The NAI installed in the Newbridge bookshop

The *NAI* contribution to my investigation concerned two aspects of prototyping: iteration and test. Both relate to its provisionality: tests need to be replicated to validate hypotheses and compare alternative ones. At the same time prototypes are never stable, never accepted as they are, and exist only insofar they keep testing and experimenting. Finally, the *NAI* embodies a particular way of conducting research through prototyping. As thoroughly discussed by Schofield, this is based on the process of making as a way of dissecting and analysing technological systems by rearranging their parts and making specific relationships more evident. In a way, the work adopts the rhetorical potential of prototypes by acting as the embodiment of an argument and making it more convincing through its physical presence.

3.6.6 300 Year Time Bomb

The two works presented by Diego Trujillo-Pisanty in the show were not explicitly linked to a research project. However, they have been realised as part of his Masters at the Design Interactions department at The Royal College of Art, and exhibited for his degree show. *300 Year Time Bomb* (2012) is a fake time bomb set to explode in 300 years. The artist imagined the fictional event of its discovery at 100 years after its manufacture, thus leaving 200 years left before the explosion. The scenario, presented through printed materials, involves the construction of a bespoke blast-proof museum where the bomb can become an object of public contemplation. Trujillo-Pisanty explained how the narrative should provoke a reflection around the relationship between time and technologies: the human ability to put

them under control transforms them into material traces and triggers aesthetic appreciation. Set to explode in a future time that does not concern us directly, a dangerous object can acquire historical relevance. Meanwhile, the contrast between the dramatic effect given by the running countdown and the awareness that it sits in a safe environment generates experiences typical of a spectacular but controlled display.

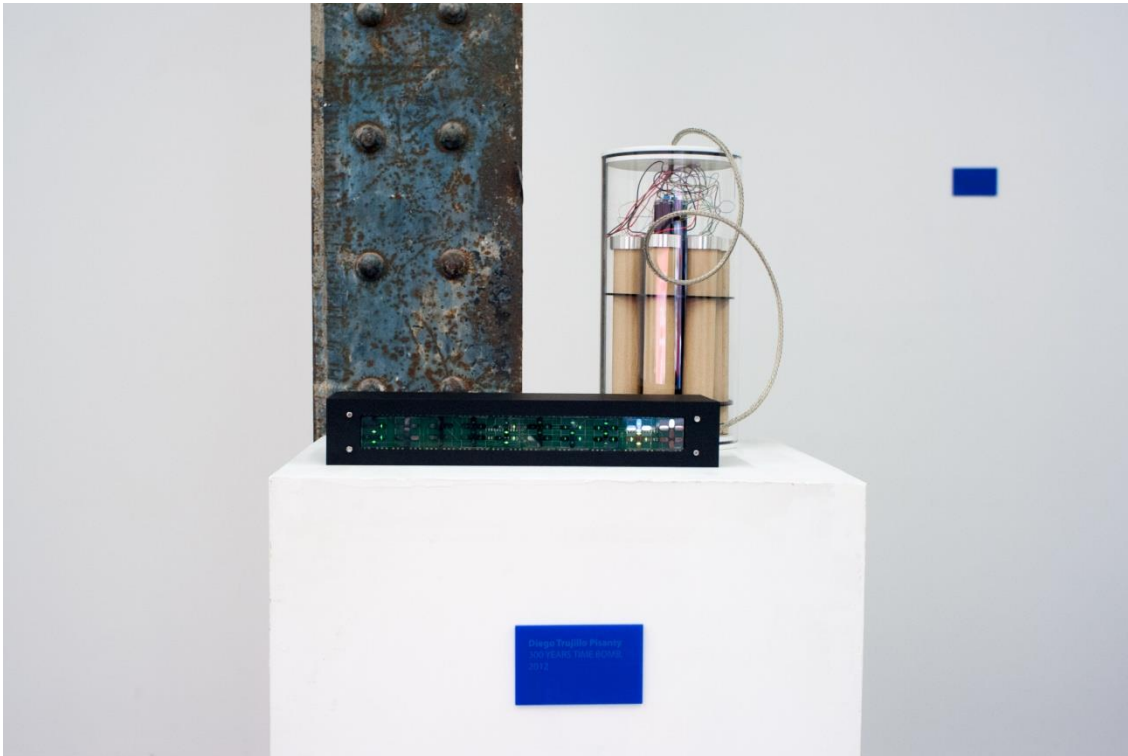


Figure 24. Diego Trujillo-Pisanty, *300 Year Time Bomb*. Copyright Katarina Maciagowska

Trujillo-Pisanty admitted seeing the bomb as a prototype precisely because it is not working, and only built to provoke a reaction. Nevertheless I hesitated before deciding to include in *Betagrams* a piece clearly intended as unique, referred to contemplation, and conceived more like a story than a proposal for new practices. Nevertheless, the main reason to include the piece in the show concerned its relationship between device and narrative. A recurrent feature of speculative design prototypes (and to a certain extent of all designed objects) is the capacity to suggest fictional courses of action and scenarios. The *300YTB* behaves in a similar way and allowed me to compare, in the show, two alternative ways to associate objects and fictions. Whereas in *Corrugations* the scenario and practices connected to the prototype are entirely left to the viewers' imagination, here the fictional layer is provided by the artist through documentation, supportive materials and the title of the work.

3.6.7 *Generated Man*

The second project presented by Trujillo-Pisanty, *Generated Man*, subverts the way in which internet services keep personal profiles of online users. Whereas Google tracks real persons

through statistics collected in a database, the work starts from character sheets inspired by role playing games to end up, possibly, with a personality. Each sheet contains a list of keywords and preferences which are fed into the Google search engine. A piece of software written by the artist selects a number of web search results which lead to a collection of objects from the Google 3D warehouse⁵. The version of this work installed in *Betagrams* included a number of character sheets, and two small screens dynamically displaying the web results.

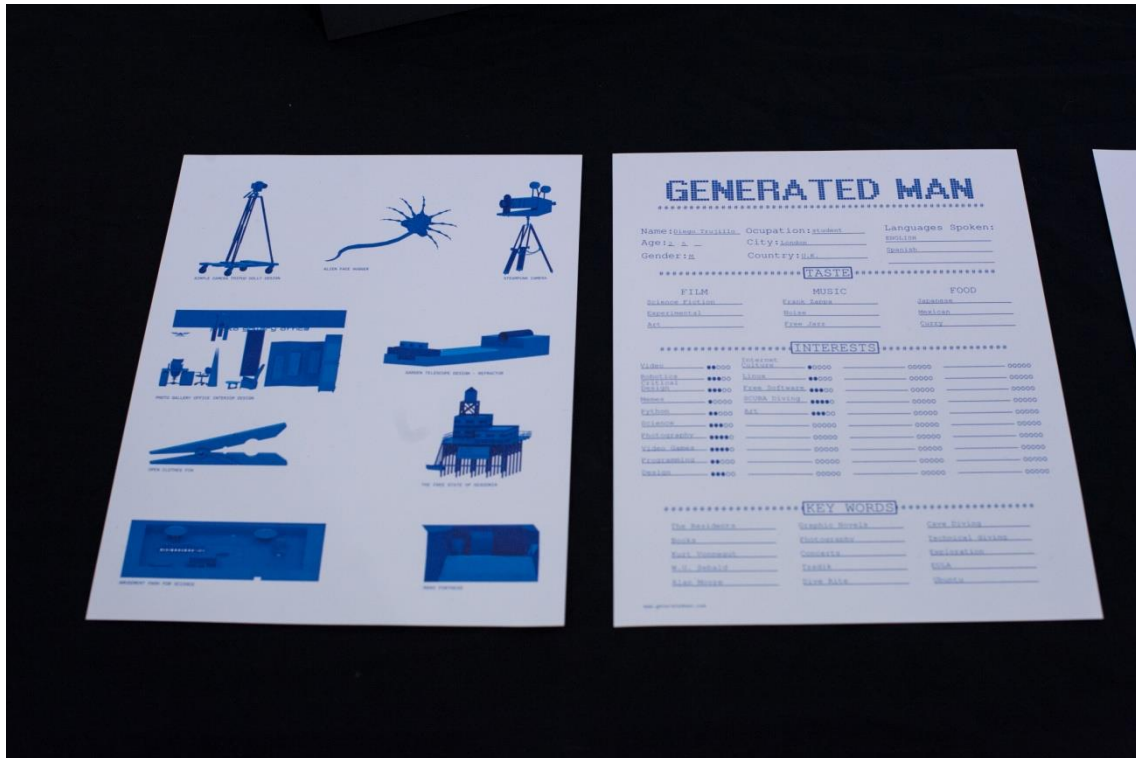


Figure 25. Diego Trujillo-Pisanty, *Generated Man*. Copyright Katarina Maciagowska

I selected this work as a suitable example of art practice as experiment. The starting point was a hypothesis that the programme could evolve from a limited number of preferences to define a more complex personality. With a bachelor's degree in biology and a scientific interest in complex systems, the artist conceived the piece as a controlled environment where a generative system evolves from a set of initial parameters, towards unpredictable results:

Generated Man provided a controlled way for me to interact with a self regulated system. Much like a scientific experiment allows researchers to understand nature's underlying mechanisms; Generated Man allowed me to take a look at how an internet created personality evolves (Trujillo-Pisanty 2012).

According to Trujillo-Pisanty, the outcome of the experiment suggests that a certain degree of complexity emerged from the process. A combination of very specific 3-dimensional objects, such as a Lego version of Han Solo, a Gotham Police Department van or an alien face hugger, can provide hints about a real identity behind them.

⁵ An open source library to share 3D models.



Figure 26. Diego Trujillo-Pisanty, *Generated Man*

What was relevant to me however was not whether or not the initial hypothesis was validated, but rather how artistic prototypes can be built as semi-autonomous environments or tools for experimentation, introducing a new way for artists to give up complete control on how a work should look and behave when finished.

3.7 Conclusion

This chapter has juxtaposed and compared literature and curatorial projects to map the concept of the prototype, which nevertheless remains open and far from a univocal definition. In the Big M workshops and in the *WIP* show prototypes are embraced in a very broad sense which encompasses unfinished operational devices and simple ideas of artefacts. The *WIP* show underscored the assets offered by prototypes within a research community; because research seeks to be innovative, it demands the introduction and testing of new devices and artefacts like prototypes. Additionally, dissemination, sharing and communication are crucial and, as emerged from the literature review, prototypes differ from other kinds of objects specifically for their capacity to share ideas and attract discussion around a project. This helps to explain why prototypes are so common when artists work in labs. A closer look at the works presented in *Betagrams* challenges the prevalent view that sees the knowledge produced by PbR as subjective, affective and non-transferable. In contrast, these projects demonstrate how artistic prototypes can generate a range of contributions shareable and applicable to other contexts, including:

- The introduction of new methods and methodologies (the *SO*, for instance, suggest how to research the philosophical dimension of ‘touch’ through material assemblages)
- Practical guidance for artists and designers (*NAI* contributes specific facets of materiality that can inform the making and analysis of other artefacts)
- Technological or design advancement/innovation (*Pelvics* can lead to new applications in the field of medical practice and body literacy)
- Sociological or psychological insight/ new understandings of people’s relationship to technology (*Corrugation* was conceived as a way to elicit people’s reactions)
- The introduction of new areas of exploration (by analysing people’s reaction, *Corrugation* can identify new avenues for designers to invent products or services).

The research process also drove me to discover how prototypicality is often present in activist creative practice (*CC*). This placed in a different and richer perspective the notions of both the laboratory and the prototype, demonstrating how prototypicality is a phenomenon that transcends the academic setting.

From the other projects discussed here a number of properties of prototypical artefacts produced in artistic contexts emerged. More specifically, the workshops in the Big M highlighted the link between prototyping and fiction, while *Betagrams* provided a series of examples that I annotated with different features of prototypicality: improvisation, critique, fictionality, iteration, testing and so forth. At this stage I felt that it was necessary to bring these findings to a more general and abstract level, so that they could be more promptly appreciated and applied elsewhere. Hence, these features of prototypicality are further explored in the next chapter, and support the articulation of a theoretical framework for the understanding of artistic prototypes, their behaviour and the way they could be built or analysed. This leads to answer to my central research question focused on how to describe artistic prototypes and how to articulate their qualities or features.

Chapter 4. Artistic Prototypes: a Conceptual Framework

In this chapter I draw together the findings and insights gained through the practical projects analysed in Chapter 3 to achieve one of the main contributions of this thesis. This consists in a conceptual framework for understanding the behaviour of artistic prototypes and their role in research and activism. It is argued that openness and fictionality constitute two key features of prototypes and together concur to set up an experimental environment where new practices can be materialised. The chapter also delineates an aesthetic of prototyping addressing the artists' aesthetic choices and public reception.

4.1 Openness and Fictionality

The previous chapters addressed the relationship between prototypes and research at several points. The practical projects in Chapter 3 in particular illustrate different ways in which prototypicality supports research. It is now worth summarising them more systematically and highlighting artistic prototypes' capacity to:

- elicit reflection and feedback (as seen in the *WIP* show, *Corrugation*, *Pelvics*, *Consolidator*);
- materialise hypotheses and provide an environment to test and evaluate ideas (*Generated Man*, *SO*, workshops at the Big M);
- keep the making process visible and therefore more easily analysable (*NAI*; *SO*);
- allow an iterative cycle where evaluation and testing result in implemented versions (*NAI*);
- support an understanding of human behaviour through eliciting improvised responses (*Corrugation*, *SO*, *Pelvics*).

These potentials depend essentially on two key features of artistic prototypes. Their instability and **openness** to change encourage feedback and responses from other people. In fact it is suggested that the artefact is not finished, and therefore welcomes and expects further interventions. This feature, henceforth simply defined as 'openness', also facilitates iteration and the investigation of the making process, since the prototype is (generally) not enclosed in its final packaging, but tends to reveal materials, technologies, and intermediate stages of development. The capacity of prototypes to materialise and test hypotheses, and to stimulate improvised behaviour that discloses attitudes of the human being, relates instead to **fictionality**. This does not necessarily imply narratives but includes a range of modalities in

which hypothetical socio-cultural systems, values, visions, actions, habits, events, contexts, are associated to specific artefacts.

The ways prototypes are suitable for activist purposes emerged from the analysis of *CC* and can also be summarised as follow:

- supporting collaboration and co-creation (as opposed to hierarchical organisational forms);
- facilitating the transferability, circulation and transformation of devices and therefore practices;
- demonstrating the feasibility of alternative practices;
- encouraging critical approaches and resistance to top-down impositions.

These qualities are supported by the openness and fictionality of artistic prototypes. In particular, collaboration and transferability tend to arise from openness. Demonstration of feasibility and criticality stem more directly from the way prototypes evoke alternative worlds or suggest the possible alarming consequences of emerging trends. This bifurcation is however quite porous, and in the later paragraphs of this chapter I clarify how openness and fictionality actually act together. To encourage further interventions on a prototypical artefact the public needs to both perceive the provisionality of the artefact's current condition, and envision the possible world where it could belong.

Figure 27 is a graphic representation of the framework, integrating features and applications of artistic prototypes. It illustrates how openness and fictionality together support specific behaviours, enabling research or activist purposes. I chose to position these fields of application at the same level with the circle representing the artistic prototype to emphasise the idea that it is not just a one-way relationship at stake here. Indeed, certain characteristics of prototypes facilitate specific possibilities, such as the analysis of the making process or the materialisation of alternative practices, necessary for activism and research. It is also true however that artistic prototypes present these features because they have been shaped towards these particular aims. Consequently, the diagram has been designed to emphasise associations rather than clear sequential patterns. Similarly, the four characteristics or potentials of prototypes indicated at the centre of the circle (generativeness, participation, critique and testing) are positioned so to suggest how they are respectively closer to either openness or fictionality, but not exclusively related to one or the other.

