...And Hear The Coffee: The Brewcast Project as Diegetic Prototype for a
Post-smartphone Design Fiction
By
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Abstract

      I have designed the Brewcast project, a communication interface that attempts to combine coffee drinking, social networking technology and telecommunication interface design. By making a functioning prototype, I attempt to problematize current design conventions and motivations, placing value on the narrative of the design, a design fiction. The design fiction I create in my work takes place in a near-future where post smartphone culture, ubiquitous computing and wide spread internet or network access has replaced the need for individualized smart-phones and social networking apps. Through this widespread access to wi-fi hotspots that provide city-wide internet access people may be less inclined to carry around a personal communication device because of access to internet based connection almost anywhere. Social networking may revert back to traditional social collective interaction styles with the obsolescing of individualized mobile communication technologies. Durational interactions, like coffee drinking, could become a model for these social interaction technologies.

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Chapter 1: Introduction

"There's no such thing as silence. What they thought was silence...was full of accidental sounds. You could hear the wind stirring outside during the first movement. During the second, raindrops began pattering the roof, and during the third the people themselves made all kinds of interesting sounds as they talked or walked out."

-John Cage, speaking about the premiere of his work *4"33"* (Kostelanetz, 2002, p. 33)

"Design fictions help tell stories that provoke and raise questions. Like props that help focus the imagination and speculate about possible near future worlds — whether profound change or simple, even mundane social practices."

-Julian Bleecker (Bleecker, 2009, p. 8)

The objective of my research is to explore how contemporary communication technologies can be integrated into a design practice that privileges the auditory, with the intention to disrupt the *every-day* nature of current communication paradigms, like the telephone, text messaging or texting, Twitter, Facebook and other social networking interfaces. The disruption of these technologies can problematize these interfaces, in order to speculate on the kind of systems that can be created, introducing new interactions, emotional resonances and narratives. The system I have created is socially and economically disruptive since it enables the user to build, modify and share plans on how

to use, modify and create aspects of the interface. The disruption I am intending will happen around the quotidian act of preparing and consuming coffee. The brewing of the coffee itself is the catalyst for the telecommunication to be initiated and disconnected when the coffee is done. The interface links the user to another person or place through an audio connection over the internet. I will contextualize my work within the genre of design fiction and speculative design to imagine the future narratives that my interface can produce. I consider coffee to be an important part of my daily ritual and the daily lives of many people. The sharing of coffee in social situations predates telecommunication by hundreds of years and I think it is this hybrid practice that could become a new way for ubiquitous computing and internet enabled smart devices to allow users to connect with people and places.

The design fiction I create in my work takes place in a near-future where post smartphone culture, ubiquitous computing and wide spread internet or network access has replaced the need for individualized smartphones and social networking applications. Through this widespread access to wi-fi hotspots that provide city-wide internet access people may be less inclined to carry around a personal communication device because of access to internet based connection almost anywhere. Social networking may revert back to traditional social collective interaction styles with the obsolescing of individualized mobile communication technologies. Durational social interactions, like coffee drinking, could become a model for these social interaction technologies.

I've created this near-future narrative around coffee using a hybrid theoretical and methodological approach through design fiction. Julian Bleecker describes design fiction as a "mix of science fact, design and science fiction. It is a kind of authoring practice that recombines the traditions of writing and story telling with the material crafting of objects" (Bleecker, 2009, p. 7). I will also reference David Kirby and his methodology of achieving a functioning diegetic prototype in order to make a convincing work of design fiction. As Kirby defines it, the term diegetic prototype is often a technological object or interface in a work of science fiction that "demonstrates to large public audiences a technology's need, benevolence and viability" (Kirby, 2009, p. 44).

For my thesis work, I will be creating an internet-enabled interface for sharing the coffee drinking experience through an audio link between two or more people or locations. The title of this work/device, including the hardware within it and the software that runs throughout it is called Brewcast, and will be referred to intermittently as The Brewcast interface. Electronics are embedded within a wooden 'serving tray' or tablet. The heat from the brewing method, i.e. coffee press, Chemex pour over brewer and etc. initiates the network connection. When the coffee is done or what's left in the press becomes cold, the interface shuts off and the connection/interaction ends. The tablet possesses a microphone and a speaker allowing for two way communication. By adding identification chips (RFID) on each cup used with Brewcast, the network is customized to each person, allowing the user to choose who or where they connect to. The Brewcast can be considered a form of social networking, the interaction is an oral-based mode of online

social networking, augmented by a computer interface that makes the experience as fleeting as a discussion over coffee.

Thesis Questions

How can coffee drinking, social networking technology and telecommunication interface design be combined in order to make an emotionally resonant design object?

How can my work exist as a diegetic prototype in order to further the post-smartphone design fiction I am trying to create?

The ability for a near-future that could be considered post-smartphone, is made possible by the increasing amount of publicly accessible wi-fi hotspots. This access would alleviate the pressure to carry around a personal communication device when the ability to connect to people around the world through audio, video or text can be done through thousands of locations around the city they live in. This access would be even greater in areas where social networking often occurs, for example, coffee shops, restaurants, parks, offices, school campuses and more. The increase in city-wide wi-fi access can be seen in locations like New York and possibly soon, Toronto. In New York there are studies underway to understand the feasibility of converting pay-phones into free wifi hotspots. Maya Wiley, counsel to the mayor of New York stated, "Making these pay phones digitized, 21st-century Wi-Fi hot spots is going to be incredibly exciting for so many New Yorkers who otherwise have a hard time getting access." (Dunlap, 2014) Toronto's Ward 22 Councillor, Josh Matlow speaks of the way freely accessible wi-fi in Toronto's

downtown could inspire creativity and social communication (O'Toole, 2013). These news articles point to the new possibilities of city-wide wifi access, one of the main components to the ability for ubiquitous computing and networked objects in city centers around the world.

My research references and contributes to research in the field of ubiquitous computing, Internet of Things and design fiction. All of these technological concepts can be contributed to the rise of smart objects, like cell phones, fridges or cars, all with computers inside that can interact using sensors, or tactile input system to gather information about your physical state (walking, sitting, etc.), read ambient light or location in order to create an interactive user experience. The Internet of Things (IoT), is a term made popular by computer engineer Kevin Ashton, at a presentation he made to Proctor & Gamble in 1999 (Ashton, 2009). Ashton considers the IoT to be a reaction to the way conventional diagrams of the internet include servers and routers and so on, but leave out the most numerous and important routers of all, people (Ashton, 2009). Ashton believes it is the embedding of sensors like RFID (Radio Frequency Identification, a technology that can communicate data over radio using tiny embedded chips) into millions of objects that can enable *things* to generate data with people in order to track and count everything, and greatly reduce waste, loss and cost (Ashton, 2009).

David Kirby explains the way these systems intertwine to create ubiquitous computing or ubicomp. "Computers might become more directly integrated into the architecture of the environments that people occupy. Rather than manipulating them with

a keyboard and mouse, people might use gestures for direct input" (as cited in Bleecker, 2009, p. 39) These technologies work together to create ambient interfaces that are not immediately visible or obtrusive for the user, to the point where they are operating without the users' awareness. An example of this kind of embedded computer technology is a home automation system, that senses the users motion, temperature, and through this, extrapolates the users' mood in order to adjust the home's temperature. The Brewcast interface uses the connectivity of IoT with the gestural and ambient operations of ubicomp to create a user experience that demonstrates these technologies and ideas at work.

The design fiction I developed around coffee is a near future where the cellphone has fallen out of favor because of its addicting screen-based interfaces that encourage people to be looking down at their device for extended periods of time, avoiding contact with people around them, and create feelings of being overwhelmed from constant updates, notifications and advertisements. By combining science fact (Wi-Fi, RFID, infrared temperature sensors, etc.) and science fiction (a society where the Brewcast interface is a common product in everyday use), Brewcast becomes what David Kirby calls a *diegetic prototype*. "Diegetic prototypes have a major rhetorical advantage even over true prototypes: in the fictional world – what film scholars refer to as the diegesis – these technologies exist as 'real' objects that function properly and which people actually use" (Kirby, 2009, p. 44). In my work, I imagine the Brewcast interface to be understood as real and functioning within a social climate where people actually use them. This helps

me to imagine what is needed for this to happen, bringing the science fact back in to my science fiction work.

Methodology and Design Practice

Through my particular assembly of materials, technology and construction methods that include creative discovery based research and improvisational making I will apply these ubicomp and IoT technologies to my practice. Recently accessible technologies like Bluetooth, Wi-Fi and RFID, which I will further explain in the paper, allow me to achieve IoT type connections within the work. The application of these technologies also depends on my ability to learn how to apply them. This is where I rely on Adafruit Industries (Adafruit.org), Sparkfun Electronics (Sparkfun.com), Github (Github.org) and Bildr.org to provide tutorials and diagrams on how to use these technologies. It is my reliance on these services and the communities who create them that inspired me to make contributions to these open-source communities as part of my design process and methodology, by providing plans and code examples. I have created a Github repository (github.com/brewcast) that will house the code used for parts of the Brewcast project, and a section of my website (stephensurlin.com/brewcast) in order to contribute and enter into dialogue with these communities.

In my work I engage in Graeme Sullivan's (2010) conception of problem-based learning. I apply Graeme's principle of learning how to access and apply information to real-world problems by adapting existing knowledge from various sources in self-directed

inquiry (Graeme, 2010). This is done through my accessing of information technology like online tutorials helps me find solutions to design problems from various fields like electrical engineering, industrial design and computer engineering. My work is not an attempt to create a final solution, but to work within a cyclic process in order to use experience and feedback to influence new and old work, a non-linear iterative design process. This system of creation is informed by my experimentation. I have tested my materials in different configurations to achieve a *workable* product, one that can be improved, and is continuously intended to be. I also use a cyclical methodology of "Create-Critique, Meaning-Making, Problem-Finding" (Sullivan, 2010, p. 106), a system of creating and critiquing, moving between production and theoretical contextualization, then making and testing, to understand and make meaning through my theoretical framework. In this case, my contextualization of Marshal McLuhan's (1988) concept of acoustic space.

The art and design research of Anthony Dunne and Fiona Raby has lead me to understand three of their main methodological frameworks for speculative design: *design fiction*, *critical design* and *design noir* from their book *Speculative Design* (Dunne & Raby, 2013). These methodologies help me to contextualize my artefacts, products and artworks, within the realm of contemporary cultural production, especially within the realm of consumer products and the narratives constructed around them.

I use the three-part theory of Speculative Design to establish a framework of active imagining, a kind of cross-reference to give me a lens through which to work and

to contextualize the types of experiences I want my interface to create. Below, I will elaborate on the meaning of these three concepts and the ways that I apply them to my practice.

Design Fiction:

Design fiction has been defined by Dunne & Raby as a mix of science, design and fiction (Dunne & Raby, 2013). The term describes an emerging area of design that uses storytelling as an experimental device to question the world around us, and it is this method of storytelling that I used to imagine the trajectory of an interface like Brewcast (Dunne & Raby, 2013). I imagined the Brewcast interface as a near-future consumer electronic product that was created as a response to the banal, *everydayness,* of cell phones and social networking platforms. I imagined a narrative where people where tired of the overwhelming feeling of being constantly connected to social networks through their smart i.e. computer embedded devices. This thought focused my attention on the creation of an interface that stays in the home or a public place and has its duration of use based on a limited-time activity, coffee drinking.

Critical Design:

Dunne & Raby's concerns with the uncritical drive behind technological progress, especially when technology is assumed to be good and capable of solving any problem encourages me to question the drives behind some of my material and aesthetic design

choices (Dunne & Raby, 2013). This questioning brought me to use reclaimed wood and create an interface that avoided my desire to pack the interface with features, similar to a contemporary smartphone that has the capabilities of a desktop computer, making you feel able to solve any problem. The wood used in the interface is intended to create an emotional warmth that references the aesthetics of coffee shops and cafes. I wanted to avoid the use of plastics in order to maintain this emotional resonance, while avoiding associations with futuristic design aesthetics that may inspire associations with technological-centric progress (instead of human-centric) design. I wanted to embed computer technology within the interface, while maintaining a simplicity that makes the interfaces design simple, warm, and emotional, similar to the kind of social interactions over coffee that I was trying to emulate. Though, I wanted to create more than a telephone attached to a coffee machine and create something that intervenes and problematizes the actions and interfaces of the everyday. Dunne & Raby (2013) expand on their definition, "Critical design uses speculative design proposals to challenge narrow assumptions, preconceptions, and givens about the role products play in everyday life" (p. 6). I attempt to do this in my work.

Design Noir:

  Design noir is another term coined by Dunne & Raby, in their book, *Design Noir: The Secret Life of Electronic Objects* (Dunne & Raby, 1996). The term is used to describe a collection of objects that have a "placebo effect" (Dunne & Raby, 1996, p. 75), where

the users are told the objects will reduce the electromagnetic fields in their homes caused by cellphones, televisions, power lines, etc. though they don't really reduce them. Here, Dunne & Raby''s work uses *design noir* principles to explore the effects of objects on a person's emotions. The effect of an artefact does not directly relate to its function, it is also influenced by the meaning the user brings to the design, which, in the case of Dunne & Raby's placebo objects, is an anxiety around the hidden dangers that come from the electronic objects that surround people in urban environments.

Limor Fried, the founder of open-source electronics manufacturer Adafruit, defines the noir aspect as a reference to the noir genre of films that are often dark and seedy with characters that have "hidden agendas and secret lives" (Fried, 2005, p.16). Some of the emotional subtext of my interfaces are found in the desire to connect to a server, a person, place, a sound. I imagined the Brewcast interface as a physical manifestation of the act of *connecting* to another person online. The diverse sensory experience can illicit a range of feelings in the user, the smell of fresh grounds and brewing coffee, the feeling of slowly pressing down the plunger of the press, the sound of filling the glass or the first sips taken, can all trigger feelings of familiarity, warmth (physical and emotional) or sensuality in the user. I may not be referring to dark and 'seedy' aspects of the interface, though there are hidden qualities of Brewcast that are experienced in its use, similar to the emotional resonance of Dunne & Raby's placebo objects. The ideas surrounding design noir give rise to questions around what it is that

could be hidden about current coffee drinking ritual or social networking interfaces or technology.

In order to assess the potential for a successful presentation of a near-future narrative, I will use Kirby's three criteria for believable narrative construction within design fiction. When referring to the attempt to overcome public anxiety aruond the implantation of a permanent artificial heart in humans, Kirby (2009) outlines the three main criteria that science needs to establish within a narrative, often the diegetic prototype takes on this role (p.43).

1. The necessity of the technology.

2. The normalcy of a person using the technology.

3. The viability of the technology.

The necessity of my interface is demonstrated in the desire for new versatile wireless systems that can interface with the ubiquitous computing technologies in common use, especially Bluetooth-enabled mobile computers and smart-phones. There are many examples of this trend found in contemporary consumer electronics, as I outline in chapter 2, companies like Jawbone's *Jambox* and Teenage Engineering's *OD-11,* both popular lines of Bluetooth enabled wireless speaker systems. My work extends these interfaces by encouraging a connection to a person or place, creating a social experience that takes advantage of the networking capabilities of this technology, another desire found in the popularity of social networking interfaces like Facebook and Instagram.