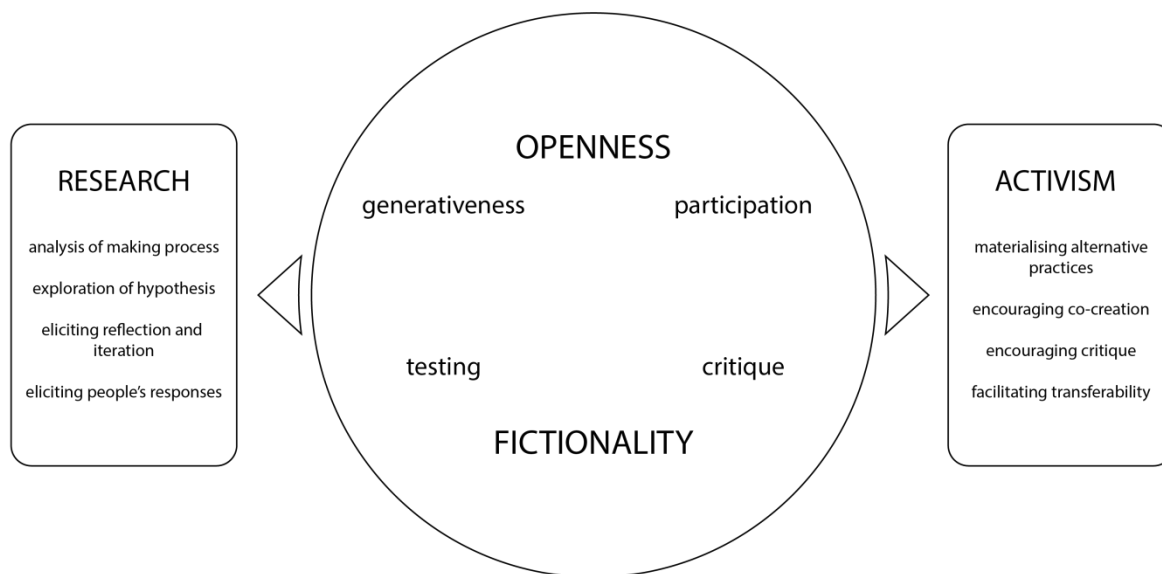


Figure 27. Artistic prototypes framework including features and applications

The development of the framework went through different stages and a few discarded attempts. For instance, at the beginning its design was based on three key elements: Openness, Fictionality and Testability. I subsequently realised that the latter could not be on the same level of the first two features. First because I thought it could misleadingly be interpreted as a merely technical operation (assessing if ‘it works’). Moreover, it soon made more sense to me to understand testing as emerging from the association of Openness and Fictionality. Furthermore, I considered including the titles of my practical projects as an additional version of the framework, to further demonstrate their reciprocity. The fact that most projects address more than one feature though, made this unfeasible from a graphic design point of view. To visualise the connection between framework and projects then, I am including below a different visual (adapted from the homepage of the website documenting my practice) in which each project is ‘annotated’ with its specific features (fig. 28).

The following sections articulate the notions of openness and fictionality at length, explaining in greater detail how they support specific behaviours and establishing connection to a broader set of cultural issues.

4.2 The Openness of Artistic Prototypes

The term openness is intrinsically ambiguous and carries a complex and heterogeneous range of meanings. This fits well the richness of ways in which prototypes can be considered open. This refers to them being unstable, provisional, not definitive, not fixed, subject to transformation and re-definition, situated in a dynamic life-cycle, incomplete. Each prototype might agree better with one or the other of these partially overlapping meanings.

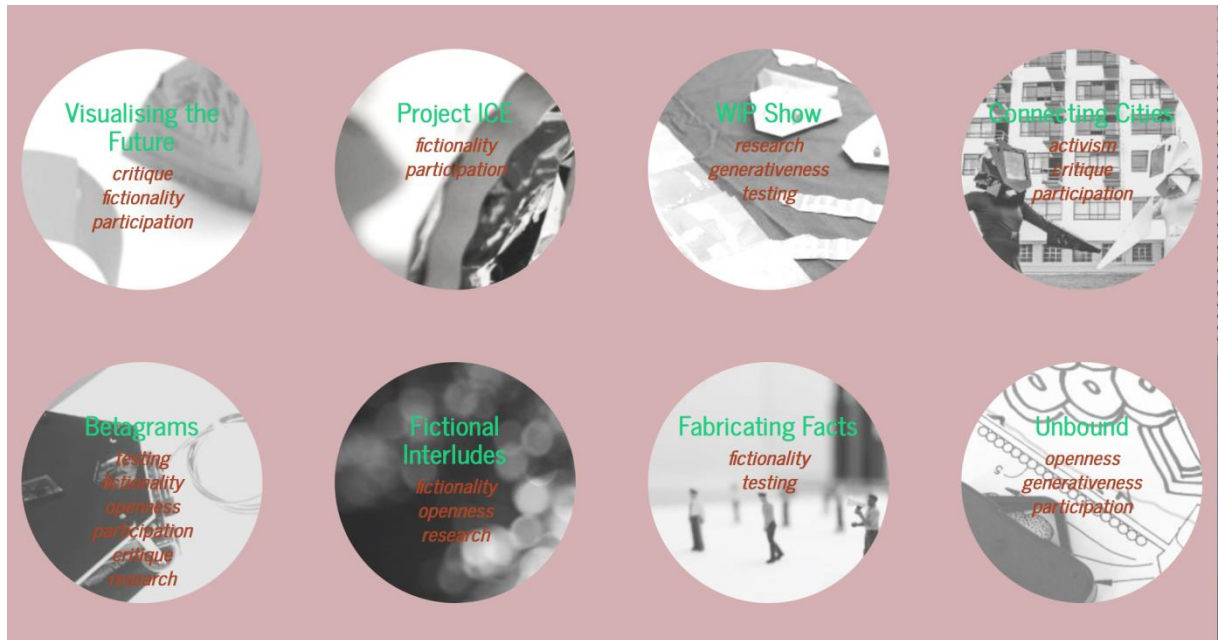


Figure 28. The practical projects associated to their features from the framework

It can also address different levels of openness. For instance, an artefact might be technologically unstable while the artist is ‘waiting’ for an improved technology, is in the process of learning to use it better, or when, at a later stage, he needs to upgrade to newer technologies to guarantee the survival of the piece. A second level of openness concerns the way an artefact is understood or interpreted, which practices, values and cultural systems it is associated with by the viewer. These associations are never definitively established, but shift and evolve according to subjective or cultural factors. A further level is that of material transformation, involving all kinds of modifications of the physical and aesthetic arrangement of the artefact (personalisation, expansion, adaptation, addition or subtraction of parts, change of materials, and so forth). Finally, it is important to remember that these transformative interventions can be operated by the creator of the artefact as well as by other participants, individually or as part of co-creative processes. Openness is in fact at the basis of prototypes’ participative and generative potential. Another way to categorise openness could be to distinguish between works intentionally conceived as prototypes since the beginning, and works which gradually become the centre of a broader set of further productions (for instance when their code become the basis for other works by the same or other artists). Nevertheless, not all works which evolve through time can be considered open in a prototypical sense.

Works grounded on liveness and changing input data (such as those involving web scrapers) show a constantly different appearance but if their core identity and functioning remains consistent they might not be seen as prototypes.

4.2.1 Cultures of the open

Peter Lunenfeld identifies the ‘unfinished’ as the defining trait of the aesthetics and the attractiveness of digital media (2000, p.7). The unfinished he is addressing is that of the virtual space and the hypertext, which offers never-ending patterns of spatio-temporal trajectories and narratives. He also refers to the dissolved boundaries between a text and its context, a digital product and its ever-expanding media-sphere, where stories are always subject to be continued because of a business imperative (ibid. 2000, pp.14–15). Lunenfeld wrote at the end of the Nineties and focused on what was distinctively immaterial of digital media, addressing cultural artefacts experienced through screen interfaces. The principle behind his aesthetics of the unfinished is however a fitting premises to the openness of artistic prototypes.

A pre-digital formulation of aesthetic openness is offered, among others, by Umberto Eco’s theory of the *Open Work* (Eco 1989 [1962]). Even though primarily concerned with literature, it found wide application to the analysis of the visual arts as well. The open work is defined by Eco as an object whose properties make possible a number of evolving interpretations and perspectives (ibid. 1989). The key idea is that of polysemy: to various degrees artworks are characterised by an intrinsic ambiguity of meaning. This recognition transforms the reader or viewer into an active agent in completing the work. He can no longer be considered a simple receiver as the message becomes the source of new information, therefore continuing the series of transmissions. Eco is only one representative of a wider array of ‘reception theorists’ arguing that meanings are completed in the space between the text and the reader (Iser 1972). Roland Barthes’s notion of ‘scriptible’ text for instance introduces analogous challenges to the role of the reader, called to re-enact the action of the writer in an active interpretative effort (Barthes 1975). A detailed analysis of these approaches is not my concern here. Instead, what I want to stress is how the idea of openness advanced in my thesis goes beyond the semantic level and cannot be incorporated within an understanding of the work of art as a message to be transmitted and decoded. Prototypical artworks are not just open to variable interpretations, but also to multiplication and material transformations involving their physical arrangement, their positioning in a context of use and their applications and functions. In other words, the openness is not limited to reception but expanded to all sort of interventions on the work.

The contemporary rhetoric of the open tends to associate technological and social openness (Cramer 2013) through notions such as Open Data, Open Access, Open Knowledge. The notion of OS (open source) has generated a set of discourses that need to be foregrounded at this stage. OS software can be freely accessed, used and modified by everyone. Stallman's notion of Free Software (2002) originated as a reaction to growing restrictions on the use and production of software, essentially as a pragmatic way to defend the programmers' freedom. The ideas of Free Culture and OS approaches to artistic production attempt to apply the same logic to the circulation and modification of creative content. From the Creative Commons Licence to Copyleft, a number of strategies have been proposed to allow various forms of appropriation and re-use of creative content. Prototyping practices are naturally involved in a culture of the OS but sit in a complex position because of their double implication with matter and code. When we talk of artistic prototypes generated for research or activism, there is, for different reasons, an intrinsic imperative to dissemination. Openness in these cases is more a requirement than an opportunity. The notion of OS is however more strongly rooted in the digital nature of contemporary cultural products. The replicability of code instead is only one aspect in the openness of prototypes.

The impact that the cultures of the open had on the market is significant and contributed to the development of new economic and development models (see for instance Gold, 2004; Hippel & Krogh, 2003). Even more, the programmatic notion of Open Design advocates a model of production that integrates "sharing, design and innovation", promoting practices of co-creation and distributed manufacturing to increase the involvement of the user in the creative process (Van Abel et al. 2014). In this context, the role of the designer changes towards that of a database or meta-designer, not directly designing objects, but "shaping a design space in which unskilled users can access user-friendly environments in which they can design their own objects" (Mul 2014). Open Design goes along with what has been called a template or database culture, based on the relevance of databases as

'ontological machines' that shape both our world and our worldview. In the age of digital recombination, everything – nature and culture alike – become an object of manipulation (ibid. 2014).

There is an even more literal idea of openness associated with emerging technologies, and concerning the way these are presented to the user in the marketplace. Usually, technological products are enclosed in cases, the parts they are made of are hidden and inaccessible to the user, and everything is set up to discourage the user's intervention (either fixing or modifying) in the device. This is a long-standing practice that received special attention by Steve Woolgar who interpreted it as a way of configuring the user and preventing unapproved

forms of access to the device (Woolgar 1990). By encasing it and furnishing it with warning messages referring to warranty void if seal is broken or cover removed, companies provide a specific interpretative framework and maintain the dependency of users to the company technical support. Instruction manuals too define the correct behaviour around technologies, consequently shaping the users' identities, capacities and possible actions. In Woolgar's view, cases and manuals affect the way technologies are read and interpreted (as texts). Cases, in particular, determine an explicit boundary between technology producers and consumers. While users only have access to black-boxed machines, with an impenetrable cover and prescribed meanings, machines are usually left open on workbenches inside the company. Here, engineers need quick access to their components and are expected to take them apart without limitations (ibid. 1990).

A similar perspective views the open as literally 'broken', as suggested by Fuller and Haque (2008) in their proposal towards an alternative approach to urban development:

a broken system is usually one that attracts the most attention, in part because it appeals to others' desire to "repair" and also because breaks can enable one to understand better how something should or *could* work (ibid. 2008, p.31).

By releasing systems or artefacts in a pre-emptively broken condition the intention is to promote re-use and re-purposing, but also a "sense of individual responsibility and technical audacity" (ibid. 2008, p.32). The political value of artistic prototypes in this light could be precisely that of expanding the public access to the inside of a technology. The absence of a case and the visibility of components and inner functioning is not a characteristic of all prototypes, but it is definitely part of the aesthetics of prototyping. The possibility to look inside is a prerequisite for inviting others to tinker and intervene at various degrees on a device. The openness of prototypes offers a form of physical accessibility and visibility that abolish or reduce the separation between insiders and outsiders, therefore (in an activist light) generating a redistribution of powers and authorities.

4.2.2 Openness in practice

It is appropriate now to go back to *Betagrams* to highlight how openness might be intended by artists and how it is manifested in some of the artworks included. The interviews conducted indicated that none of the artists ever considers his or her work finished, but mostly simply abandoned or interrupted once achieved a certain target ("good enough for publishing a paper or an exhibition") or when superseded by new projects or interests. The fact of working with non-standardised practices and media also contributes to maintain unclear finishing points, as there are no established criteria to evaluate how a final outcome should be.

Finally, exhibitions are described as often characterised by a settling period for the work, which might be subsequently modified or improved according to the feedback gathered in the public realm.

The *NAI* is particularly suitable to discuss openness. This feature is here associated with a process of iteration of the same idea through the exploration of different variables and criteria. The potential to continue the series is extended to a wider community of practitioners by publicly sharing the code and building principles on the artist's website⁶. His preferred way to expand the project would be, however, a series of workshops where participants would think of alternative metrics to evaluate our proximity to Armageddon, and build the relative indicator (Schofield 2014).

Workshops are a common platform to exploit the openness of prototyping. Ben Freeth's practice, as seen with *The Consolidator*, is based on collaborative sessions where participants (often musicians) are invited to develop new devices using rapid prototyping and microcontrollers. By supporting the integration of technology in the musicians' own creative work Freeth creates the conditions for available tools and materials to be assembled to invent musical instruments and unexplored experiences with sound. Here it is possible to discern an even stronger degree of openness, commensurate to the lack of structured guidelines and predefined aims for the workshops. The artist's intervention in this case consists of creating a situation to facilitate prototyping and its inclusion in artistic practices. A similar approach characterises the *SO*, always maintaining multiple possibilities of development open, therefore working as an ideal research environment where options and trials can happen under consistent conditions.

The openness of *Corrugations* is instead less concerned with making and more with the interpretation that the artefact might engender in the viewer. This relates to the way openness can support research aims: it is by letting this process of imagining contexts and uses emerge that new understandings of users become available to the researcher.

Pelvics, finally, can be understood in the light of Woolgar's investigation of the case as a black-boxing measure guiding and limiting the users' interpretation of a device. The process of critique starts for Almeida precisely with opening and breaking medical devices apart. Disassembling and exposing bits and parts becomes a way not only to start an intervention of re-design, but to expose inadequacies, perform an analysis and cancel

⁶ In a private communication Schofield points out that the most common reason for artists for sharing code is however not to allow others to replicate their work, but to be helpful to other practitioners doing similar things or seeking to reproduce similar behaviours in their own projects.

predetermined interpretations. This eventually opens the process to the introduction of new values and subjectivities directly onto the devices.

4.3 Fictionality in Artistic Prototypes

The definition of fictionality I propose in the framework links to the space where the future orientation of prototypes is projected. Therefore it is not conceptually opposed to the notions of fact or reality, but it is rather related to it dialectically. In these terms, fiction has not much to do with fantasy, but maintains a groundedness in relation to scientific and technological research. In the Introduction, I identified speculation as a key ingredient in the development of a culture of prototyping. Speculative design prototypes tend to be extremely polished and accurately crafted in order to communicate complex narratives and allow the public to relate to them immediately. Indeed, they embed a fictional dimension and it is precisely this capacity to evoke alternative worlds that makes them a prompt for critical thinking (Dunne & Raby 2013a). Speculation however is not the only way design relates to fiction. In the following paragraphs I review different kinds of fiction in the context of design practice to support a deeper understanding of the notion of fictionality presented in the framework.

4.4 Fiction and design: a review

Fiction has been used for several decades in a range of user-centred and participatory methods for design research. In adopting fictional or pastiche scenarios, developing personas and conducting future workshops (Kensing & Madsen 1992; Carroll 1995; Blythe & Wright 2006; Chang et al. 2008) fiction is deployed instrumentally, to elicit feedback from users and understand their needs or desires. This exploits the potential of fictional situations to support a process of projection in a non-actual situation. These methods capitalise on the association between tangible prototypes or props and imagined scenarios, because physical objects reinforce the immersion of the participant in the action and suggest a rich complexity across the realms of facts and fiction.

Proponents of DF have focused in a different way on the relationship between fiction, design and innovation. Dourish and Bell opened the discussion by suggesting the contribution of science fiction in building a collective imaginary favourable to ubiquitous computing (2014). In response to an early, unpublished version of their paper, Julian Bleecker devised the concept of DF to describe a combination of science fiction, science facts and design. Design is intended here as an authoring practice, an alternative approach to storytelling to develop possible and habitable futures with the goal of identifying new avenues for

innovation. The role of fiction is also to provide knowledge for action or reflection: a background against which evaluate consequences, impact and problems connected to innovative design proposals (2009). David Kirby advances a position close to Dourish and Bell, but articulates it further with his definition of ‘diegetic prototypes’ (Kirby 2009). These are innovative devices included in cultural products (particularly feature films) in order to make existing developing technologies more understandable and appealing, so to attract support from stakeholders or the wider public. Fiction in this case has the rather instrumental role to demonstrate the viability and desirability of specific innovation projects. David Brian Johnson’s idea of ‘science fiction prototyping’ (2011) can be seen as an applied version of the above approaches, deployed in his role as resident futurist at Intel Corporation. Stories become a tool to test emerging technologies and develop their implications in ways that can feed back into the design process and the implementation of prototypes.

Fiction is understood in fairly different terms by critical designers. Dunne, who defines his artefacts as material tales (2008, p.XVII), stresses its role in generating a defamiliarised and estranged reception of designed objects, therefore enabling critical reflection (ibid. 2008). Working with fictional worlds allows the designer to not only avoid financial and technical constraints, but more importantly to test ideas in a rich (although imaginary) environment. Dunne introduces the term ‘value fiction’ to emphasise how at the core of critical design is an exploration of moral and cultural issues, rather than technical ones (Dunne & Gaver 1997). The interplay between facts and fiction in critical design is also framed through a comparison between ‘fictional functions’ and ‘functional fictions’:

The former is what we get everyday - functional products that meet fictional needs. The mobile phone is a perfect example, we don’t need half the functions it offers us, they are pure fictions created to sell more bandwidth. On the other hand, many of the projects in this book we would describe as functional fictions. They do not exist as ‘real’ products, but as prototypes, semi-real, fictional, but these fictions are highly functional and the needs they address, although often intellectual, are real and genuine (Dunne & Raby 2010).

The potential to evoke alternative worlds, practices and behaviours is not limited to speculative and futuristic prototypes. It is to a certain extent a property intrinsic in all designed objects, regardless of how established they are already in our everyday. Madeline Akrich examines how technical devices originate from the designer’s hypotheses on the context they will inhabit, including the user’s aspirations and taste (1992, p.208). She defines this process of embedding socio-cultural factors and practices in the device as ‘script’, elaborating and adapting to technical objects the Latourian notion of ‘inscription’. While pioneering the application of ethnographic methods on science studies, Latour focused on inscription devices transforming traces of matter into written documents including all texts,

graphics, images, charts generated as output of scientific activity. Inscription marks the key passage of translation from a phenomena in the lab to the production and dissemination of knowledge (Latour & Woolgar 1979). Nevertheless, Akrich's application of the term does not simply move it to a different domain (from science to technology) but includes the public as an integral element. The agency behind a 'script' is not coming from the designer only: the users' expectations are taken into account to "define a framework of action together with the actors and the space in which" the technical objects are supposed to act (1992, p.208). The relevance of Akrich to my exploration of the fictionality of prototypes is reinforced by her terminology explicitly alluding to the imaginative realm of film or performance:

A large part of the work of innovators is that of 'inscribing' this vision of (or prediction about) the world in the technical content of the new object. I will call the end product of this work a 'script' or a 'scenario' (ibid. 1992, p.208).

This suggests that all sorts of visions, desires and expectations inscribed in technical objects can be regarded as part of an expanded definition of fiction associated with the design process (particularly with prototyping). Fallan elaborates on the notion of 'script' to underline its role in understanding how "designers, products and users negotiate and construct a sphere of action and meaning" (2008, p.63). Fictionality emerges here as a synthesis of intention and interpretation. The two elements however can easily diverge. Akrich suggests the term re-inscription to describe a feedback mechanism between users and producers that modifies the values and practices inscribed in a specific object. This is also a key idea behind *Pelvics*, where the process of taking apart and redesigning medical devices involves a redefinition of their values.

4.5 Levels and Roles of Fictionality in Artistic Prototypes

Different kinds of fiction can be more or less suitable to different purposes. The following paragraphs introduce a possible way of categorising some of these approaches, to enrich the ways we can talk about fictionality and further locate it in practice.

4.5.1 Explicit vs implicit fictionality

A comparison between *3YTB* and *Corrugations* instantly suggests how the fictional layer can be either directly provided by the artists/designer, or be intentionally implicit, entirely or partially left to the viewer's imagination. We can therefore establish a first classification between **explicit** and **implicit** fictionality.

In the first case, the fictional layer can be communicated by presenting additional material and documentation, together with the object, or by offering oral explanations within

the context of display. The title can also play a role in this sense. Additionally, the fiction can be clearly revealed as such, or introduced as supporting information presented as true or

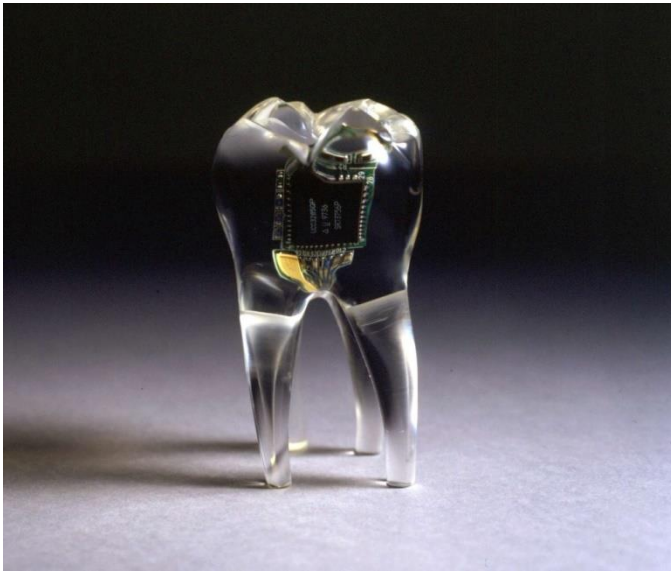


Figure 29. Auger-Loizeau, *Audio Tooth Implant*. Copyright Auger-Loizeau

ambiguous. Some examples will corroborate this characterisation.

The *Audio Tooth Implant* by Auger-Loizeau (2002) is a miniature device that, embedded in a tooth with a routine dental surgery, can communicate with mobile phones or the Internet enabling a sort of telepathy. The project was presented to the public with a rich amount of information. This included the creation of a fictional company as proponent of the concept; a publicity film illustrating the functioning and

advantages of the devices; a number of articles and blog entries that followed the first release of the proposal into the public realm. The public was offered plenty of scientific details supporting the project, as well as suggestions on its potential uses. In order to stimulate and investigate the public responses to the device, the fictional dimension was initially masked as non-fiction, and only revealed as such in subsequent publications and shows. Addressing forms of digital activism and contemporary performance, rather than speculative design, Carrie Lambert-Beatty defines a similar kind of fiction with a foot in reality, or perceived as real, as ‘parafiction’ (Lambert-Beatty 2009). Its distinctive technique is that of stylistic mimicry, replicating the styles and languages of reliable media and institutions, as Auger-Loizeau did with corporate identity and newspapers. According to Lambert-Beatty the effect of ‘parafiction’ on the public should be a combination of scepticism and belief, ultimately solved into an attitude of critical doubt towards the media and institutions addressed.

Another strategy involves the direct intervention of the artist in discussion with the public. This is what happens in *The De-extinction Deli* by The Center for Genomic Gastronomy, a market stand where visitors can learn about “the emerging technologies, risks, and outcomes of the growing movement to bring back, and possibly eat, extinct species” (The Center for Genomic Gastronomy 2013). Fiction and reality overlap insofar as what is offered by the stand is authentic debate and the proposal acquires a certain degree of effectiveness simply by being discussed in a real encounter between artists and public. The proposal

however is clearly framed as a provocation so that visitors are aware the artists' aim is to generate debate and not to actually bring back extinct species.



Figure 30. The Center for Genomic Gastronomy, *De-extinction Deli*. Copyright The Center for Genomic Gastronomy

When prototypes are presented without any narrative or background information, the viewer is faced with an ambiguous presence that does not offer a clear explanation of its function, nor the cultural values which might be at its basis. This approach is common in Research through Design, where designers create ambiguous prototypes, whose functions and meanings are not explicitly outlined, in order to gain a deeper understanding of the user or to discover new opportunities for further design. Participants in this kind of experiments are demanded to interact with the device, invent ways of using it, and talk about the approaches and feelings elicited during a trial period. This is the reason why the creators refrain from suggesting their own fictions. The idea is to leave space to multiple and open interpretations: these fictions can contribute to sociological investigation and suggests new ideas to the designer.

Most of the projects developed by the Interaction Research Studio at Goldsmith College, for instance, adopt this strategy. Prototypes like the *Local Barometer* and the *Plane Tracker* (Gaver et al. 2008), both presenting information gathered from the home surroundings, were given to volunteer households to analyse the ways in which they were being appreciated, or neglected. *The Local Barometer* displays text and images from classified advertisement depending on the local wind conditions. *The Plane Tracker* visualises the flights of aircrafts passing overhead the house. They do not possess a clear function,

beyond the vague idea of emphasising the connections linking the house to a broader context and offering the household something to talk about. Before conducting the studies the designers could only make guesses about their possible reception and, indeed, many of the associations, behaviours and forms of engagement that emerged were unexpected to them. In this framework, fictionality opens a participatory dimension in which new devices are not received as products with predefined sets of meanings attached, but can be a first step into a collaborative process of discovery and the definition of new practices.

4.5.2 *Characters of fictionality*

One way of looking at the relationship between fiction and prototypes is to evaluate to what extent one is instrumental to the other. Some artworks involve prototypical artefacts as tangible manifestation of a narrative or a pattern of action. Here the story is the priority and design works as a storytelling technique to mediate and articulate the **plot**. Design offers the method to develop the story, through spatial analysis, trajectories of action and possible consequences. *Under Black Carpets* (2012), described in Chapter 5, is a good example of this kind of artwork, essentially conceived as a way of prototyping events.

A different case is when the **narrative** is still inherently associated to an artefact but generated through text or other mediums, independently from the design activity. In *300YTB* for instance there is a linear narrative involving the recovery of the bomb and the construction of its blast-proof museum.



Figure 31. Noam Toran and Onkar Kular *The MacGuffin Library*. Copyright Toran and Kular.

The MacGuffin Library (2008) by Noam Toran and Onkar Kular is a collection of 3D printed objects, each one accompanied by the synopsis of a non-existing film. Made out of a black polymer resin, these artefacts embody an aesthetic of prototyping but are presented as unique exemplars: they are not proposals for future possibilities, nor they are intended to be

appropriated or transformed. By contrast, they resonate with a definition of the prototype as archetypal, and suggest an extremely complicated transaction between artefacts and artifice:

Through the industrial process, detailing and materiality, the pieces produced sit in an unnatural space, challenging their status as art objects, being neither products, nor sculptures, nor props, but an amalgamation of all three (Royal College of Arts 2008).

Once again, the ultimate purpose is to encourage the viewer to imagine something more about the objects and expand the fictional or hypothetical space, by subjectively filling the gaps between artefact and synopsis so that “an audience can create the film themselves” (Toran & Kular 2008).

A common strategy in speculative prototypes consists in taking an emerging technology or societal issue as a starting point, and imagining what could reasonably happen should it develop to significant scales in a hypothetical future. In this case fictionality can be described as a **projection** of current phenomena into their possible evolutions. The artefacts here are usually intended as solutions or responses to problems, or the trigger to new socio-cultural arrangements. Many projects conceived at the Royal College of Art, by Dunne & Raby or their students, are representatives of this category. *Foragers* (Dunne & Raby 2009) for instance, starts with some facts: our planet is overpopulated and running out of food. The designers project this emerging threat into a scenario where the food shortage has become an everyday issue and propose synthetic “microbial stomach bacteria” that, together with other electronic and mechanical devices, enable human beings to maximise the nutritional value of resources available in the urban environment.

Another project by Dunne & Raby, *United Micro Kingdoms* (2013) suggests that the fictional layer can consist of the articulation of **socio-cultural or economical systems**. Rather than related to emergent tendencies in the present, they are autonomous, hypothetical realms dominated by unfamiliar values, forms of governance and driving technologies. The work proposes an England divided into four different counties, each one experimenting with its own lifestyle: Digitarian (a totalitarian society based on digital technologies), Communo-nuclearist (endowed with unlimited energy but forced to live on a 3Km long mobile landscape), Anarcho-evolutionist (engaged in bio-hacking and DIY practices) and Bio-liberal (where each individual produces his own energy).

4.6 Testing

This classification is only tentative: clearly some of these typologies overlap, and different examples could have suggested further kinds of fictionality. What is common to all of them is the way fiction provides a context of understanding for the practice or behaviour inherent to

the prototype. More specifically, fiction is often the key ingredient for performing a test. This can result in confirming or rejecting hypotheses, letting a system evolve under observation in a circumscribed environment, trial ideas or proposals with participants and assess their reception. Fiction is what makes hypotheses not only more graspable or understandable, but also subject to more effective explorations, richer in details and powerfully engaging. Consequently, fictionality turns prototypes into stronger prompts for reflection.

The relationship between prototyping, testing and conducting research is undeniable. Because of their proneness to rearrangement, prototypes possess an inherently experimental condition. In a way, their suitability for testing allows artistic research to align itself with established scientific methodologies required to be more easily acknowledged in academic circles. Testing determines the way experience is introduced in a process of reflexivity. The relationship between test and knowledge is at the core of Avital Ronell's philosophical investigation of what she considers one of the strongest obsessions of contemporary society, the 'test drive' (2005). From nuclear to HIV, pregnancy, admission, DNA tests, military strategy, health, drug, technology, Ronell asserts how questions of truth and security are today based on testability. Experiment is recognised as our primary way of constructing reality. Its value however is always temporary:

[It] still makes claims of absoluteness (something has been "tested and proved"; we have "test results") but in the form of temporariness. It opens up the site that occurs, Nietzsche suggests, after Christianity has fizzled, arriving together with a crisis in the relationship of interpretation to experience (Ronell 2003, p.565).

The scientific method demands not just testing experience, but to constantly inquire into its own processes and methodologies. In other words, the experimental disposition implies that truth is subject to incessant questioning and restructures our life around a condition of essential tentativeness and provisionality (Ronell 2005, chap.1). This emphasis on the provisional resonates with the way artistic prototypes have been characterised in this thesis as both open-ended and research-related. Ronell herself addresses the notion of the prototype to establish the equivalence between building and knowing:

The theme of information design opens a region wherein the distinction between discovery and the more instrumental epistemology of how something works is suspended. An invention no longer is figurable as a spontaneous eruption of substantial thinginess but now gets serialized or parallel processed by various trials and tryouts (2009, p.168).

Her claim is inspired by the field of Artificial Intelligence, where a crucial shift is marked by Dennett's design stance towards the mind (1968). Rather than investigating the nature of rationality, his inquiry began to focus on how a rational agent can be designed (Ronell 2009, p.168). Another way of putting it would be that prototypes are central when knowledge is

associated with simulations and re-creations of reality, rather than from reality itself. This links back to a definition of fictionality as plausible simulation of reality.

This view is consistent with accounts of scientific experiments as replications or reconfigurations of the real, maintaining an indirect relationship with reality itself (Gooding, T. J. Pinch, et al. 1989; Cetina 2009). According to Knorr-Cetina, in particular, the objects used in lab experiments are not as they occur in nature. Rather, scientists work with their traces, images of purified versions. Laboratory practice entails the detachment of objects from their environment and their installation in a new phenomenal field (Cetina 2009, pp.26–27). This can be related to my definition of fictionality as a conceptual environment where prototypes are attributed meanings and associations with socio-cultural instances.

4.6.1 Levels of testability

Betagrams comprises works strongly related to the idea of testing: in *Pelvics*, *Corrugations*, *NAI* and *Generated Man* this is present both as a topic and a functional logic to develop the work. What emerged from my conversations with the artists was a distinction between three different levels of testing, as performed by artistic prototypes in research.