I attempt to normalize the use of the Brewcast interface by building the experience around a ritual that, for many people is, daily, fun and important, the drinking of coffee, whether alone or with others. The act of coffee drinking seemed to be a good location for a technological intervention that remains ambient rather than obtrusive, a trend that can be seen in the wireless, effortless to use speaker systems and social communication interfaces in use today. The simplicity of the interfaces functioning can be inviting and accessible for many people, including people who may not be as technically inclined as some, including the elderly. I often imagined the use of the technology by my own grandmother who would often have a morning tea, which near the end of her life, was very often alone. With Brewcast, she would have been able to connect with me in the morning for a daily chat, or we could listen to the birds together, by connecting to a stream from a park outside the noisy city of Chicago where she lived.

The viability of the interface is demonstrated through the Brewcast interface which is mainly a prototype. This prototype works to inspire, imagine its potentials and share code to continually shift the project and provide the chance for a user to create their own interface. The online resources that accompany my work, which includes visual documentation, descriptions of content and example code for several components, allow for accessible sharing of the open-source content that goes into the creation of the Brewcast interface.

Theoretical Framework In Context

In this section, I contextualize my work within Marshall McLuhan's *Laws of Media: The New Science* (1988), in order to develop a design methodology for producing an artefact that, according to McLuhan (1988), occupies *acoustic space* rather than *visual space*. McLuhan (1988) explains the contrast between the two forms through his description of *visual space*: "Created by intensifying and separating that sense from interplay with the others, is an infinite container, linear and continuous, homogenous and uniform" (p. 33). This emphasizes the way the design of various communication technologies like the telephone, with its ability to call, or send texts, tries to isolate a single sensory experience. Possibly to fit within a niche in the market to follow the logic of consumer product compartmentalization. My work attempts to avoid being constricted in visual space by appealing to the emotional and phenomenological experience of the coffee drinking experience as a vital part to the use of Brewcast. McLuhan (1988) considers *acoustic space* to be "always penetrated by tactility and other senses, is spherical, discontinuous, non-homogenous, resonant, and dynamic (p. 33). This can be translated through my work by considering the sensual and phenomenological experience of the Brewcast interface to create a discontinuous and spherical connection through sound over a streaming server, allowing for unpredictable and dynamic interactions. The Brewcast interface acts as a physical manifestation of McLuhan's idea of a spherical *acoustic space*. By creating an artefact that can be interacted with in a phenomenological way, i.e. through sense of touch, taste, smell and hearing, the act of coffee consumption

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becomes a catalyst for digital communication. This can be seen in contrast to the digital, "infinite container" (McLuhan, 1988, p. 33) of communication interfaces found in smartphone applications like Facebook Messenger which exists in a *visual space,* an *"infinite container...homogenous and uniform"* (McLuhan, 1988, p. 33).

In order to further contextualize how technologies work within *acoustic space* to augment their emotional narrative, I will use McLuhan's (1988) *tetrad* system to unpack the social, historical and political context of a medium. The four laws of the *tetrad* system are: enhancement, obsolescence, reversal and acceleration, which work simultaneously to "form a practical means of perceiving the action and effects of ordinary human tools and services" (McLuhan, 1998, p. 98). Below is a more detailed description of McLuhan's four laws.

McLuhan's Four Laws (1988, p. 98):

Enhances:

What does the artefact enhance or intensify or make possible or accelerate? This can be asked concerning a wastebasket, a painting, a steamroller, or a zipper, as well as about a proposition in Euclid or a law of physics. It can be asked about any word or phrase in any language.

Obsolesces:

If some aspect of a situation is enlarged or enhanced, simultaneously the old condition or unenhanced situation is displaced thereby. What is pushed aside or obsolesced by the new 'organ'?

Retrieves:

What recurrence or retrieval of earlier actions and services is brought into play simultaneously by the new form? What older, previously obsolesced ground is brought back and inheres in the new form?

Reverses:

When pushed to the limits of its potential (another complimentary action), the new form will tend to reverse what had been its original characteristics. What is the reversal potential of the new form?

Gloss:

Gloss refers to the poetic and more abstracted qualities of the aforementioned terms. McLuhan would take this opportunity to add short anecdotes, ideas, situations, potential relations and references within this exterior space of the tetrad.

These four laws help me to understand a technology's ability to be effected by correlating forces, which acts as an important tool in projecting into the future in order to create believable and therefore emotionally resonant design fiction. By comparing the diagonal forces in the *tetrad*, for example, enhances compared with obsolesces, the technology in question can reveal the nuanced social and cultural shifts that come with these technologies. The benefits and the new problems, what is gained and left behind, can be outlined and understood in a *tetrad*.

Tetrads for the Contextualization of Theoretical Framework

In this section, I will further contextualize McLuhan's theoretical framework by describing how McLuhan's four laws, applied with specific technologies, can be applied to my design methodology and practice. The first example illustrates how McLuhan's four laws are used to create a *tetrad*. I will then depict McLuhan's *Telephone tetrad*, in order to understand the potential connections with my work. Afterwards I will create my own *tetrad's* to illustrate the way this theoretical framework and methodology will be applied to my design process.

McLuhan's Tetrad Example

Example

(gloss)   (gloss)

Enhances   Reverses Into

Retrieves   Obsolesces

(gloss)   (gloss)
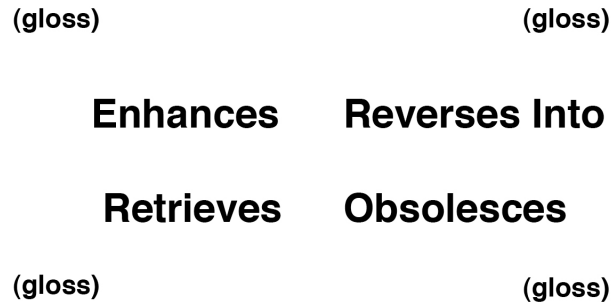
Figure 1 - McLuhan Tetrad Example (McLuhan, 1988, p. 129)

Above (Figure 1) is a template for the creation of *tetrad's* found in *Laws of Media: The New Science* (1988), the following *tetrad's* are based on this template. In the *Example tetrad,* a relationship between enhancement and obsolescence can be seen in the way that new devices, technologies, and tools phase out or push aside older tools that performed similar tasks. This *tetrad* system helps theorize around why this happens and what its effects can be. I have chosen the telephone *tetrad* by McLuhan, in order to conceptualize how the Brewcast interface may differ from the emotional, social and narrative function of the telephone.

McLuhan's Telephone Tetrad

Telephone

person-to-person

...the mythic world of the discarnate, disembodied intelligences: you *can* be in two places at once.

After many a test, Bell has rejected the videophone as socially unacceptable though physically feasible.

'phoney' - 'as unreal as a telephone conversation'

hang-ups - no put-down

dialogue   the sender is sent

instant access   privacy by universal
to users   cable access

dialogue as gesture: Many kids conduct whole conversations without once using words; rather mumble, giggle, grunt.

the old barriers between physical spaces: there is here and here is there

Figure 2 - McLuhan Telephone Tetrad (McLuhan, 1988, p. 152-153)

While the telephone enhances person-to-person dialogue (Figure 2), the recent increase in access to an internet connection allows Brewcast to obsolesce private cable access, while wider access to the internet can retrieve "instant access to users" (McLuhan, 1998, p. 152). Many telephones today are untethered to a wall socket in the way that McLuhan specifies in the *tetrad* above. This *tetrad* acts as a jump off point for my research into the affect of telephone technology, in order to inform the ways I augment this technology, embed sensor technology and enable internet access. I have created several *tetrad's* that can help me contextualize the way I will augment this technology and

conceptualize potential narratives associated with: coffee, wireless internet (Wi-Fi), and

the Brewcast interface.