- Operational: to check if the code works as it should, if the device behaves as planned or if it actually responds to the research question (this first level is basically always present whenever prototyping is involved).
- As an observable microcosm of interacting elements: to see how the system evolves without any anticipation of the outcomes (as in *Generated Man*).
- Reception: to explore people's reactions to the device, the ways it is interpreted or appropriated by the public (as in *Corrugation*).

To conclude, it is useful to briefly but explicitly assert the reciprocity between testability, openness and fictionality. Because tests intrinsically need to be validated, re-confirmed, and constantly challenged, the openness of prototypes can be seen as correlated with testability. At the same time, testability is supported by fictionality. Without the prototypes' capacity to suggest their own context of application, tests would not be effective. Besides, their relationship to testing, openness and fictionality are connected because of the way prototypes invite viewers to both imagine and actuate various forms of appropriation, interpretation and transformation. Openness requires some degree of fictionality to imagine further transformations, while fictionality involves some kind of openness to suggest the idea that prototypes can be appropriated, disseminated, embraced. Nevertheless some artistic

prototypes show a stronger degree of openness and very little fictionality (the SO, for instance), while others are primarily characterised by fictionality (UBC is a case in point).

4.7 Towards an Aesthetics of Prototyping

The features of prototyping discussed in this chapter can contribute to delineate an aesthetics of prototyping that is intended at two levels: i) the aesthetic choices made by the artists in prototyping; ii) the public reception of artistic prototypes. The first point refers for instance to the tendency to work with physical computing; the preference given to certain materials (such as cardboard or MDF, associated with the temporary, rudimentary, re-cycled) or the mimicking of a product-design feel; the visibility of components. The second level depends on the prototype's role in the fields of activism and research. Their aesthetic appreciation relates not just to their appearance but to the perception of their agency in the world.

The term aesthetics has alternatively designated, throughout its philosophical history, a kind of judgment, attitude, object or experience. Because of their multiple entanglements with different socio-material possibilities of development, artistic prototypes demand an aesthetic judgment extending beyond the physical object. This is in line with recent tendencies of grounding such judgment in dialogue with the participant or viewer. For example, Grant H. Kester's notion of discursive aesthetics, developed in response to activist and collaborative artworks, values the exchange between different subjectivities (2004) and addresses the longstanding issue of art's autonomy by characterising its permeability with other zones of symbolic production (2011, p.7). Similarly, in approaching the aesthetics of artistic prototypes it is necessary to abandon exclusively artistic categories and recognise its interfacing with knowledge production and activist intervention.

Positioning aesthetics in relation (or opposition) to knowledge has constituted a recurring issue in philosophy (see for instance Vico 1961 [1725]; Baumgarten 1961 [1750]; Adorno 1997 [1970]; Rancière 2006). In our case, we might be facing an intersection between aesthetics and epistemology, with artefacts simultaneously generating aesthetic experience and knowledge⁷ in a deeply correlated way. That means that one needs to grasp the knowledge to have a proper aesthetic experience; and needs to experience the artefact aesthetically (and in its operational dimension) to fully grasp the knowledge (fig.31).

⁷ In the case of activist prototypes, I refer to knowledge about alternative possibilities or practices, or knowledge as critique.

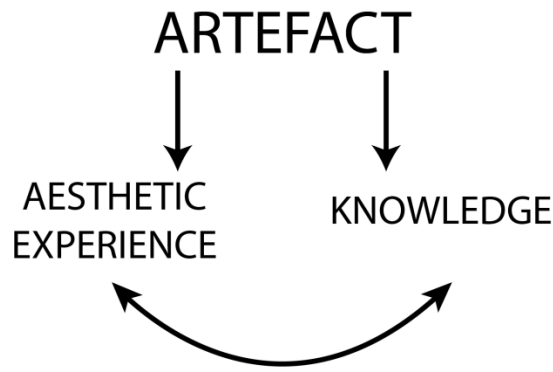


Figure 32. The aesthetics of artistic prototypes

Similar approaches are found in the field of the Digital Humanities (DH), where Johanna Drucker embraces aesthesis as “a theory of partial, situated and subjective knowledge” (2009, p.xiii). For the scholar, this is a way of challenging the authority and the mechanistic rationality of digital systems, by anchoring scholarship to contingent and specific points of view. However, I consider subjectivity a limiting perspective in understanding knowledge formations associated with artistic prototypes, as it can put transferability under question. In my view, and as emerging from the examples provided with *Betagrams*, such knowledge is never entirely subjective and has a bearing beyond the contingent, individual experience.

Another relevant factor in the aesthetic experience of artistic prototypes is the awareness of their openness to further development. The vision of potential transformations and the recognition of their unfinished condition are integral to their aesthetic reception. In a quest for a possible reference to this perspective, Bakhtin’s dialogical aesthetic model provides a view of the artwork as intrinsically projected towards a response or an invitation to others to engage in dialogue. Bakhtin’s notion of answerability, conceived as the communion of cultural meanings and experiential participation in the artwork, implies that an aesthetic action is such only when encouraging and anticipating an answer (Bakhtin 1990). The artwork is therefore always incomplete and productive of chains of actions, in ways not dissimilar from the prototype’s future-orientedness.

The aesthetic approach outlined in this section is meant to complement the framework in understanding prototypes as the outcome of artistic work. It implies an account of art as practice trespassing fixed categories and operational fields, demanding the public to go beyond contemplative attitudes to embrace some form of action or transformation.

4.8 Conclusion

One of the contributions of this thesis consists in the articulation of a conceptual framework for understanding the behaviour of artistic prototypes. I identified in openness and fictionality their two main features, and explained how they support the role of artistic prototypes in research and activism. These features act together in allowing the public to broaden the possibilities suggested by the prototype. Whereas fictionality enables people to relate a prototype to their own lives and imaginatively appropriate it, openness supports the actual process of adopting, replicating, expanding or customising it. I have highlighted how openness and fictionality contribute to the creation of an experimental system, which serves both activism and research. In fact, both fields of application demand to visualise portions of alternative worlds and to respond to it into practice. A point of convergence between activism and research themselves relates to the anti-authoritarian dimension of prototypes, challenging disciplinary and institutionalized processes of knowledge creation.

The framework can be used to analyse, describe or develop artistic prototypes, particularly in terms of the experience and agency they can support. Beyond being a flexible basis for approaching individual works however, the framework is also intended as a tool to engender and inspire innovative curatorial practices. The next chapter illustrate how a range of approaches can be built starting from an understanding of the prototypicality of the artistic object. Contextually, existing practices can also be re-framed, discussed or evaluated on the basis of the framework.

Chapter 5. Curatorial Strategies

The framework developed in Chapter 4 has value insofar it can support an understanding of artistic prototypes and inform new creative production. Additionally it can have an impact on curatorial practice. Specific features of the prototype can inspire new approaches to interpretation and engagement, subverting established logics and introducing new values in curatorial work. This chapter demonstrates the validity and applicability of the framework by analysing three curatorial projects I developed on its basis. Further considerations address heritage practices conceived and realised by other practitioners to discuss how the notion of artistic prototype can be extended to challenge established values in dealing with archives and collections.

5.1 Eye Resonator: Fictional Interludes

One of the difficulties in engaging visitors with generative, responsive artworks depends on the contemplative attitude the public tend to assume in museums. When artworks can be approached as prototypes, however, they can disclose new potential, leave wider room for curatorial intervention and for the public to appropriate and behave with it in different ways. This project involves an immersive interactive installation, the *Eye Resonator (ER)* by Brigitta Zics and John Shearer, presented through an experimental curatorial strategy based on the fictionality of artistic prototypes, with the intent to structure and enhance the public experience of the work.

5.1.1 *The Eye Resonator: an outline*

The *ER* (2014) is a computational system that applies generative visualisation technologies responsive to psychological changes in the participant, detected by reading the eye movement. It concentrates on basic biological processes of self-exploration and self-observation. The piece comprises two parts: a dome that, positioned above the viewer's head, is responsible for sound and mechanisms of cooling and heating; and a screen where images reacting to the viewer's behaviour are projected. After stepping inside the dome and waiting a few instants for eye calibration, viewers encounter the images of small entities behaving like swarms following their gaze. Their role is to take control of the swarms, which keep changing their audiovisual pattern according to the different affective states⁸ viewers are experiencing: birds,

⁸ The correspondence between eye movement and affective states, according to Zics, is based on the Pleasure-Arousal-Dominance psychological model (Mehrabian 1996) and measured through pupil dilation.

fishes, insects or amoebas correspond to states of reactivity, cohesiveness, chaos, and meditative balance. The interaction might take as long as participants want. Some of them achieve the final state of control and relaxation, others are held in one of the initial patterns.



Figure 33. The Eye Resonator. Copyright Brigitta Zics

The reasons why the *ER* can be interpreted as an artistic prototype relate to its nature of experimental, unstable device, and to its development alongside research. Zics developed the work, under the name of *Mind Cupola*, as part of her PhD at the University of Wales awarded in 2008. She subsequently implemented it during her four years as lecturer at Culture Lab, where she collaborated with Shearer on the programming of the system. The work has never achieved a final condition, and is still approached as an evolving artefact, transformed to accommodate new research directions undertaken by the artist. Reflections on the *Cupola* have been published in a number of articles and papers, framing the project as a way to investigate cognitive-driven modalities of interactive art (Zics 2011a), to suggest an immaterial approach to art production (Zics 2009), and to redefine the relationship between body and mind (Zics 2011c). The contributions offered by the work concern a new model of active participation and new ways of addressing experience in HCI (Zics 2011b). Informal conversations with Zics indicated that there was no conscious decision of leaving the work unfinished. However, it was the unfolding of the project through time and its evolving relationship with research that required constant transformations. The piece was never

abandoned or perceived as weak on a conceptual or technical basis, but it was repeatedly reinscribed into different research and artistic agendas. Besides its permanent incompleteness and its role in research, the *ER* can be also seen as an experimental piece of technology in the field of affective computing. Hence, it can be attributed functionalities and meanings alternative to its status of purely artistic interface, and, accordingly to my framework, related to possible daily life situations.

5.1.2 Developing fictional interludes

This is behind a curatorial strategy based on the development of fictional scenarios imagining possible applications for the *ER* in the future. Inspired by methods for design inquiry such as DF (Bleecker 2009), I intended this approach to work as a temporary interpretative level and entry point offered to the public and conceived three scenarios on the basis of existing specificities of the *ER*. The first scenarios, ‘Self-Therapy’, is inspired by how the *ER* can support self-analysis and relaxation. It is imagined that the participant is affected by psychological troubles that can be assessed and cured by interacting with the interface. The second one, ‘Affective Recruiter’, is based on the fact that an optimal experience of the *ER* necessitates focus, empathy and self-control. The participant here is imagined to be a job-seeker whose suitability for the position could only be assessed by the device. The third scenario exploits the conditions of monotony and repetition generated by the system. The participant is in this case a potential buyer for a ‘Boredom Machine’ that would introduce entirely new paradigms of home entertainment. Once defined the scenarios, I questioned how much of the history of the project should be revealed to the public, how to frame the relationship between the original piece and my new intervention. An artefact can be understood as prototypical by its makers only, or by a wider audience. The *ER* was presented as an innovative device in the scenarios but this is something different from the concept of artistic prototype. A reading of the *ER* as a prototype was relevant to me as curator insofar it allowed room for a radical intervention on its meanings. Not so for the public, since there was no expectation for the visitors to be involved in a similar process of transformation. With the goal of creating an immersive, flowing experience in mind, I considered that the ambiguity of an artefact lending itself to both aesthetic and utilitarian readings could be an asset. Too much information on the research dimension of the project would have endangered our strategy, distracting the audience from the experience itself.

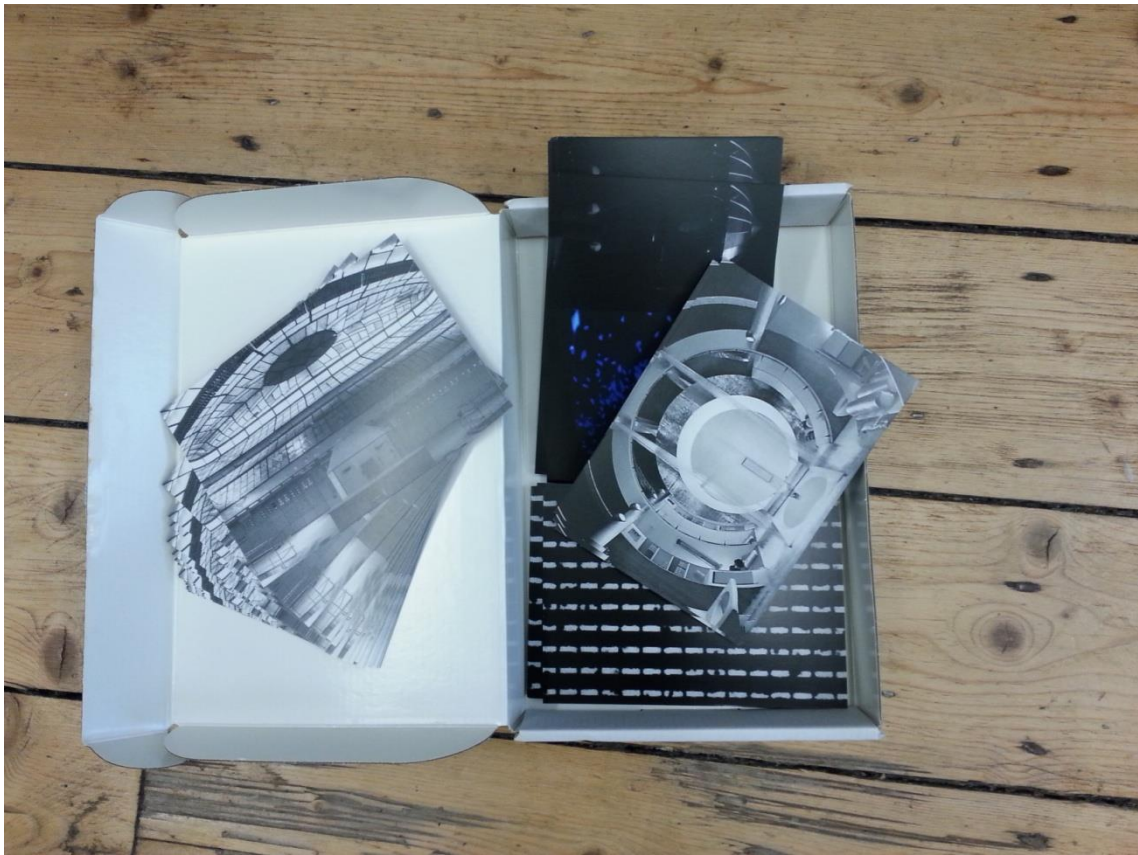


Figure 34. ERFI: the cards

5.1.3 Addressing key problems and structuring the interaction

The idea for this intervention surfaced during a series of conversations between Zics and me around the possibility to further modify the *ER* to address a set of interactional and engagement issues. In previous showings of the piece, participants demonstrated difficulties in understanding that the system was actually responding to their gaze and that they could have a certain degree of control over it. Instructions on correct interaction were only provided verbally before the start of the experience, and therefore missed out by some, or simply forgotten once inside the *Cupola*. Failing to understand the responsiveness of the system prevented a fulfilling experience and turned what was conceived as an active situation of control into the passive observation of projected images. This often generated in the public feelings of frustration, confusion, or boredom (Zics 2014). Furthermore, most users struggled in attributing meanings to the experience, due to the abstract appearance of the visualisations and the lack of cultural associations. Finally, the piece demanded active participation, but presented itself as a screen-based interface whose only interactional tool is the gaze, making the interaction unusual and difficult to control. Despite these weaknesses typical of interactive artworks, I considered the *ER* a valuable work, with a very interesting core experience and I found challenging and stimulating the idea of improving the participant's journey to reach that

core. As a curator, it was natural for me to respond to Zics request for a contribution by addressing the structure of the experience and the way it was introduced to the public. I titled the project *Eye Resonator: Fictional Interludes (ERFI)* thinking of it as a temporary phase in the life of the piece. The scenarios have been developed to offer an alternative context where instructions and guidance can be provided and become more easily memorable; and by suggesting possible meanings that the public could relate to their own cultural background. The first deployment took place in a three-day long public display at Culture Lab (June 2014), followed by a second one in Budapest (April 2015).

5.1.4 Entry points

The *ER* belongs to a strand of digital art building performance settings based on bodily sensations and subjectivity. These works often establish an identity between audience and performers and require facilitation to gradually accompany participants through the interaction. Steve Benford underlines the importance of scaffolding the experience and managing transitional moments (such as beginning and endings) in a performance (Benford et al. 2009). In the mixed reality games at the centre of his research this can be done by connecting virtual and physical space and by orchestrating roles and interactions between different participants. Because the *ER* does not extend across a dual virtual/physical dimension, and is experienced in isolation, it would not be possible to adopt similar solutions in our case. However, Benford establishes the notion of performance frame as a set of structures allowing a performance to be understood as such and generating certain expectations in the public. He also instructively explores how the interplay between fiction and reality can encourage the desired behaviour in the participant/performer and a suspension of disbelief which enhance the dramatic tension of the experience (Benford et al. 2006).

Loke & Khut (2014) identify four stages of audience experience in bodily-based digital art. In the ‘Welcoming phase’ the public is invited to participate and offered hints to make sense of the approaching experience and to adopt an adequate behaviour. The ‘Fitting and induction phase’ instructs the public on how to operate the interface and other practicalities. The ‘Ride’ defines the core aesthetic experience, while ‘Debriefing and documentation’ introduce a moment of reflection. This framework explicitly suggests that “curators can potentially expand the remit of the artwork beyond the core experience to incorporate strategies of entry and exit stages for enhanced audience engagement” (ibid. 2014, p.106). Two examples (the artworks *The Heart Library* and *Speechless*) are introduced to illustrate how this might happen, however in both cases only the ‘Debriefing’ stage appears a well developed and articulated addition to the artistic core system, comprising creative

activities for the audience, such as elaborating body maps, or setting up a Recall Station to collect visitor feedback. The ‘Welcoming’ stage is instead only briefly addressed by the presence of waiting rooms and information sheets. Beyond the efficacy of specific examples, these authors identify a new space of action for curators and offer instructive precedents to *fictional interludes* that can be understood as a scaffolding technique to structure public participation.



Figure 35. A visitor reading the cards

The idea that fiction is integral to the experience of artistic prototypes suggested that an entry point to the *ER* could be built around scenarios able to orchestrate the participant's expectations, orientations and behaviour. During our first trial exhibition the scenarios have been presented to the public through a set of cards containing a written, synthetic version of the fiction. Participants were asked to access a small dark waiting room, choose and read one of the three bundles of cards and start thinking of themselves less as a gallery visitor and more as attending the treatment or service suggested in the cards. After this phase, they could access the following room and step into the *ER*. A second event took place in Budapest as part of the Biennale Off (April 2015) and presented the scenarios through audio-recordings to address some of the problems emerged during the first deployment.

Both the cards and the recordings anticipate the process of positioning, calibration and ending of the experience, and instruct the participant on how to control the system through eye movement. These instructions are embedded in the narrative, as if communicated to the

patient, job-seeker, or buyer, to make them more relevant, memorable and integrated with the whole experience by exploiting mechanisms of make-believe.

I conceived the scenarios with the intention of leveraging cultural references, so that the public could build expectations and hypotheses of meaning before and during the interaction. I considered that even when not conceived by the artist, cultural connotations could support the reception of an artwork and re-calibrate its abstract and experiential nature. I wanted to adopt fictionality to offer a background that would facilitate the process of coming closer to the artwork, predisposing the participants' mindset and preventing them to be destabilised during the interactional phase.

I chose to develop not one but three scenarios to clarify their temporary, hypothetical nature, and discourage the public from thinking of them as more strongly integrated in the artwork. Instead they are proposed as suggestions, interchangeable with alternative ones, to support the participant in a progressive path of discovery and immersion.

5.1.5 Evaluation

My goal in this project was threefold:

- applying the artistic prototypes-framework (particularly the notion of fictionality) to curatorial practice;
- addressing a set of weaknesses of an otherwise interesting artwork without affecting the aesthetic experience originally conceived by the artist;
- enhancing the participants' experience through immersion in a fictional dimension.

The development of the project itself allowed me to demonstrate how a conceptual understanding of artistic prototypes could translate into practical applications in interpreting and presenting digital artworks in the public domain. Informal, semi-structured interviews conducted with some of the participants in the first deployment suggested that the second objective was also at least partially met by structuring the beginning of the experience.

However an effective immersion in the fictional world was more problematic.

Several comments corroborated the hypothesis that the scenarios could provide some background and anchor points to the aesthetic experience: "it was nice to have that kind of narrative, a sort of context that worked quite nicely"; "it gave me some meaning"; "they gave me some guidelines"; "I have a certain fear of the unknown and I think this would have been quite scary without any reference at all, so reading the cards first was reassuring". The science-fiction flavour suggested by the cards occasionally inspired further individual narratives and associations in the public: "I imagined being in a spaceship, flying and moving

into space”; “I felt very much to be at the optician, but in a futuristic setting”; “I wonder if this could be used with people with psychological problems? It is very relaxing and I thought it can help people to reach a condition of peace of mind”; “I think it may be good for children with attention disorder, to train them to focus on specific points”. These responses are particularly insightful when thinking of how fictionality is defined in my framework: the quality of prototypes to evoke possible uses, practices and cultural linkages.

The fictional layer proved inadequate to instigate a process of make-believe and change the role of the participant. All interviewees denied having significantly considered the scenario during their interaction with the *ER*: many admitted to have instantly forgotten about the scenario at the onset of the experience. In certain cases, confusion on how to control the system persisted. My hypothesis was that the cards, as a medium, were partially responsible for this failure. First of all, despite the presence of a facilitator, some visitor mistakenly read all the three bunches of cards (therefore three scenarios all together) or picked only one card (therefore only reading a small part of a scenario). This obviously diminished the potential for an immersive experience, and possibly increased confusion with either overwhelming or incomplete information. An additional problem concerned the insistence towards a task to accomplish, present in all three fictions. This generated in some of the participants the erroneous assumption that a correct interaction with the artwork would correspond to the clear achievement of a result. More generally, the text in the cards did not make use of good storytelling techniques, but only provided the dry skeleton of a narration, and was not integrated enough in the whole aesthetic process.

To address these issues, Zics and I decided to rewrite the fictional texts in collaboration with professional scriptwriters, communicate them through a more immersive medium (audio-recordings) and increase the dramatisation of the ‘waiting room stage’. Visitors to the second iteration of *ERFI* at the Kelenföld Power Plant Station in Budapest were invited to sit down and listen (via headphones) to a welcoming message introducing the

service provided by the *ER* according to one of the scenarios.



Figure 36. Headphones ready at Biennale Off. Copyright Brigitta Zics



Figure 37. Listening station at Biennale Off. Copyright Brigitta Zics

The fictional content here was not presented by a narrator but by a voice embedded in the fictional world itself. The new text was less literal and more ambiguous so that listeners had to reconstruct the content from the fragmentary information received, rather than being offered an explicit and straightforward account. The adoption of audio-recordings was

intended to prevent participants from missing portions of narrative out or mixing them together. Finally, the dramatisation of the entry point benefited of the dazzling environment of the Power Plant, an art-deco dome evocative of a now abandoned futuristic dream of industrial puissance⁹.

By iterating *ERFI* a second time I came to perceive the fictional layer as much more integral to the piece, and less as simple interpretation. Extending my work with Zics over a longer timescale also softened the separation between our roles as artist and curator, effectively changing the terms of our collaboration. This also made me reflect on how the transformative potential of artistic prototypes can eventually reconfigure not just the artefact itself but the whole system of social relationships at stake.

5.1.6 *ERFI*: conclusion

The polysemous nature of artworks and the subjectivity of the meaning-making process in museums and galleries (Silverman 1995) is widely acknowledged. Nevertheless, this kind of intervention challenges conventional assumptions in curatorial practice, such as the mandate to provide interpretative accounts adherent to the artist's original intention (Carroll 2011), or contextualising the work by anchoring it to coeval artistic tendencies or socio-political events. Interpretation is endowed with a higher generative power and framed as act of production. Embracing the notion of artistic prototype advanced in this thesis allows an expanded lifecycle and openness to all sorts of transformation to works even after they have been already repeatedly presented in the public realm. If a culture of prototyping generates unstable artefacts that cannot be black-boxed in fixed arrangements of meanings, uses, composition, it becomes possible to conceive even radical interpretative changes not as disruptive provocations but as enriching interventions enhancing audience experience.

5.2 Fabricating Evidence for Under Black Carpets

As part of my research on artistic prototypes I focused on existing artworks to analyse specific features of prototypicality. Among them, *Under Black Carpets (UBC)* by Ilona Gaynor appeared as an ideal site of investigation to explore the relationship between fiction and the designed object. FACT offered me the opportunity to curate an exhibition of the work in their more experimental space, FACT-Connect, in January 2015, and to develop an engagement programme alongside the display. These collateral activities were developed with the following research aims: i) exploring the potential of prototyping in engagement; ii)

⁹ Because this iteration took place when I was about to give birth I could not collect audience feedback and conduct a proper assessment of the impact of the recordings on the whole experience.

developing activities based on the prototypical features of the artwork (in this case fictionality); iii) developing activities based on the idea that participants can expand the original work or juxtaposing new elements to it (openness).

5.2.1 *Under Black Carpets*

UBC is the forensic study of a meticulously designed heist simultaneously involving five banks in Los Angeles. The display comprises an architectural model of the buildings involved, objects, documents and images (from alibi reconstructions to trajectory diagrams) constituting a body of hundreds of individually labelled and numbered pieces of evidence of the crime. The work is an exploration of the American legal system (and of the practice of fabricating evidence) through the cinematic genre of the bank robbery. It addresses a recent shift in police investigations and court room deliberations from a focus on human witnesses to forensics, based on DNA samples, satellite surveillance, ballistics and other scientific methods grounded in the analysis of material traces and objects.



Figure 38. *UBC* at FACT. Copyright Washington Buckley

The viewer is expected to inspect this collection of evidence and build fragmentary narratives of the robbery. The plot involves a set of distracting events to lead the police away from the real targets (the banks): a plane crash, a film set, a presidential visit. A complete, linear reconstruction of the event is however impossible because of the way Gaynor conceived the role of the audience as similar to that of a jury in a court room. In a normal case indeed, jurors would only access partial knowledge of the crime, as both the defendant and the prosecutors

would select and curate the evidences to be presented to support their own argument (Gaynor 2014). The process of reconstructing a narrative is based, in my view, on the capacity of arrangements of objects to suggest trajectories of action (fictionality). Surely, in Gaynor's work the story is the core product of the design activity, whereas physical objects are only produced as its external manifestation or medium. This can be described as an approach to design as plot (Singleton 2013; Singleton & Gaynor 2014): what is being designed is not an artefact, but a pattern of interrelated or consequential actions. Such a time-based process is related to the notion of a trap: traps are based on models of the victim behaviour and dispositions, subverted in order to entrap them. In other words, design is intended as the study of how to devise or escape constraints; a way of expressing reasoning and logical, strategic thinking. These designed plots tend to be subject to multiple interpretations and can consequently arouse debate. In the case of *UBC*, for instance, the installation is supposed to become a forum for legal discussion.



Figure 39. *UBC*: installation view. Copyright Washington Buckley

The aesthetic and theatrical dimensions of the display are crucial in shaping arguments and affect the persuasive power of the evidence. Spatial and architectural analysis in particular form a rhetorical apparatus which Gaynor and Singleton define as aesthetics of precision (Singleton & Gaynor 2014), based on exact placement and timely action. Space here becomes more than a setting, rather the key resource that makes the strategy behind the robbery effective. The notion of forensic architecture, advanced by Eyal Weizman (2010) had clearly influenced the development of the project. Forensics refers to the use of technological and

scientific methods to let objects speak, and translate their stories, so that events can be indirectly interpreted. The scientificity of these methods is precisely what support plausibility and therefore persuasion. Objects are used and displayed to articulate an argument. The principle that events are registered within the material properties of objects, bodies or spaces means that they become sources of knowledge. Objects maintain a double relationship with the registered event and with the forum of people gathered around them. Forensics refer both to the investigation of objects and the development of a forum (Anon 2010).

The way material objects are considered in forensics has some commonalities with prototypes, also usually invested by rhetoric, argumentative roles. They share an attitude towards testing and scientific assessments. Finally, both prototypes and material evidence are objects of knowledge. They carry and communicate knowledge embedded in their materiality, and refer to contexts not immediately under the viewer's eyes: the crime scene in forensics, and a possible everyday setting in prototyping. Kirschenbaum corroborates this analogy when identifies the forensic imagination with the aestheticisation of the process typical of new media (Kirschenbaum 2008).

5.2.2 Under Black Carpets: Engagement Activities

The initial idea for developing an engagement programme around *UBC* was inspired by the notion of cultural probes (Gaver et al. 1999) and aimed at generating unexpected insights on the public, proposing an alternative approach to audience surveys. I was interested in the idea of objects for testing, released in the public realm to stimulate reactions. The proposal was also based on a critique of existing approaches to audience research, generally focused on measurable factors to support funding applications and marketing strategies. My intention was instead to develop forms of audience feedback that could be inspirational for the curator and generative of further projects (similarly to how probes are insightful for designers).

Soon though, these aims appeared too ambitious and difficult to pursue with a one off project. The idea gradually shifted towards a stronger focus on the notion of fictionality. The guiding principle, inspired by my framework, was to make people play with forensic tools to address the relationship between objects and stories. Furthermore, the idea of openness was addressed with the remit to expand the collection of evidence constituting the artwork with additional ones produced by the public. In the meantime, I started collaborating with PhD student Bettina Nissen, whose research focused on the use of digital fabrication to materialise and enhance cultural experiences. Working together on the activities allowed me to expand my perspective, and explore the potential of rapid prototyping technologies in audience engagement.



Figure 40. UBC: forensic kit. Copyright Washington Buckley

We conceived and designed a forensic kit to be distributed to willing participants visiting the exhibition. The kit, presented in a transparent plastic bag, contained the items necessary to engage in three interrelated activities.

- 1) A forensic report with sections to be filled according to individual interpretations of the crime plot. The questions are inspired to real forensic reports, but made more open and ambiguous to let people expand the narrative beyond what is possible to gather from the display, by including more personal, invented accounts. The report's first role is however to invite the public to further examine the display by providing hints for reflection and for engaging in a meaning-making process.
- 2) A crime scene template with a set of silhouettes to help drawing sketches of real or imaginary events on printed maps depicting the gallery space, the surrounding urban area and a home interior. The templates used in forensics usually contain shapes such as different positions of the human body, pieces of furniture, vehicles and weapons. We preferred to include in our template (that we laser-cut in transparent acrylic) a mix of everyday and anomalous objects to stimulate the participants' imagination beyond the stereotypical elements of a crime scene.
- 3) A specimen collection kit including cotton swabs and small plastic bags to collect samples of matter around the gallery space. A USB microscope was available in the

space to magnify, digitally manipulate and archive in a public blog the images of the new material evidence collected by the participants.