Coffee

passionate debate, dialogue, discussion

to work, to play

ritual turns to dependence

mental stimulation, energy

routine, dependance convenience

daily ritual, collective social experience

tiredness, rest, sleep

prolonging mobility

social gathering

sharing of stories, opinions, ideas

spaces for public gathering i.e. cafes, and other cultural hubs.
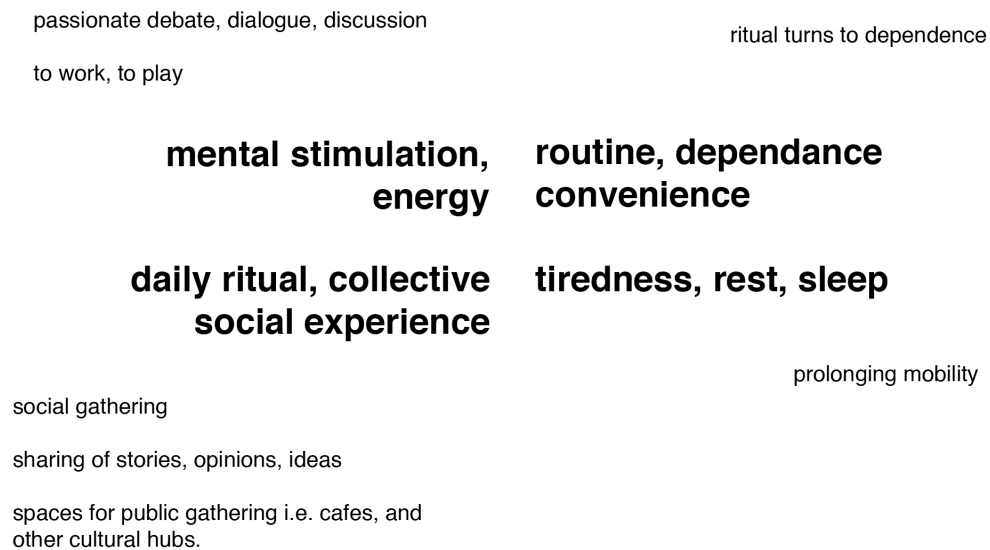
Figure 3 - Coffee Tetrad

For the coffee *tetrad*, I wanted to explore the physical effects of coffee, the way it

enhances and obsolesces physical and chemical processes in the human body. Coffee also

acts as a catalyst for social interaction in its ritual and collective sharing practices found

in cafes and homes. Though all of these factors can contribute to a routine of coffee use

that results in dependence, possibly to avoid sleep, potentially in solitary activity at home

or in public. This leads me to question, how does the Brewcast interface synthesize,

encourage or deter interpersonal interaction or environmental interactions with the

environment through *acoustic space*.

Tetrads For Technological Contextualization

Wireless Internet (Wi-Fi)

invasive social media (constant updates)

automatic connection to internet

moving in and out of Wi-Fi networks may
cause uploading of location data and other
information over internet and social
networks.

multiple simultaneous connecitons

percevied freedom

**device mobility,
ability to connect**   **constant connection
unintentional connection**

**internet access
in public**   **telephone cables,
physical tether to network**

privacy compromised

internet previously accessable from home
network.

loss of connection to other devices
(physical and emotional)

'sharing' of a single connection, rather than
one cable, one connection

Figure 4 - Wi-Fi Tetrad

Wireless internet's (Wi-Fi) ability to connect multiple users to multiple outputs/

inputs simultaneously on the same device enhances mobility and the ability to connect

(more objects with embedded Wi-Fi connectivity). Physical tethering like cables and

multiple access points in public spaces is obsolesced, and Wi-Fi becomes a web style

network, with multiple simultaneous connections that can reach globally. A user is no

longer confined to finding a hardwired line, and can now, especially in metropolitan city

centers around the world, access a ubiquitous network free of charge to use at will with

little to no restrictions.

Brewcast System

potential to simultaneously 'chat' with 1000s of 'friends' online through social networking software applications.

sharing experience of coffee drinking:
smell, taste, stimulation, warmth, nostalgia

person-to-person online connection

simultaneous interactions limited by human hearing and ability to decipher sound.

ease of connection

**dialogue,
multisensory experience**

**mass simultaneous
virtual connections**

**daily collective
ritual**

**calling, dialing,
manual network connection**

increase of social bonds through
repetetive ritual

private voice expanded

nuances in vocal communication

automatic connection and disconnection

auhenticity of person you are communicating
with (lack of anonymity compared to other text
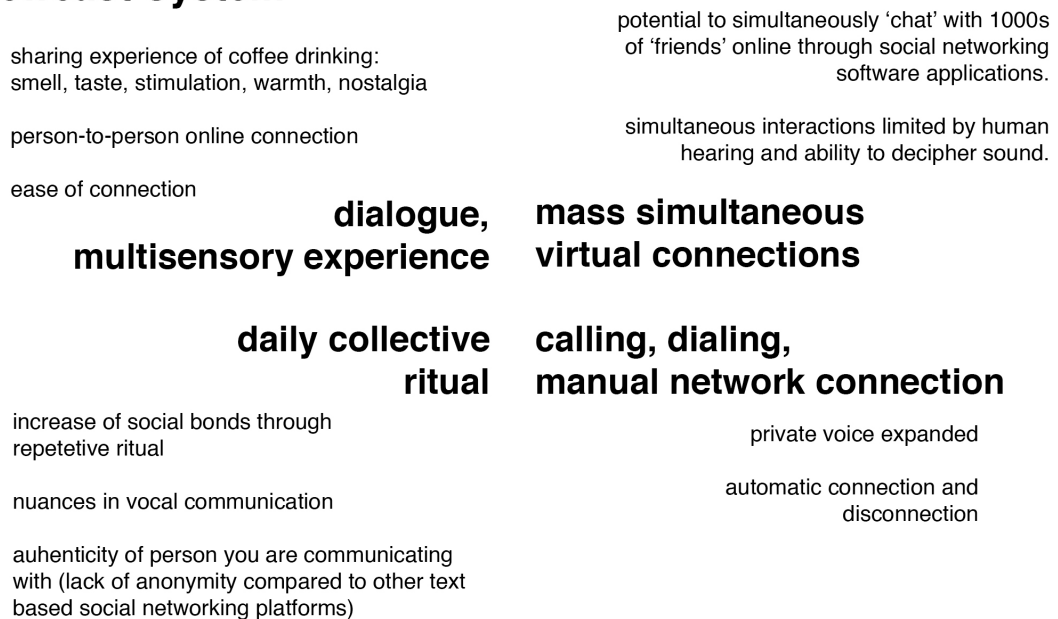based social networking platforms)

Figure 5 - Brewcast Tetrad

In the Brewcast *tetrad* (Figure 1-5) I describe how, like the telephone, dialogue is

enhanced, though unlike the telephone, the user engages in an enhanced multisensory

experience. The Brewcast interface incorporates the smell, taste and stimulation that

comes from coffee drinking into the function of the device, since it requires the presence

of coffee preparation and consumption (the heat of the coffee press and the RFID found in

the cup of the user) the user is engaging more of their senses than the traditional

telephone, which mainly uses hearing and touch. The use of heat sensors and RFID tags

obsolesces the need for calling a person to initiate a conversation. The act of calling can carry its own set of actions and connotations, i.e. a person doesn't need to initiate the action first, then wait for the other party to answer the call. The connection is on as long as the user is having coffee and is available as long as they are doing so.

The Brewcast system connects automatically, and is disconnected automatically. The connection method and the importance of coffee, which is a very quotidian part of many peoples lives, including my own, retrieves the daily ritual found in social interaction that is constrained to a time-based activity, the system confines the social interaction to a specific time. This quality, mixed with the regularity of use because of regular coffee drinking may retrieve collective social bonds. The daily ritual and increased familiarity may retrieve a sense of identity with the person or people a user is speaking to, which may come from a lack of anonymity through hearing the nuances of vocal communication. The Brewcast interface reverses the ability to have potentially thousands of simultaneous conversations using asynchronous text-based communication, like Twitter or Facebook Messenger. Some may consider this a detriment for the interface, though some may consider it a welcome change from the sometimes overwhelming results of high volume messaging like e-mail, and text-based messaging like Twitter, Facebook and cellphone texting.

Design Practice

I synthesize the three genres of *design fiction*, *critical design* and *design noir* through speculative design to create a strategy for imagining potential design futures and to speculate on potential social desires, products and experiences. I use the principles of speculative design in order to conceptualize my artefact, product and design, Brewcast. Speculative Design gives me the tools to theorize a social environment, along with the methodology of "Create-Critique, Meaning-Making, Problem-Finding" (Sullivan, 2010, p. 106) in order to design an interface that is imaginative and functional.

I use Sullivan's and Dunne & Raby's methods of design problematizing to question and at the same time, incorporate design principles and aesthetics from Dieter Rams and his work with Braun. Rams developed ten design principles that he uses when creating some of his famous and widely recognizable designs for consumer appliances. One of the works I find most influential from Rams and Braun is the TP1 portable modular radio record player system. The radio has a built-in speaker and radio tuner, allowing for it to be used on its own. The record player is a compact design that plays 45 speed vinyl records. The record player can be connected with a headphone jack to the radio, to use its internal speaker or plugged into another amplification system. Braun also designed a housing for the two units to increase their portability. The modularity of this unit is an inspiring form to consider ways to make the product functional even after certain aspects are obsolesced. Today, the 45 speed record is rarely used, even with the current resurgence in vinyl. Though an iPod digital music player could still be attached to

the TP1 radio in order to share your music with others. Below I will outline Rams' ten principles, followed by an explanation of how I've synthesized his ideas.

Dieter Rams' Ten Principles of Design (as cited in Lovell, 2011, 354-355):

1. Good design is innovative

The possibilities for innovation are not, by any means, exhausted. Technological development is always offering new opportunities for innovative design. But innovative design always develops in tandem with innovative technology, and can never be an end in itself.

2. Good design makes a product useful

A product is bought to be used. It has to satisfy certain criteria, not only functional, but also psychological and aesthetic. Good design emphasizes the usefulness of a product whilst disregarding anything that could possibly detract from it.

3. Good design is aesthetic

The aesthetic quality of a product is integral to its usefulness because products we use every day affect our person and our well-being. But only well-executed objects can be beautiful.

4. Good design makes a product understandable

It clarifies the product's structure. Better still, it can make the product talk. At best, it is self-explanatory.

5. Good design is unobtrusive

Products fulfilling a purpose are like tools. They are neither decorative objects nor works of art. Their design should therefore be both neutral and restrained, to leave room for the user's self-expression.

6. Good design is honest

It does not make a product more innovative, powerful or valuable than it really is. It does not attempt to manipulate the consumer with promises that cannot be kept.

7. Good design is long-lasting

It avoids being fashionable and therefore never appears antiquated. Unlike fashionable design, it lasts many years – even in today's throwaway society.

8. Good design is thorough down to the last detail

Nothing must be arbitrary or left to chance. Care and accuracy in the design process show respect towards the user.

9. Good design is environmentally-friendly

Design makes an important contribution to the preservation of the environment. It conserves resources and minimizes physical and visual pollution throughout the lifecycle of the product.

10. Good design is as little design as possible

Less, but better – because it concentrates on the essential aspects, and the products are not burdened with non-essentials. Back to purity, back to simplicity.

Rams' principle five states, "Good design is unobtrusive" (as cited in Lovell, 2011, 355). I consider Brewcast to embody this principle because of its lack of ornamentation, visible knobs or buttons or any other deliberate markings. Their design is therefore, restrained, though maybe not particularly neutral. This is where I problematize Rams' principle by using reclaimed wood material. The material possesses a planered surface and rough 'live' edges. Where the material lacks the "neutrality" Rams mentions, it gains potential to inspire an emotional connection that tells a story or narrative for the user. This emotional resonance may be helpful in achieving a more emotional experience with the device, which is what I'm trying to achieve with the speculative design methodology.

My work reflects the sentiments of Rams' ninth principle, "Good design is environmentally-friendly" (as cited in Lovell, 2011, 355). The inclusion of reclaimed

wood in my process is an attempt to propose a way of working with materials that are not traditional industrial design materials like plastic and aluminum, but ones that contribute to a preservation of the environment. My work proposes a design for a near-future aesthetic where modular hardware that is mostly open-source can be attached to reusable or recycled materials using standardized materials from a local hardware store like screws, brass sheets or galvanized steel fasteners, allowing for high amounts of reuse and recycling. The ability for the reuse of materials and the constant updating of open-source hardware and software disrupts the common cycle of quickly obsolesced consumer electronics that end up in a landfill within a relatively short period of time (less then a year) compared to solid wood chair (a use cycle often measured in decades).

Rams' last principle, "Good design is as little design as possible" (as cited in Lovell, 2011, 355), acts as a kind of manifesto for my design practice and methodology. During the design of the Brewcast interface, I used this principle to imagine what could be considered non-essential. For the Brewcast interface, by adding the ability to harness the existing power of the user's computer I made the interface have no control knobs, switches or other tactile elements (except for a gain control knob directly attached to the speakers amplifier on the back of the interface). The gestural act of brewing coffee is all that's needed to operate the interface using sensors. Even though I see these goals as unattainable, they encourage me to imagine a design practice where I can question, problematize and do good design in order to engage with and effectively intervene in contemporary design practice.

Brewcast Design and Branding

The name Brewcast comes from the connection between the project and two sources of conceptual inspiration and technological process used in the project. Brew refers to the brewing of coffee, a large component to the function of the interface. Brew also refers to homebrew, often referring to the brewing of alcohol at home, but in this case, refers to the Homebrew project, which is considered "The missing package manager for OS X". (Homebrew, n.d.) Homebrew installs many libraries on a computer running OS X and makes it easier to download and update files between many sources and developers, especially on Github (Github.com), a code development and sharing environment online. Github acts as a kind of social-networking hub for developers to share, edit and update code that a single or many users have worked on. This code can be applied to websites, games or micro-controller code i.e. for an Arduino to control motors or water plants. My Brewcast project uses Github as one of its online repositories to share and edit the code used in the project, which is all released as open-source, in order to contribute to the communities that I have used throughout the Brewcast project.

The "cast" part of the name comes from the Icecast2 streaming servers that are used to compress the audio in OGG Vorbis file format to stream over the internet. The streams I use are hosted by a service called Giss.tv and the stream is created in Pure Data (Pd) a free, open-source program that also controls the way the RFID and heat sensors effect the stream connection. These two concepts come together to create the term Brewcast.

The Brewcast logo (pictured in Appendix A) is based on the connection between coffee, audio input (microphone) and audio output (speaker). On the secondary logo, the three bars above the cup are representative of symbols often used in describing and demarcating Wi-Fi access points and wireless internet in general.

In Chapter 2, I engage, contextualize and synthesize the theories and practices of writers, artists and designers working within my field. In Chapter 3, I explain my material practice through a breakdown of the technologies used in the Brewcast interface and significance of the organic materials used, I reveal how my methodologies of discovery based practice lead me to address my design challenges in this specific way. In Chapter 4, I conclude my thesis by contextualizing the implications of my work and the areas for future research.

Chapter 2: Literature Review

In this chapter I will contextualize some of the relevant literary sources that inform my understanding of theoretical arguments within my field. Later in the chapter I expand on artists and designers who work within similar mediums and practices as myself. Then I highlight commercial design and later, hardware manufacturers that play a role in the authoring of learning materials, i.e. tutorials, product videos, and etc. that I use to understand how to apply the hardware I use and provide resources like example code and imagery for the imagination of design methods.