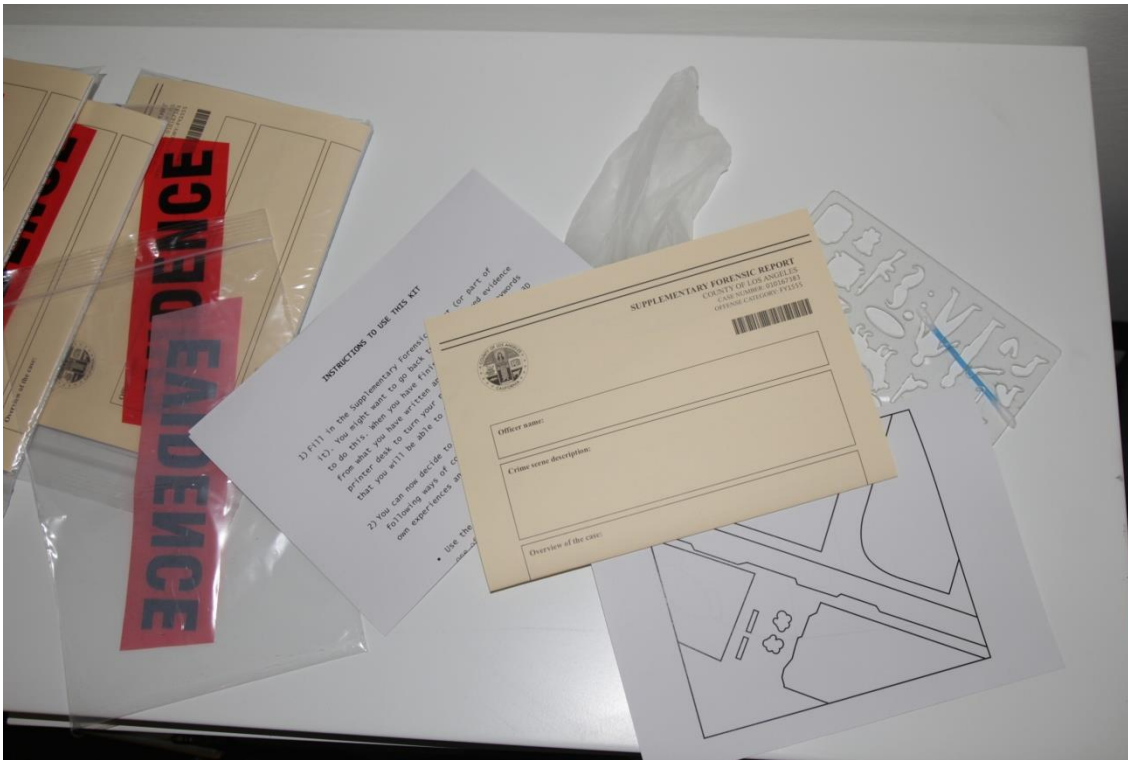


Figure 41. UBC: forensic kit

In the same room with the *UBC* display, we set up a desk with a 3D printer operated by Nissen for a few days during the opening times of the show. Participants were asked to select five keywords from their filled forensic reports and to feed these into a bespoke programme that would process them to create the shape of a personalised fingerprint. This was then 3D printed and offered to each participant as a tangible trace of their own individual experience of the artwork.

The underlying idea was to build on the practice of ‘fabricating evidence’ which is adopted (and critically questioned) in Gaynor’s work. The robbery in *UBC* is an imaginary one, and the evidence constituting the artwork is not coming from traces directly extracted from the crime scene, but from objects manufactured to arrange a dramatisation of the crime or mimic the way a police investigator might have represented the facts. These kinds of representations are common in the US legal system, where fictitious (artificial or distorted) documents might be offered to a court to support an intended account of the events (Gaynor 2014). The fact that each piece of evidence was numbered and referred to a rigorous list, also on display, reinforced the impression of authenticity and authority suggested by the collection. Sekula describes a similar dynamic associated to photographic archives, capable of

constructing “an imaginary world and pass[ing] it off as reality” (Sekula 2002, p.443). In other words, rigor of presentation and plausibility come to supersede truth.

The participants in our activities were therefore invited to add new pieces of evidence to the collection (these were always maintained separately from the original display, to avoid confusion), use them as supporting elements in their own narratives, and play with their aesthetic components (with the magnified images) to further reflect on the rhetorical dimension of forensic practice. Coming back to the concept of objects of knowledge, common to evidence and prototypes, we observed a paradoxical dynamic between the scientificity inherent to a forensic approach and the practice of turning it into an aesthetic and narrative endeavour. The activities were indeed conceived to further highlight this contradiction. For instance, the crime scene template was clearly limiting and influencing the stories sketched by the participants, instigating a critical reflection on the complex reciprocities between scientific instruments, the way they mediate or represent facts, and the fictional space that emerge in the process. Something similar can be said of the magnified evidence collected in the blog. Images of bits of matter collected around the building were digitally manipulated by the simple application of filters, in a process facilitated by Nissen but essentially left to the participants’ personal preferences. This resulted in a sort of inverted forensics, as the bits of matter, initially clearly identifiable, were made less and less recognisable and impossible to read, turned into beautiful and enigmatic abstract compositions.

5.2.3 UBC activities: impact on audience experience

The presence of the 3D printer desk and the running of the activities in the same space of the display had a significant impact on the way the artwork has been experienced. *UBC* was installed in a white cube environment, mitigated by the fact that only two walls were surrounding the work, as the rest was directly open to the busy hall of the building, hosting a cinema ticket office, access to a lift and to two separate exhibition rooms. The activities, available as drop in sessions at any time during the first two days of opening of the show, further reduced the white cube-look of the installation and modify the approach of the visitors. For people engaging with the forensic kit, in fact, the display became a source of information, a set of elements to connect or take apart, examine, compare, rather than a contemporary piece of art to be contemplated. The presence of the 3D printer and the microscope added a lab-flavour that also contributed to make the space messier and operational.



Figure 42. UBC: children engaging in 3D printing. Copyright Washington Buckley

Over the two days, 16 participants from primary school children to middle aged adults engaged in the activities. Their experience was assessed through observation and informal conversation during or at the end of the activities. Positive comments addressed the 3D printed fingerprint as a nice reward to take home, offering some kind of achievement and tangible outcome to the effort of developing interpretations and narratives through the report. The latter also had the effect of significantly increasing the time and the attention spent by participants in the exhibiting area. Most of them only looked at the artwork for a few minutes, but once given the forensic kit, were encouraged to stay in the space longer (occasionally over an hour) to analyse the evidence better and ‘solve’ the mystery. A social dimension was also spontaneously boosted when participants already visiting in small groups of family or friends started discussing possible interpretations among each other. Issues of confidence however emerged in this process, as some were afraid of the inadequacy of their story, and despite being reassured of the opposite, believed in the existence of only one, correct reconstruction of the events.

The three activities were originally conceived as autonomous steps, with the report more strongly linked with *UBC*, and the templates and image manipulation potentially more suitable to an application of forensic aesthetics to people’s everyday stories or experiences. All participants however playfully integrated them more organically, using all the tools to tell the same story across different media, and providing evidence directly related to their own narrative. Further comments concerned the role-playing dimension instigated by the activities:

this was perceived as well balanced since people embraced the investigator role as a temporary assignment, without the burden of overly characterised fictional identities.

5.3 Unbound: orchestrating creative collaboration

In reviewing the projects I curated in response to my framework, I soon realised that they were primarily engaging with the element of fictionality, and I felt the need to explore other features more thoroughly. The openness of artistic prototypes can translate in particular social arrangements surrounding the participative development of an artefact. This suggested the idea of a curatorial intervention aimed at orchestrating a particular model of creative collaboration and the distributed creation of an artistic object.

I invited seven practitioners from various disciplines (designer, musicians, visual artists and performers) to work on the same artefact for one day each across one week. Adopting a sort of ‘chinese-whispers’ or ‘cadavre exquis’ mechanism, the project was conceived to stage and accelerate the possible life-cycle of an artistic prototype, passed on and independently transformed by different participants. My intention was to observe how such an artefact can spark imagination and improvised creative responses, opening the process to different contributors at different stages of development. I was also interested in exploring how ideas can circulate, and be manipulated or altered, through material objects mingling the moments of making, communicating and sharing.

Once I had formulate the basic format of the project, I faced a set of questions including whether to provide a starting point to the first participant (and if so, what?), how to brief the artists and how to orchestrate the passing on of the artefact every day. I wanted to find my answers as much as possible by looking at the broad notion of prototypicality which I researched through my PhD. Hence, I decided to provide a set of drawings taken from patent libraries, and a box full of objects or parts of objects collected from my house which I did not use anymore but that could be somehow recycled (from a ping-pong ball to a toy sliding pole). I did not want the experience of the first participant to be completely different from the others; therefore something to start with was needed. To help and enrich my documentation process, and to provide a framework for the participants in communicating their intentions between one another, I devised a sheet with four parameters to be filled by each participant at the end of the day. The parameters (title, keywords, sketch and picture) were supposed to maintain a balance between ambiguity and information: in fact, I consider a prototype as a combination of determined and undetermined elements.

The artists invited were all broadly linked to Culture Lab and their interventions were scheduled in this order: John Bowers, Ping Yee-Li, Riar Rizaldi, Tim Shaw, Sean Cotteril, Tom Schofield and Alexia Mellor.

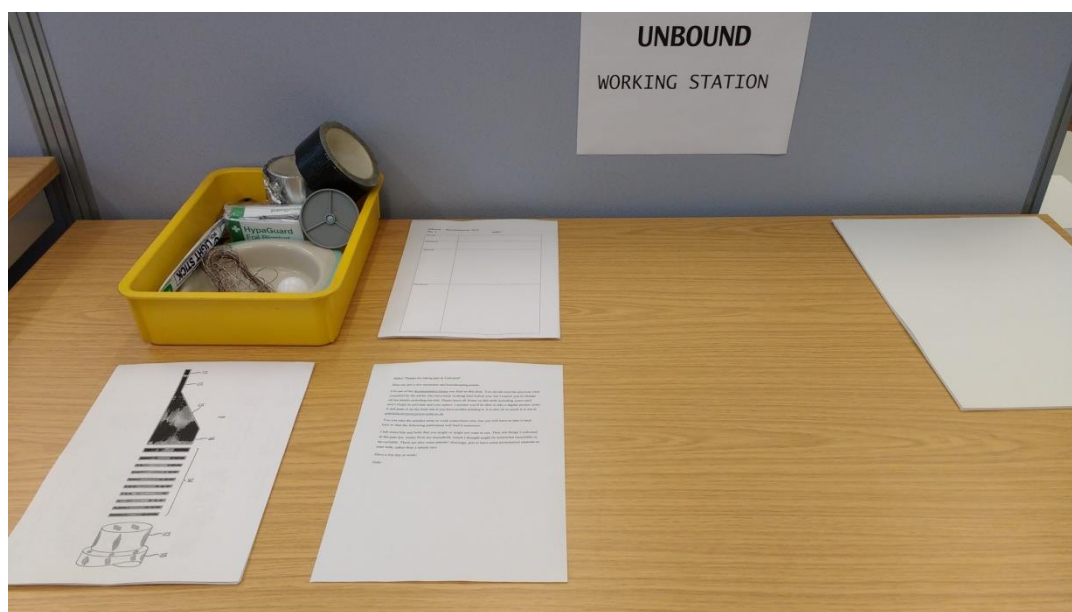


Figure 43. Unbound: initial set up

5.3.1 Transdisciplinarity, ownership and documentation

The working station was set up in Culture Lab close to my own desk; therefore I could maintain a constant conversation with the work and the participants. I also conducted semi-structured interviews with all of them, asking questions about their initial approach to the project; their feelings about picking up the work of somebody else and the lack of control on the finalisation of the piece; the process of passing on and documenting its developments. All participants followed my recommendation not to prepare anything beforehand, so as to respond directly to the prototypical assemblage of materials available. They brought their usual working devices such as laptops, software and smart-phones.

When questioned about their ownership of the piece the most common reaction was uncertainty and pondering. Everyone was happy for his or her work to be manipulated or even destroyed or ignored by someone else. This was obviously agreed because of the nature of the project itself, but some mentioned that the idea of leaving their work open-ended was also inherent to their own practices. At the beginning, some felt sensitive or nervous about transforming artefacts made by the previous participants, particularly when these seemed already aesthetically accomplished, but this feeling faded during the process. The rules of the game however were crucial in making people feel authorised in their manipulations. This suggests how artistic prototypes need to be framed as such to guarantee their participatory

dimension and circumvent traditional norms of respect towards artistic work. Such framing is usually done by an explicit declaration, or more often by making code and technical specifications publicly available.

The experience was described as “making something together while working individually”. Tim suggested how a way of talking about ownership in this context could be to look at the stylistic distinctiveness of each intervention. Despite the multiple manipulations, specific parts of the ensemble were clearly recognisable as belonging to one or the other artist because of the use of a characteristic tool or programme or aesthetic choices.

The creative interventions can be categories as follow:

- Continuing previous work (for instance Ping used images and voice recording produced by John to create an interactive audiovisual piece; he also made pictorial interventions on John’s collages)
- Spreading or diverging (John generated several new raw materials like texts, pictures and collages; Riar initiated a new line of work by generating sound from a graphic notation of a metal spring)
- Reassembling or reconfiguring (Tim created an installation adding some of the objects I provided and connecting John’s and Ping’s collages to a sound piece based on the audio-files generated in the previous days)
- Disassembling or de-constructing (Sean took Tim’s installation apart and re-used only some parts to provide a completely novel configuration)
- Appropriating ideas (Alexia did not manipulate anything done before, but took the ideas of patents as a springboard towards reflection on commons and water rights, introducing a completely new topic and a new artefact in the form of a drawing).

Having practitioners from different backgrounds and skills was challenging because some of the artefacts passed on were in the form of pieces of code which could be understood and used only by those familiar with the same programming language. However, everybody found ways to appropriate and develop at least partially the work done in the previous days. The entire project could actually be seen as a model for transdisciplinary collaboration, where everyone independently develops the resources more suitable for his own skills, knowledge or attitude, without any deliberate allocation of roles and outside any logic of specialisation. Nevertheless, all participants shared an interest in the creative use of digital technologies which emphasised the layered nature of the piece. Digital artefacts lend themselves to be

repeatedly transformed through different programs and into different languages (for instance from analogue images, to digital collages, to digital collages with glitches and distortions).

The use of digital tools also had a bearing in the ways the artefact had been passed from hand to hand. A rich documentation was perceived as crucial not only to allow further interventions but to communicate the creative essence of the work, particularly given the lack of a face-to-face encounter between the participants. To enable the following participant to fully consider all the work done, it became necessary to send large sets of files, comprising immediately legible materials (such as pictures or audio files, and explanatory ‘Read-me’ texts), and bits of code. In this respect, the four parameters (title, keywords, sketch and image) of the documentation sheet I provided were not enough. Indeed even what could be considered as sheer metadata or supportive information has been endowed with generative potential and creatively appropriated (for instance Tom based his intervention on the ‘Read-me’ text left by Sean).



Figure 44. Unbound day 4

From the interviews it also emerged a certain degree of confusion around a possible distinction between documentation and creative outcomes. Monitoring the materials handed on every night, I had a similar perception. There was an irresolvable overlapping between what could have been handed on to document the process, and what acquired an autonomous aesthetic value, beyond its role in the process. I argue that this confirms the ambivalent and composite nature of artistic prototypes as endowed of their autonomous value and

simultaneously assigned the function of communicating an idea to be developed.

Documentation is not just a necessary step for every practitioner-researcher, but becomes the way to guarantee the generativeness of each element in the process.

5.3.2 The outcomes

When conceiving the project I imagined the development of a self-contained object. The result however was a series of discontinuities and ramifications; a proliferation of co-dependent artefacts all sourced from the same set of materials and ideas. These artefacts included: collages; interactive audio-visual pieces; texts generated by scraping patents repositories; a poem; a drawing; a range of assemblages comprising printed images, collages and found-objects. Analogue and digital elements were intertwined in some artefacts (such as videos of the collages), but were behaving strikingly differently in terms of the visibility of their layered structure. While the physical assemblage of printed paper and objects was immediately showing its final condition, none of the technologically based artefacts were visible at the end of the last day. Additionally, there was no way of going back to the previous stages of development in the analogue installation. By contrast, all stages of development in the technologically based works were easily retrievable if activated through a laptop or phone. This aspect made me wonder to what extent I should recognise the situation on the desk at the end of the last day as the final outcome, while considering all other artefacts as development stages. This separation was in line with my initial expectations, but looking at the many ramifications taken during the process, I felt such a hierarchy would have been awkward. The outcome was better conceivable as an ensemble of co-dependent elements still open to different arrangements. I also considered how analogue and digital prototypes behave very differently, with the latter more suitable for going back and forth across different stages of development.

Most interventions were lacking a thematic subtext and were essentially informed by an aesthetic of interoperability. They could be described as assemblages of material-driven explorations. The exceptions were John's metaphorical gesture of 'uninventing' inventions by grinding patents' drawings; Alexia's digression about water on Mars; and partially Sean's idea to divide the installation into the three sections of Spring, Summer and Autumn (this was interestingly inspired by a misunderstanding around the metal spring which was at the core of Riar's and Tim's interventions). I attribute the lack of a shared theme to a number of factors. First of all, participants privileged passing on elements such as images, sounds and code, rather than reflections or forms of cultural associations. Even the titles, assigned every day and reported in the documentation sheet, were mostly pointing at operational perspectives

(“Slow down / Fasten up the Inventions”), or at the specific elements used (“Spring music”, “Spring fragment”). Moreover, the short time-frame allocated, and the fragmented nature of the project, encouraged a work responsive to the material propensities of the available resources, and did not allowed deeper engagement with broader cultural issues. There was also a general feeling that the structure itself of the project and the topic of creative collaboration were already offering enough discursive material. Finally, the concept of artistic prototype resonates strongly with accounts of the creative process which unfold in concert with the materials at disposal rather than from a pre-determined idea (Ingold 2013).