Theoretical Readings on Art & Design

Julian Bleecker wrote the essay *Design Fiction*, published in 2009. Bleecker opens his essay with a short quote, from Dennis Dutton's Twitter feed, "Fiction is evolutionarily valuable because it allows low-cost experimentation compared to trying things for real" (as cited in Bleecker, 2009, p. 4). This statement succinctly summarizes Bleecker's and my understanding of *design fiction*, put into practice. Bleecker (2009) describes the way design allows you to use your imagination and creativity explicitly, and that, the term *design* can denote a license to use creative processes that can reveal new experiences, social practices, or that reflect upon today to consider, habitable futures (p. 4). Bleecker (2009) asks the question, "If design can be a way of creating material objects that help tell a story what kind of stories would it tell and in what style or genre?" (p. 6)

My work attempts to answer that question. I use several genres of *design fiction* to actively imagine outcomes for a potential future product design, though I primarily rely on *design noir*. I use the genre of *design noir* to explore and imagine "real human needs" (Fried, 2005, p. 16) that might be present in social networking technologies like Twitter and Facebook, along with cellphone technology and the potential future of coffee drinking interface design.

This consideration of human needs is linked to the emotional characteristics of a design. What emotions does the artefact create, or even suppress within the user? Bleecker describes a device from his Near Future Laboratory called *Slow Messenger* that works as a response to this question, specifically addressing feelings of being overwhelmed, through the design of a portable, hand-held messaging interface. *Slow Messenger* works by augmenting the speed at which a message is received by only displaying a single character at a time, more emotionally charged messages take longer to receive, potentially taking up to a day to complete (Bleecker, 2009, p. 9). Bleecker (2009) goes on to explain the significance of the imagined device for the near future, "In most terms, such a device is preposterous, yet it starts conversations and considerations about the sometimes overwhelming communications practices of mobile and instant messaging" (p. 5). The need for making and doing is very present in the writing and prototyping work of Bleecker. My methodology can be contextualized by Bleecker's consideration of potential futures with a desire to realize them through making.

Another example of understanding through making is outlined in Nigel

Cross' (1982) article *Designerly Ways of Knowing* that a principal outcome of the Royal

College of Art's research project on "Design in general education" was the restatement of

a belief in a missing *third area* of education (p. 221).

Cross reproduces some of the main points on design from the RCA report, *Design

with a capital D*:

• The central concern of Design is 'the conception and realization of new things'.

• It encompasses the appreciation of 'the material culture' and the application of 'the arts

of planning, inventing, making and doing'.

• At its core is the 'language' of 'modelling'; it is possible to develop students' aptitudes

in this 'language', equivalent to aptitudes in the 'language' of the sciences - numeracy

and the 'language' of the humanities - literacy.

• Design has its own distinct 'things to know, ways of knowing them, and ways of finding

out about them.' (Cross, 1982, p. 221)

Cross' *Design with a capital D* methodology reflects an important part of my

practice. My design methodology and design practice relies on the experience of making

and doing to create knowledge. The kind of design education Cross is proposing here has

the potential to inspire methods of making and collaboration that can help artists and

designers like myself to create and collect knowledge that can be easily understood and

presented in a way that is accessible to many people. This methodology can work well in

tandem with online repositories like the ones I am using for the Brewcast project. By

using multi-media collections of data like photographs, tutorials and commented code, designers are able to spread their knowledge through doing and quickly apply the knowledge of others.

Relevant Practices Within the Field of Art and Design

In the following section, I outline various makers, designers, artists and companies that engage in the construction and application of communication technologies or the means to produce or augment them. Each of these sources create a narrative around their means of communication, many referring to the desire for humans to communicate with machines and each other. This making is often a way to learn more about ourselves through making. Whether through metaphors of computer learning and AI (artificial intelligence) or networked devices that reveal our abstract understanding of the invisible digital world of data and radio waves around us.

Inter-human Communication, Digital Representation and Computer Feedback

The particular fields of study I work within have been in development for several decades. There has been a rise in robotics in the 60s and 70s, networked communication, the spread of *mass media*, and the exponential rise in processor power found today in objects ranging from computers, cellphones and motorized transportation to toasters, stoves, and washing machines. An increasing number of artists and designers are dealing

with these contemporary subjects, trends, and potential futures. I have selected several examples of artists and designers who engage in these dialogues.

Multi-media artist, Doug Back's, *Small Artist Pushing Technology* (1987), a kinetic sculpture that rotates a small video screen around a circular track exemplifies his interest in the repetitive nature of human robot interaction. On the small screen, Back is seen pushing against the edges of the screens frame. When Back pushes, the screen, attached to a robotic rotating arm, moves the screen along (Langill, 2009). Back describes some of his inspiration behind *Small Artist Pushing Technology*.

Back states: "This version has more to do with our current state, in which we struggle to find the me to couple with machines, performing compulsive repetitive tasks to maintain our youth/health. The normal state for our bodies is slumped inert in front of screens while new information exercises itself within us" (Langill, n.d.).

Back's connection with the body and contemporary computer interfaces calls to attention, a critical art practice towards these technologies through his focus on the ability to be trapped in a Sisyphean cycle of self-harm through uncritical and continuous consumption of screen-based media and robotic automated systems found throughout every day life. My interface is designed with some of these *problems* in mind. The systems of interaction that I am proposing allows the user to engage in inter-human social networking in a way that doesn't confine a user to a singular screen interface and avoids making the user feel inert when using it.

Norman White creates art that uses computer programming to emulate and be augmented by human behavior. Most of White's work is interactive, often with the viewer working with or for a machine in order to win a telephonic arm wrestling contest, or to help soothe an uncomfortable robot. White, in collaboration with Doug Back, created *Telephonic Arm Wrestling* (1986), which illustrated the new possibilities in telephonic data connections and the new ways in which people can interact. White's piece *The Helpless Robot* (1987-96) is an interactive robot sculpture that must depend upon its synthesized voice to encourage people to move it as it would *like*. *The Helpless Robot* contains no motors, a wooden and steel frame and handles to rotate the object, the computer within processes how it is interacted with and makes *decisions* in order to develop an *artificial personality.* When a user interacts with the robot/sculpture, it says things like, "I appreciate your help but you are turning me too far, I said: go to the right! Go back I said, uh."(Poppe, 2006) The ability for White's work to capture the emotional resonance of the user and the imagined emotional response to them is an inspirational example of emotionally charged user interactivity in an interface.

White states that *The Helpless Robot* "is essentially an unfinishable work," (White, n.d.), since the embedded computing system that records data read from user interactions within the gallery can be adjusted and translated into other programming languages, in order to make new versions of the work. The source-code for *The Helpless Robot* project has been made available to the public by The Year Zero One (YZO). YZO is a non-profit media arts organization committed to the production, development and

presentation of electronic media art through networked exhibitions and site-responsive

projects in public space (YZO, 2006). YZO explains that, "By sharing and publishing *The*

Helpless Robot script, Norman White invites fellow creative individuals to collaborate on

a software project aimed at: creating more powerful and varied simulations of an

emotional entity. And by translating the code into Java or another web language, so as to

create a net-based version of The Helpless Robot (as cited by YZO, n.d.).

  This kind of institutional collaboration between artist/designers and non-profit

organizations is a potential new method of making and collaboration in order to create a

cycle of creation the includes: Artist/Designer > Design Store/Manufacturer/Gallery >

Consumer/Designer/Coder and back to Artist/Designer. The tools I use in the creation of

my works attempt to make this cycle easier. Especially through the inclusion of easy to

use micro-controller systems, open-source hardware and software, tutorials and example

code that explains how to use all of these things. To do this, I use my Github.com/

Brewcast and StephenSurlin.com/brewcast website. This method encourages the adoption

of modular consumer electronics and modifiable/interactive modular artworks in galleries

that interact with the viewer, and invite the viewer to contribute to the making of the work

as well.

  Julian Bleecker's work in design fiction has been a relevant source for me because

of his speculative process around his project *Slow Messenger*. When Bleecker started the

project, he had a series of questions around, at the time, new forms of networked

communication, he states, "Connected things in the era of IP networks always do their

thing as fast as possible...Almost without question, this is seen as a good thing. But I wondered what it would take to disrupt that assumption." (Bleecker, 2007a) This lead Bleecker to a series of questions, including, "What is "slow" in the era of connected things? Can there be a slow instant messenger device?" (Bleecker, 2007a)

Bleecker attempted to create a prototype to answer his questions around this potential design. Bleecker starts to construct a narrative around this work of design fiction by considering the current shifting in various tiers of service "with for-pay super high speed networks and bottom-tier, low-rent slow networks." (Bleecker, 2007a) Bleecker then considers the question, "Is it really safe to assume that we'll always have fast networks available to us?" (Bleecker, 2007a) He goes on to reference the way higher speed mail services are more expensive than standard postage, and that this trend could become a model for the future of internet pricing methods (Bleecker, 2007a). With this theory, it becomes clear how new systems for data streaming may shift the way we view the time it takes to communicate. Bleecker lands on three main criteria for what his prototype requires to function (Bleecker, 2007a):

1. Time, lots of it.

2. Commitment — the thing only works if I keep it close. If it's off on its own, it slows down its delivery to glacial proportions.

3. Movement — I basically need to carry it with me wherever I go. And if I don't go anywhere..if I sit at my computer all day, kind of like I did this entire afternoon and evening? That message just isn't going to move anywhere.

This radical set of criteria disrupts assumed norms around communication technologies, especially ones caused by desire, novelty or necessity (each not mutually exclusive). After completing a working prototype using an OLED screen that displays *instant* messages, Bleecker reflects on the process and it's results.

> "Efficient, quick communication is a product of power-politics. In order to exert one's influence geographically, it's necessary to communicate one's will over distances and do so in as little time and with as much efficiency as possible. Slow messaging just doesn't make sense in that context. And that simple necessity has soaked through most of our forms of communicating, even when we are not particularly powerful. It just becomes an assumption that communication happens quickly – not because it cannot be any other way, but because it has become part of the unquestioned "DNA" of communication as a social practice." (Bleecker, 2007b)

Like Bleecker's *Slow Messenger,* I hope to create an interface that shifts certain assumptions around the way people connect using communication technologies that include the telephone, radio, Facebook, Google Hangout or Skype. The Brewcast interface may be considered to constrict the virtually unlimited potential to connect to anyone anywhere or create a seamless zero-latency connection. Though I am attempting to imagine a potential future where the calming simplicity of limitations in potential connections, devoid of overwhelming choice, advertising and distractions, could give insight into the ways other future technologies can be imagined.

Artists, Designers and Open Source Making Practices

In this section, I will contextualize the work of several artists and designers that I share a similar practice with by highlighting their approach to user experience, the integration of technology in their work and how their use of, and contribution to, the open-source and maker communities influence my work. Artists and designers today work within an expanded field of design, where designers are no longer constrained to designing things right, contemporary design integrates dynamic interactions with objects, spaces and services (Suri, 2003). In Jane Fulton Suri's paper, *The Experience Evolution: Developments In Design Practice,* Suri, in association with the innovative design firm IDEO, writes about these expanded fields of design.

Suri's (2003) article states: "This expansion of opportunity for design is due partly to advances in technology that impact people's behavior and experience beyond specific individual objects. Increasingly we find ourselves designing for complex interactions that integrate hardware and software, spaces and services. A design project today is likely to involve connected products such as mobile digital devices, or systems of linked design elements" (p. 40). Suri makes an important connection to the increasing need for designers to consider the effects of integrated technologies and the new narrative opportunities to come. Suri (2003) considers designers' awareness of subtle details, cultural patterns and learned meanings in people's everyday behavior to inform intuitive and inviting interactions (p. 89). The Brewcast interface was designed with the intention

of emphasizing these subtle details and cultural patterns in order to inspire emotionally

resonant experiences by the user.

Limor Fried's use of *design noir* principles became manifest in her work. For

instance, the radio jamming *Wave Bubble* (2005) device, mainly designed to jam the

signals of nearby cellphones, in order to have a peaceful coffee break at a public cafe

when a noisy patron sits down nearby (Fried, 2005, p. 28). Fried refers to Anthony

Dunnes' writing *Hertzian Tales Electronic Products, Aesthetic Experience, and Critical*

Design (1999) to expand on spatial human machine interaction: "Hertzian space describes

what happens in front of the screen, outside of the object, it is part of the space our bodies

inhabit, even though our senses detect only a tiny part of it" (Fried, 2005, p. 7) My work

looks to frame a user experience that expands "outside of the object" (Dunne & Raby

2001, p. 12) as Dunne describes. Fried also works within a practice that incorporates

open-source design. She places the schematics and plans for circuit boards in her thesis

paper *Social Defense Mechanisms: Tools for Reclaiming our Personal Space* (2005). This

process is an important component to my work. My thesis exhibition will contain a

printed document that includes example code, descriptions of the hardware I use and links

to sites with tutorials on making or augmenting my work, along with the download of

these resources. This document will be a physical manifestation of the Brewcast online

repositories, github.com/brewcast and stephensurlin.com/brewcast. I want to propose a

system of consumer technology that encourages user reconfiguration of the product they

originally purchased or made themselves using plans/kits, in order to contribute to the maker community that enabled me to create my work.

Kyle McDonald is an artist who "works in the open with code" (McDonald, n.d.). He is a contributor to arts-engineering toolkits like openFrameworks, and spends a significant amount of time building tools that allow artists to use new code, programs and algorithms in creative ways. His work is process-oriented, and he has made a habit of sharing ideas and projects in public before they're completed (McDonald, n.d.). He enjoys creatively subverting networked communication and computation, exploring glitch and embedded biases, and extending these concepts to reversal of everything from personal identity to work habits (McDonald, n.d.). McDonald's website (http://kylemcdonald.net/) describes his practice in a way that encapsulates his playfulness, humor and social methods of design and art practice. McDonald has a diverse practice that includes: *Only Everything Lasts Forever* (2010)*, an online audio streaming piece that contains every sound we can distinguish as humans, as dictated by the MP3 specification (ISO/IEC 11172-3), creating a composition that is approximately 10^{450} years long. *Us+*(2013), is a Google Hangout app that analyzes speech and facial expression to "improve conversation". (McCarthy, n.d.) All of McDonalds' works use networked technology to expose how computer interfaces augment human interaction over the internet. From the compression algorithms of MP3 to allow for the kind of Icecast2 streaming servers I use in my work, to the computer sensing capabilities found in the

Google Hangouts that change the way people interact online. He then shares his progress

and results all along the way.

Commercial Design Practices

Teenage Engineering is a small design firm with 16 team members, established in

2006, the company describes themselves as a "Studio for future commercial products, and

communication" (Teenage Engineering, n.d.). They have only a few products in

production: the OP-1 synthesizer, the StudioSystem modular lamp, OpLab programmable

microcontroller MIDI/Sensor interface and the OD-11 wireless sound system. I am

inspired by all of their design work, though in particular, the OD-11 stands out as an

innovative use of embedded computing, wireless audio technology and minimal design

practice. The OD-11 uses a cloud system that connects the user to audio from other

connected devices like computers and mobile devices like smart phones. The speaker has

an embedded computer that plays the received networked audio through the amp and out

of the speakers. This all occurs within a small cube of about 10 inches. I am trying to

incorporate this style of technological integration into my Brewcast interface. The

Bluetooth enables the main speaker system to interface with other systems like a

smartphone or computer. The internal embedded computing system also takes care of

some of the processing and network connections to stream audio automatically from the

internet. This is similar to my use of Raspberry Pi and Pure Data to handle the automatic

processes like the sensing of the coffee's temperature and connecting to various audio streams.

Jawbone is a maker of Bluetooth enabled speaker and microphone devices, often used with cellphones or MP3 players. This commercial manufacturer developed the *Jambox* wireless speaker system and *Era* the in-ear Bluetooth headset. Both of these devices use wireless technology in an easy to use and intriguing housing. These design styles are influential on my work, though do not manifest in analogous ways. My work uses similar principles to create products that encourage user manipulation of the technology, or the hardware, found within the device, rather then focusing on a sleek exterior finish that discourages or renders virtually impossible any user experience of the hardware within the product.