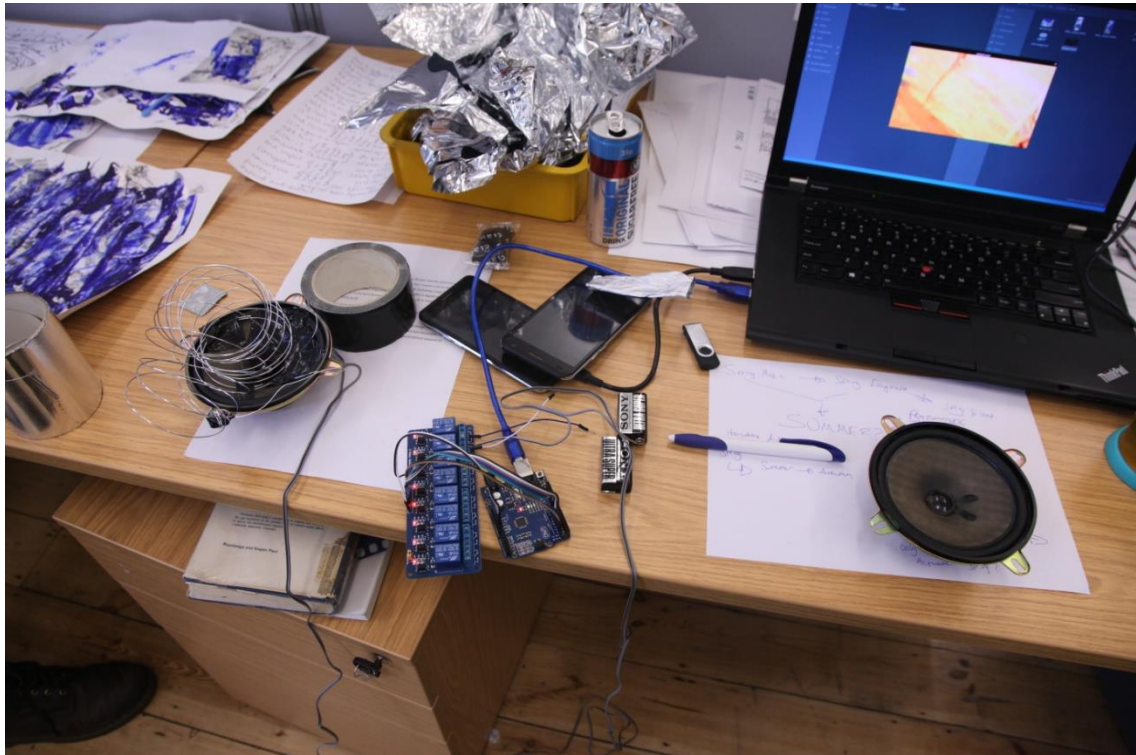


Figure 45. *Unbound*: working around the 'spring'

The idea of leaving things open to further intervention was never intended as a simple interruption. Rather, participants always left after achieving a determined result, leaving things open but after accomplishing specific stages or parts. Moreover, the availability of many different materials instigated in some a process described as “trial and error”, in which transformative interventions were tried on different objects to see which ones were offering the best result. Many described their contributions as iterations and tried to take the development of the piece towards their own comfort zones and preferred tools.

A final consideration concerns my role. Once again, the idea of prototypicality pushed me to expand the remit of curatorship in unconventional territories. In *Unbound*, I became an instigator, but arguably also a collaborator or co-creator, since providing the starting materials, the setting and the structure of the creative process had a decisive impact on the artistic outcome. Indeed, during the entire process I felt I was embracing a more creative role

which some of the participants compared, in the interviews, to experiences of instruction-based and conceptual art.

5.4 Prototyping Heritage

ERFI, *UBC* and *Unbound* represented an effort to develop curatorial interventions inspired by my framework in direct collaboration with contemporary artists. Nevertheless, it is possible to observe or apply the idea of prototypicality also to artefacts or collections of artefacts created in the past and completely outside the ‘cultures of prototyping’. Indeed, I will now move on to illustrate how the notion of artistic prototype can contribute to conceptualise, understand and facilitate a range of approaches to collections and archival material. These tendencies have been observed in the work of colleagues involved in collaborative projects with museums and archives. The analysis of these tendencies helps to demonstrate the applicability of the framework beyond my own practice and to signal the expanded boundaries of curatorial work that might address prototyping. The deployment of prototypes in museums is not a novelty, and there is a now established strand of research focusing on the experimentation of digital tools to support learning and accessibility (Parry 2007; Tallon & Walker 2008). It is possible to trace their development from self-contained interactive displays, to mixed-reality applications and hybrid digital and tangible artefacts that rearrange collections into new exhibits, thus moving towards a stronger integration between the prototype and the museum object (Bowers et al. 2007; Petrelli et al. 2013).

What is distinctive of the prototyping practices explored in this section is how they can support further creative or research work. Principles of preservation and transmission to future generations are therefore partially subverted to privilege generative and transformative approaches where collection items are the starting point for the creation of something new. A further consideration concerns the role of technology. For a long time digital media have been used by heritage professionals to provide interpretative aids separated from the museum object itself. By contrast, the practices I am addressing as prototyping heritage tend to undermine this separation, and introduce a deeper integration between the original collected item and technological devices.

I illustrate my proposal through two examples involving, respectively, the archive of a publisher of poems, and a collection of geological artefacts. The first one is symptomatic of the recent complicity between prototyping and the DH. Here the process of digitisation allows for varied forms of access and manipulation of archival materials, and prototyping usually results in the development of interfaces and visualisation strategies (see for instance Smithsonian Design Museum n.d.; Rijksmuseum n.d.). The second example is more closely

related to collaborative practices of DIY and maker culture. Applied to cultural heritage, these practices can introduce new ways of experiencing collections through making.

5.4.1 The Poetics of the Archive

The Poetics of the Archive, Creative and Community Engagement with the Bloodaxe Books Archive (TPOTA) was an eighteen-month-long research project hosted by Newcastle University subsequent to its acquisition of the archive of a publisher of contemporary poetry, Bloodaxe Books, consisting of around 60,000 manuscripts of poems. A collaboration between the Department of English and Culture Lab, the project involved the development of interfaces to allow innovative interactions with the archive. The primary audience for these consisted in a group of thirty participants drawn from a community of poets, whose role was to develop creative work in response to the archive. The designer in charge of developing the interface, Tom Schofield, adopted the strategy of presenting early prototypes of visualisations to the poets to generate a sense of evolution and flux. The visualisations exposed different facets of information emerged during the archival process, and attempted to redefine approaches to filtering and sorting, by suggesting alternative criteria of information retrieval. For instance, one of them invited the user to draw a shape with the mouse, in order to get access to all the poems whose graphic pattern matches that shape.

The project was conducted in parallel to the cataloguing and digitisation process, and some of the works explicitly addressed the archive's state of transformation. This also emphasised the idea of prototyping as a way of working on a shifting and ever expanding ground. One interface, for example, visualises the cardboard boxes in which the manuscripts were gradually transferred to the university library from the publishers. Shared entities between the boxes are also highlighted, such as boxes containing the work of the same author or from the same year. This was intended to assist the project participants in locating materials, but also to provide a snapshot of the archive evolving condition.

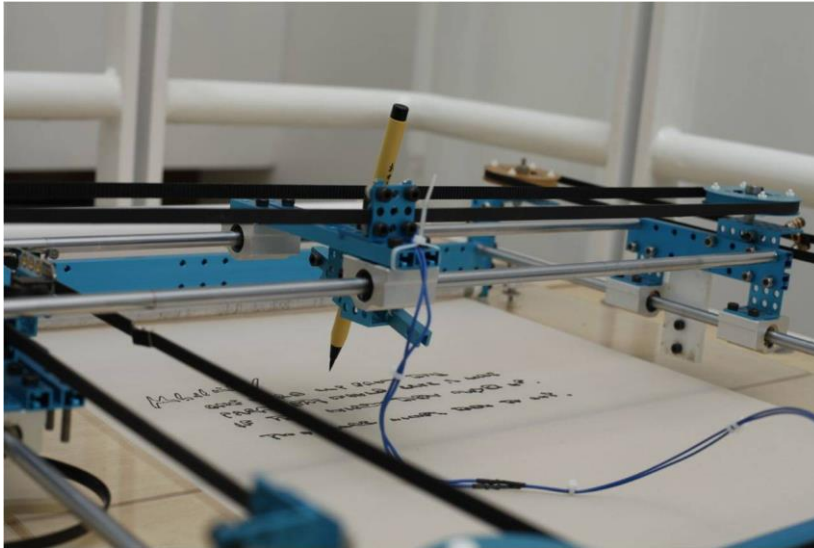


Figure 46. Tom Schofield, *Marginalia Machine*. Copyright Tom Schofield

The liveness of the archival process was further explored through the *Marginalia Machine*, a robot drawing reproductions of the handwritten editorial notes from the manuscripts, without the original texts. This prototype has been used to stimulate conversation among the project team and the public (when the Machine is exhibited in events or shows). More crucially, it recalls the initial editorial work within the publishing house and brings to life a set of practices belonging to publishing and archival professions. This leads to reflect on the new identity the documents assume when they shift from one institution to the other.

5.4.2 *Interglacial/Erratics*

As part of a residency programme at the Pacitti Company in 2014, artists-researchers John Bowers and Tim Shaw were invited to respond to a series of geological artefacts from the collection of the Ipswich Museum. These items were approached as raw materials to develop a number of sonic devices and experimental musical instruments, as well as displays and installations. Like in *TPOTA*, the primary audience involved other practitioners or members of the public willing to participate in sessions of Public Making (Shaw & Bowers 2015) to make new creative work out of the museum artefacts in conjunction with technologies such as sensors, transducers and microcontrollers. By Public Making the artists intend a practice of making and assembling work in public and with the public, as opposed to more traditional tendencies of presenting accomplished artworks by themselves.

Two main strategies have been employed in the creative process: juxtaposition and sensorial engagement. One way of engendering curiosity and playful interventions was to juxtapose the museum artefacts with other materials and data in a range of assemblages and installations. Through sonification, visualisation and recordings, the sensorial dimension of the artefact was expanded, replacing more intellectual approaches based on interpretative and

historical information. One particular intervention, the *Rock Harmonium*, explored the texture and consistency of a number of rocks, connected across the terminals of a 9v battery. The circuit was also connected to a loudspeaker with the rocks in between acting as transistors and giving form to what could be seen as an initial stage towards the development of an instrument (Bowers & Haas 2014). Another intervention was instigated by a member of the public, an artist who brought with her a digital USB microscope to take close-up images of some of the artefacts. These were subsequently scanned line by line to use the grey values as entries to synthesise sound.



Figure 47. *Erratics*, part of *Performing Collections* by Pacitti Company. Copyright Mafe Valen

Overall, the project suggested how museum objects could be framed not as coming from the past but focusing on their presence and potential in the present, and re-contextualised on the basis of imaginative associations and material or sensorial characteristics. They can be part of temporary assemblages or devices, ready to be taken apart again and reassembled in a different ways, supporting a practice of making and tinkering.

5.4.3 *Subversive logics*

The examples described suggest how the idea of prototyping heritage contributes to current practices that diverge from a set of established standards of heritage work. These can be preliminarily summarised as follow:

- From didactic approaches to generative ones

- From preservation to manipulation
- From fixed to changeable values

The first point links to the primary role that education has been awarded in museums since their inception as a public institution (Hein 2002). Until recently, the encounter between audiences and collections has been mostly informed by didactic frameworks, grounded on historical or contextual information about an object. Both our examples, by contrast, de-emphasise the amount of information that could be associated to archival or collection items, by focusing on the aspects of an object that can support or instigate further creative or research work.

The second and third points are intimately related to this generative perspective. Even though the idea of prototyping heritage does not involve endangering the preservation of the artefacts, it is true that preservation and maintenance are de-prioritised in this perspective. The material integrity of the objects in the projects described has been respected (with most manipulations concerning only digitalised materials), but the principle of conservation is challenged by the prominence assigned to creative re-use. Standards and priorities of heritage work face a potential redefinition also when the reasons why an object is currently significant and therefore collected shift from fixed to changeable ones. For instance, the geological artefacts in *I/E* become relevant to creative practitioners not because of their antiquity (at the basis of their original inclusion in the collection), but because of their sensorial qualities, their capacity to vibrate or their potential in generating sound. Similarly, the manuscripts from Bloodaxe Books were originally archived because of their connections to the published poems, but in *TPOTA* they can be experienced autonomously and through factors such as their shape or the presence of selected keywords.

These subversive tendencies can be understood and legitimised in the light of discourses critical of the notions themselves of museum or heritage, revealed as contingent and affected by power relations. For instance, Bennett (1994) defines the ‘exhibitionary complex’ as a set of regulations and behaviours that developed alongside the museum institution. The acceptance of the rules, such as avoiding touching the exhibited objects, indicates also the acceptance of a specific ordering of people and things. Similarly, Laurajane Smith (2006) points out the role of heritage in legitimising or de-legitimising cultures, by attributing stable and fixed values to artefacts to support a specific vision or ideology. Another kind of contradiction afflicts preservation: despite its intention to contrast change and decay, “protective action invariably alters any site or structure, often to their detriment” (Lowenthal 2015, p.422). Prototyping can therefore be recognised as a way of liberating

cultural objects from ideological stances and returning them to a dimension where a multiplicity of values and points of view are simultaneously at play and activated through collaborative work. Or, if we recognise the argument made by Lowenthal, we can simply consider the idea of ‘prototyping heritage’ as the acceptance of the inevitable transformability of everything.

5.5 Summary

This chapter analysed a number of projects and issues in curatorial work which are either inspired by or understood through the framework on artistic prototypes. The *ER* is interpreted as a prototype and adopted to test a curatorial strategy (*Fictional Interludes*) developed with both openness and fictionality in mind. The artwork is therefore imagined as having a possible alternative life more strongly connected to everyday life. By addressing the *ER* as a prototype, it was possible to introduce transformations, in this case concerning its uses and contexts of application. The development of fictional scenarios suggesting what the *ER* might be is the key to actualise such proneness to change in the imagination of the public. This process is not an end in itself but, in this specific case, a way to structure the experiential trajectory of the public.

UBC allowed a closer investigation of fictionality in relation to material artefacts. None of the objects and documents displayed in the show is a prototype, but the plot of the robbery as a whole can be seen in these terms if we consider prototyping also as a way to design possible trajectories of action or sequences of events. The collateral activities developed alongside the show stem directly from the framework. By using prototyping tools in the same space of the display we transformed a white-cube set up into a site where making is in process. Accordingly, we facilitated the expansion of the collection of evidence by asking participants to contribute new ones, fabricated or collected on site. Furthermore, the activities emphasised the correlation between objects and stories, in the same way that prototypes become meaningful by imagining possible worlds and narratives. Finally, both the artwork and the activities focused on forensics, a context in which material artefacts, just like prototypes, are intended as objects of knowledge, carrying information about the processes and events they have been involved with, and simultaneously suggesting arguments or interpretations.

Unbound was conceived to observe the life-cycle of a prototypical artefact in its social dimension, as co-developed by different practitioners. With this project I demonstrated how my framework can support new models of collaborative and transdisciplinary work which might be potentially applicable to other fields, beyond the realm of creative practice. The

project also confirmed two key ideas related to prototypes: their ambiguous identity as both autonomous objects and channels of ideas, reflected in the way documentation and artistic iterations kept overlapping during the entire process; and their unfolding in concert with contingent socio-material arrangement.

I also looked at projects developed by other practitioners. The notion of prototyping was adopted to discuss recent approaches to archives and collections turned into raw materials to generate new creative or research work. The potential applications of the framework however goes beyond the specific examples given in this chapter, and further suggestions of exploration are more synthetically identified in the next (and conclusive) one, to open up possible directions for future work.

Chapter 6. Conclusion

This final chapter is proposed as a reflective stage on the research conducted and begins by reviewing the research questions and the way they have been answered in the thesis. It goes on to address perceived limitations of the project and eventually explores further directions of research linking them to existing emerging practices and theoretical debates.

6.1 Reflecting Back on Research Questions and Contributions

This thesis focuses on the notion of *artistic prototypes* to address an emerging strand of technologically engaged art practice and provide a viable alternative to broader, but now inadequate, categories, such as digital or New Media Art. The concept can act as a boundary object between the disciplines of visual art, design and human-computer interaction to support a post-disciplinary perspective in addressing digital creative production.

To underline the contributions of the research let us return to the original research questions:

- 1) What happens when art practice is involved in research? What kind of aesthetic object emerges from artistic research? How is research influencing art practice?

I answered this question first by reviewing literature on practice-based research (PbR) in the arts, and subsequently by developing curatorial projects involving the work of artists-researchers. This allowed me to identify in the artistic prototype a useful concept to grasp the tendency of these works to present themselves as the matrix of many possible different versions; unclosed objects operating as carriers of knowledge, proposals, hypotheses.

Once the focus on prototypes was established, I wanted to understand the reasons to their currency in the research environment:

- 2) Why are prototypes so frequently the outcome of artistic practice conducted in labs? Which are their specific features and behaviours? How can we talk about them?

The framework presented in Chapter 4 responds to these questions and explains how the openness and fictionality of artistic prototypes support research, often creating a suitable testing environment. At this stage however, the increased familiarity with the concept of the prototype and its manifestation in art practice suggested to me the existence of another key area of application: activism (which also reveals strong links with the lab environment). The final step was to move beyond this level of understanding and explore the possible practical applications of the framework in my own field of action, curation:

- 3) How can curators respond to the notion of artistic prototypes? Are new potential avenues for practice being disclosed? How can a renewed understanding of prototyping influence the way artworks and collections are being presented to the public?

To do this I developed three independent projects inspired by the framework. I also investigated tendencies and practices observable from an external perspective, to corroborate the adaptability and timeliness of the framework itself. As a result, I demonstrated how the notion of prototypicality can impact curatorial practice by suggesting new engagement strategies and allowing more radical interventions in the conditions of use and appreciation of an artwork. I also showed how a prototypical framework can encourage various forms of creative re-use in archives and collections and support collaboration between artists and curators. All this adds up to the impact that the framework can have on artists themselves, supporting new understandings and new ways of doing their work. Finally, the world of research itself can benefit from new concepts and discourses, such as those related to artistic prototypes, in a context in which practical projects are increasingly becoming fundamental to research methodologies. This is not just concerning research in the arts but, for instance, a more heterogeneous terrain like the Digital Humanities (DH), where creative digital artefacts are at the core of “a production-based endeavour in which theoretical issues get tested in the design of implementation” (Burdick et al. 2012, p.13). Such a practice-based turn is producing new models of knowledge production and knowledge mobility, towards notions of ubiquitous and collaborative scholarship, extended to a variety of communities or the citizenship (Burdick et al. 2012). In this framework, knowledge itself becomes subject to the prototypical logic of iteration:

When knowledge exists in iterative form across global networks and local access points, with many versions and expressions of cultural information taking shape in a process whose life cycle is ongoing, then any access to that knowledge is a performance, an instantiation (Burdick et al. 2012).

I discussed attempts towards a redefinition of knowledge in direct relation to artists working in labs. The DH lab is only one example of the multiple ways in which making and thinking are being re-connected within lab-discourses. The notion of the lab, introduced in Chapter 2 with a complex and articulated history, can be now reassessed in terms of its association with prototyping. In this light, labs can be considered as spaces of synthesis of reflective and interventionist activities. I agree with Denisa Kera when she reconnects today’s hacker-spaces to the alchemic lab, emphasising its conflation of moral and scientific thinking. It is precisely the capacity of prototypes to go beyond the traditional separation between *episteme* and *techne* that, according to Kera, makes prototypes philosophical tools more promising than

mere concepts (2013). Despite its potential for collective action and for a relatively agile translation between knowledge and every-day practices, I contend that the lab remains an ambiguous entity, certainly endowed with political potential, but still negotiating different forms of governance or independence.

6.2 Challenges and Limitations

As part of these closing remarks, it seems opportune to underline two orders of limitations surrounding this thesis: a methodological one, and one concerning its contribution. As clarified in the Introduction, the research has been developed through hybrid methods combined together to adapt to the transdisciplinary and practice-led nature of the project. This was not only due to the lack of established standards and criteria around the relationship between practice and research in academia, but also to the fact that the practice adopted as part of the methodology (curating) was not the primary and only subject of investigation (artistic practice). Consequently, the practical part of the research does not comply with the typical processes of PbR, such as cycles of iteration and evaluation. The curatorial projects developed were independent from each other, and there was no attempt to improve or strengthen a particular curatorial model through multiple trials. Not unrelatedly, the thesis complies with the styles, structures and conventions of a traditional (non-practice-based) doctoral research in the humanities. However, being developed and presented alongside a set of practical projects, there was limited room to extensively address and review all issues, phenomena and debates that might be associated with the topic of artistic prototypes as would happen in a traditional thesis. Indeed, it was only possible to selectively account for those issues more necessary to the flow of my argument.

The conceptual framework of prototypicality itself needs to be understood in its tentative and provisional dimension, as more or different features could have been included, and artistic prototypes can find applications outside the spheres of activism and research. Furthermore, the concept is inherently porous, and there are no conclusive and unequivocal criteria to distinguish artistic prototypes from both non-prototypical artworks and non-artistic prototypes. Nevertheless, tentative distinctions can be made. As I argue in Chapter 2, the demarcation between non-prototypical artworks and artistic prototypes relates to the cultural discourses in which the latter are located (cultures of remaking, participation, open-source and so forth, as illustrated in the introduction). Furthermore, the openness and fictionality of artistic prototypes should be consciously addressed by the initiator (through specific aesthetic or dissemination strategies, for instance), rather than being incidental. Indeed, the aims and contexts of a project might also contribute to separating artistic from non-artistic prototypes.

Artistic prototypes do not generally lead to products that could be mass manufactured, but look at different channels and scales of distribution. They tend to be developed within arts-related academic programmes, or in association with arts organizations; they deploy artistic means of expression and maintain their own aesthetic and experiential autonomy. Ultimately, they need to be valued regardless of their following developments, whereas non-artistic prototypes' value relate to the expectation of a resolved version. Nevertheless, I believe the unsteadiness of this distinction does not make the concept less useful, and developing a sensibility to grasp it might just be part of a process of adaptation to a changing cultural landscape.

6.3 Further Areas of Exploration

The approaches explored in Chapter 5 are only a limited selection among the possible ways to envisage the impact of the framework. For instance, the idea of imagining a role for the artwork in everyday life (as suggested in *ERFI*) could be developed further by addressing the idea of 'domestication' of emerging technologies. This expression has been used to describe the transition in the way society relates to technological devices, from an initial phase characterised by fascination and experimentation, to their assimilation in the daily routine (Pantzar 1997; Auger 2010). According to Auger, speculation tends to happen before the domestication is accomplished, when neither established uses nor contexts are clearly defined. Critical designers have demonstrated how relating artefacts to everyday life is crucial to encourage reflection (Dunne & Raby 2013a). They also raised the question of the inadequacy of museums and galleries in generating an effective response in the public, since they are perceived as abstract, bracketed spaces that disconnect the aesthetic experience from the real world (Dunne 2008, p.86). Indeed, critical designers explored a range of possibilities alternative to the exhibition to orchestrate the encounter between objects and users, usually for research purposes, including ethnographic approaches such as allocating prototypes to households and individuals, to integrate them in their daily practices for a certain amount of time. Curators could find inspiration from these approaches to explore new ways of introducing artistic prototypes to the public in a domestic environment. Despite its practical challenges, and the limited number of participants that could be involved, such a format could activate a deeper and extended experience of the work. The idea of the 3D printed fingerprint given to participants during *UBC* can be seen in this light, but the approach can be extended to more complex works too. I believe there is a strong potential here in terms of in-depth engagement, even though this means pushing the boundaries of curatorial work quite far, and redefining its institutional framework and contexts.

Nevertheless, museums are also transforming their identities towards more entrepreneurial and innovation-oriented ones. The notion of artistic prototypes resonates with experiments such as the New Inc, an initiative of the New Museum in New York (New Inc 2014). Described as a museum-led incubator, half-way between business and artistic residency, New Inc offers a co-working space and a professional development programme to practitioners at the intersection of art, technology and design. The initiative recognises the hybrid status of a growing strand of artistic production and suggests an environment where prototypicality can be addressed in richer terms, beyond issues of display towards a broader cultural and practical life:

Creatives today are working in unique ways that are cross-disciplinary, collaborative, leveraging technology, and increasingly straddling the line between culture and commerce. Because they are exploring new modes of cultural production, the professional landscape in which they work is still undefined (ibid. 2014).

A further issue that could be explored in future work relates to the implications of the notion of artistic prototype in terms of ownership, authorship and market value. Whereas problems of authorships are similar to those raised by other forms of co-creation and open-source production, the positioning of artistic prototypes on the market is even more complex. This is due to their ambiguous status of artworks/inventions, their relationship to research and knowledge, their resistance to the commodity form and the tendency to replicability embedded in prototypicality. I speculate that artistic prototypes would align themselves with a hacker's ethic antithetic to intellectual property. In the definition of McKenzie Wark "hackers create the possibility of new things entering the world" (Wark 2004). This is prototyping. The concept of hacking also shares with artistic prototypes a common origin in the academic environment. Hackers "probably first emerged out of the electrical engineering labs at the MIT" (Wark 2006, p.320) where they established a tradition of technically virtuous inventions aimed at gaining peers recognition. Wark describes the early hacker's ethos as an embodiment of self-organised, collaborative labor but points out that

The hacker interest cannot easily form alliances with forms of mass politics that subordinate minority differences to unity in action, which always run the danger of suppressing the creative, abstracting force of the interaction of differences (Wark 2004).

This somewhat forced isolation also characterises the lab-formations more recently emerging in the cultural sector. If, on one side, being centres for knowledge production and technological innovation, they present themselves as key political actors, on the other side they remain elitist spaces whose inclusivity tends to remain on paper. Even when supported by activist purposes, artistic prototypes circulate around restricted publics of already

progressive and culturally savvy circles. Furthermore, despite the often low key technological and manufacturing solutions embraced, technical skills constitute a barrier to the idea of a dissemination open to everyone. For these reasons, overcoming the categorical fixity of the arts towards a post-disciplinary notion of creative practice distributed across a variety of operational fields presents a discernible potential for truly expanding the critical role that artistic prototypes might fulfil. Museums too might embrace a near future where objects are explained beyond disciplinary discourses, and where the distinction between artwork and artefact disappears (Muller & Langill 2014). Understanding creative or cultural artefacts outside given categories and frameworks of interpretations (such as western art history, ethnography or archaeology) is definitely a major implication of this thesis. The impact in terms of heritage work can be extensive. My investigation of prototypicality corroborates a vision of heritage as a collaborative, pluralistic practice based on non-fixed but ever-changing values and oriented towards the future. Current research in the field is indeed pursuing an analogous approach, rendering explicit the idea of heritage as a future-making endeavour connected with the socio-political and ecological issues of our time, rather than focused on the past, and abolishing any distinction between cultural and natural objects of preservation (Harrison 2015).

6.4 Between Change and Persistence

From a philosophical perspective, the act of framing an artwork as a prototype means that objects tend to be observed in a state of flux and becoming. The process of transformation however is not constant and frictionless but can encounter resistance, stasis or exhaustion and needs to be problematised. For instance, it might be beneficial to compare the temporalities and trajectories of prototyping with the notion of persistence, as implicitly suggested by philosopher Boyan Manchev reacting to the ‘post-modern rhetoric of fluidity’, ‘globalised liquidity’ and ‘bio-capitalised transformability’ (2012, p.47). According to Manchev, persistence is not diametrically opposed to change, but allows us to look at transformation in its durational dimension, in coincidence with a self-contained event. Persistence can also be seen as the property of discarded, obsolescent devices that remain in the present as fossilised forms carrying complex narratives of material and cultural relationships (Gabrys 2011, p.7). In its different nuances, this concept has been advanced in the context of Depletion Design, a recent orientation that aggregates a range of design issues and practices around the idea of responding to a situation of crisis and scarcity (Wiedemann & Zehle 2012). Key topics include sustainability, recycling, collaborative networks of production and use, and electronic waste. An exploration of artistic prototypes within the perspective of Depletion Design could

be seen as a promising route to pursue from here. There are two reasons to affirm this. First, prototyping has a privileged relationship with practices of recycling and re-purposing that are discussed in relation to the complex materialities of electronic and digital media. Recycling indeed appears as a viable anti-crisis strategy to creatively transform dismissed devices, and, through prototyping, give them a new life, thus salvaging pre-existing resources that would otherwise go to waste. However, not everything is recyclable and technologies “do not simply dissolve into raw materials ready to take on a second life. Instead, they give rise to irreversible effects and hazardous remainders” (Gabrys 2012, p.137). The recycling of electronic waste is in fact linked to peripheral geographies and deprived economies, but can only slow down, and not reverse, the process of decay. Furthermore, the disposition of prototypes to develop across hybrid collaborative networks is particularly relevant in a context of depletion, where alternative and decentralised organisational forms and production strategies are needed and where innovation itself is questioned. Artistic prototypes can contrast today’s imperative to constantly upgrade and support the quest for alternative and more sustainable lifestyles.

Throughout this thesis I have characterised prototypes as objects in evolution. Nevertheless, change does not need to be seen as antithetical to continuity; rather, it is inscribed into something that remains stable. In situating the notion of creativity within an anthropological perspective, Hallam and Ingold challenge its identification with invention and novelty brought about by gifted individuals (Hallam & Ingold 2007). By contrast, they conceptualise creativity as improvisation, enactment and juxtaposition of entanglements of materials and gestures. Creativity emerges then through continuity and responsiveness, and at least part of the agency in the creative process is taken away from the individual and attributed to the social and material environment (with inferable implications in terms of intellectual property).

Despite the activist ambition of many artistic prototypes, the risk is to comply with the same rhetoric of change, newness and entrepreneurship associated with liberal capitalism. Re-inscribing the idea of continuity alongside change within the concept of the prototype can therefore produce a beneficial shift of perspective. The (always contingent) notion of creativity itself is at stake. Even if coming from a very different research journey, my study converges with Hallam and Ingold in advancing an approach that values creation as a social and situated endeavour. At the time of writing this concluding chapter, the Turner Prize 2015 has just been awarded to Assemble, a collective of 18 members, for their regeneration project of a deprived area of Liverpool. With a background in architecture and a disregard towards

gallery shows and the art market, Assemble is the first non-artist and non-individual to win what is arguably the most prestigious contemporary art prize in the UK.



Figure 48 Assemble, *Granby Four Streets*. Copyright Assemble

The uncertain positioning of their work within the category of the visual arts, their own admission that they do not care about definitions (Brown 2015), their approach of working collaboratively and with local communities, their focus on the everyday and real-life practical issues are all signs that something is changing in the art-world. The debates generated around the award ultimately concern the very mission of art and see the 2015 judges' conception of a 'useful museum' with a social mandate, against the advocates of art as inherently and radically useless (Quaintance 2015; Wright 2013). In these discourses there seems to be a conflict between art's capacity to be critical and its potential to act in the world and affect people's lives. My belief is that there is no need to make a choice here. Although the case of Assemble might be unsuitable to demonstrate it, objects of use that are embedded in practices and behaviours can be critical and indeed artistic. By associating a practice-oriented conception of knowledge to the production of prototypical artistic objects, this thesis has moved precisely towards this area of indefiniteness where a new identity of artist, and a new notion of artistic value, can emerge.

Chapter 7. Appendix

Documentation and interview transcripts may be found in the accompanying USB stick or at this link <http://knowledgemachines.eu>

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List of Abbreviations

CC: Connecting Cities

DF: Design Fiction

DH: Digital humanities

ER: Eye Resonator

ERFI: Eye Resonator Fictional Interludes

HCI: Human Computer Interaction

NAI: Neurotic Armageddon Indicator

NMA: new media art

OS: Open Source

PbR: Practice-based Research

RtD: Research through Design

SO: Sound Object

STS: Science and Technology Studies

TDC: Thinking Digital Conference

TPOTA: The Poetics of the Archive

UBC: Under Black Carpets

WIP: Work in Progress Show