The design firm IDEO, in association with MIT Media Lab, has recently released a conceptual design fiction campaign titled *Made In The Future* (MiTF).

*"*Made in the Future is an effort to capture our musings about what a not-so-distant tomorrow might look like. Our tools—faster, cheaper, and more out of control than ever—have triggered seismic shifts in how we design, manufacture, and distribute. And that has us asking lots of questions: What new tools or technologies will we create? How will they change the way we behave and learn? How will they shape our world?" (http://madeinthefuture.co/)

The MiTF project presents the viewer with a collection of design objects that are physically made and presented in video form, though not fully functional. The

presentation of these objects are animated using retro style animations that reference the nostalgia of imagining the future. This project establishes an inspiring balance between method of presentation and manufactured artefact. My work will exist in these two spaces, by providing a working prototype and displaying diagrams, imagery and video that can enhance the intended interaction and ethos around my Brewcast project.

OpenStructures (OS) is a project that was launched to establish a standardized system of modular parts that would allow users and manufacturers to share new parts that can work with existing ones. The OS website describes their project as an "ongoing experiment that wants to find out what happens if people design objects according to a shared modular grid, a common open standard that stimulates the exchange of parts, components, experiences and ideas and aspires to build things together." (OpenStructures, n.d.) To participate in the project a user can download the standardized grid, then design a connector plate, rope tie, etc. with these dimensions, then, they can upload the designs to the OS website for other people to download the schematic or purchase the part from the user. This system is an innovative way to include the user in the production method, and breaks down the barriers to entry within a manufacturing system. This process also inspires collaboration on a global scale, fostering the ability for citizens from around the world to contribute their unique knowledge about certain materials and process i.e. a builder from South America or China who is familiar with using bamboo, they can design a part to work with this material and people around the world can implement it. I would like the Brewcast online repository to function in this way, where people can download

instructions and code to use various technology like Bluetooth, infrared temperature

sensor, Arduino and audio amplification to implement it on their own projects or

contribute edits or tips on how these can be implemented differently within the Brewcast

project. This system can be a catalyst for the disruption of socio-economic paradigms of

production, information sharing and learning.

Open-Source Hardware Manufacturers and Online Learning Resources

The online stores, Adafruit.com and Sparkfun.com, provide a diverse range of

electronics components and tools that greatly increase access to many new kinds of

technology as soon as they come out. These companies also create breakout boards and

shields for microchips, which allows a person to use a piece of hardware like the RN-52

Bluetooth module by laying out the necessary connections in an easy to use way,

especially with breadboards, allowing for impermanent creation of circuitry.

These two websites also provide many online tutorials that can be downloaded

which explain how to use many of the components on their website. I have used many of

these tutorials to learn how to use and connect various systems in my work, including:

Raspberry Pi, Arduino, Bluetooth, Xbee, and more. Adafruit also has their own versions

of Arduino boards which they manufacture at their factory in downtown New York City,

USA. These systems of manufacturing and knowledge spreading are important to my

practice as models to achieve a symbiotic relationship that allows me to continue working

on projects involving these technologies.

Chapter 3: Material Practices

My practice is informed primarily through research based in discovery, trial and error, and a reaction to the materiality of the wood, electronics, software and other components within my work. The technology mainly consists of: Bluetooth, Xbee (radio), Wi-fi, RFID/NFC, Raspberry Pi (Linux), Arduino (Microcontroller), Audio(mics, speakers, amps) and sensors. These materials will inform, limit and inspire the work. I will explain my reasoning for choosing these technologies and the ways I implement them later in the paper. An early rendering of the aforementioned technologies can be seen in Appendix B.

I will present my thesis work within the OCADU Graduate Gallery. The work will present two slabs of wood on a table. One will act as the 'tray' and the other will be the speaker and microphone. A computer somewhere else in the gallery will stream and receive streams from remote locations using Pure Data, Icecast2 streaming servers and hardware. When the viewer enters the gallery, they can pour themselves a cup of coffee, and listen to the stream that enters the speaker automatically. The stream will consist of various sources i.e. a busy local coffee shop, my apartment, or an acquaintance from another city. Below, I provide a step-by-step guide of how the Brewcast interface will work for a visitor to the gallery:

1.The visitor enters and sees a table, on it will be, the Brewcast interface, and coffee making tools, i.e. electric kettle, beans, grinder, coffee press, etc.

2. The visitor will be invited to brew a cup of coffee using the press.

3. When the user places the RFID (Radio Frequency Identification) encoded cup and warm coffee press on the wood tablet, the connection to another Brewcast interface is established and sound from the Brewcast's speaker fades in slowly becoming audible as the coffee warms the surface of the tablet.

4. The user will then be able to listen to the ambient sound of a coffee shop or outdoor location, or, if another person is present on the other end of the connection, the user will be able to converse with them.

5. When the coffee is done and removed from the tablet or becomes cold, the audio will fade away and the connection will be lost.

Results of Material Practice

My material practice relies heavily on my ability to access tutorials, example code and diagrams through open-source communities that include websites like Sparkfun.com (Spark Fun Electronics), Adafruit.com (Adafruit Industries), Arduino.com (Arduino micro-controller boards) and Bildr.org. All of these websites have wikis (online user generated information systems), tutorial sections and user comment sections that allow large communities to contribute and edit content that helps other beginner, novice and beginner makers (a group of people who engage in these communities) to find complete diverse technology driven projects. My work also uses Github, the code sharing repository to find example code for Arduino and other aspects of Brewcast, and to store

code and information wikis online. I find the act of accessing and contributing to the data sources an important part of my material practice because of the way it encourages me to collect and formulate data in an easier to understand way for myself, and potentially, others as well. I consider the Brewcast project to be a continually evolving artefact/product, with no actual finish or complete point, the work is intended to have a symbiotic relationship with these methods and sources of research, sharing, and development, especially with the interfaces modular parts, that can be interchanged with other components. The materials and layout of the hardware can be seen in Appendix C.

As expected, I encountered many problems and obstacles. One of the main issues were discovered after the heat sensing hardware was installed and working. I placed the Bodum french press I was intending to use on the tablet. I noticed there was little to no heat transfer, rendering the interface unusable. I attempted to test other glass vessels and realized the Chemex brewing system would work best (pictured in Appendix D). The Chemex system of brewing uses a hand blown glass vessel that will come in direct contact with the sensing element, which is a brass plate with the infrared sensor directly below it, within the wood of the tablet itself. After switching to this vessel, it began to work accurately. This aspect highlights the complexities of making an interface that works without dedicated components and accessories to be used, i.e. a specific brewing vessel, cups, wood, etc. This emphasizes the need for the online repositories accompanying the project to provide ways to adapt to various conditions and materials, which is a major component of the maker community and culture.

Technology Breakdown

As mentioned earlier in my paper, I use an array of Arduinos, sensors/shields, RFID, Bluetooth, audio hardware, Raspberry Pi and external accessories, Pure Data, and web streaming Servers. In this section I will explain further, what these components are, and the ways in which they work together to create the Brewcast interface.

Computing:

Raspberry Pi – A small $45 Linux computer slightly larger than the size of a business card. This computer runs Pure Data (Pd) and can be used as a remote audio system by using this battery powered computer with a Wi-Fi dongle, allowing the unit to be used outside in a tree for instance.

The Raspberry Pi (pictured in Appedix C) is an important type of hardware for future maker community projects, especially because of it's low cost, relatively high power and widely accessible collection of tutorials and guides on it's use. I wanted to attempt to include this hardware in order to introduce it into my practice and to contribute to the Raspberry Pi community with my research, especially in the area of open-source audio streaming servers.

Arduino – The Arduino is a small micro-controller circuit board that can be programmed, to read sensors. For the Brewcast interface, the Arduino reads the temperature of the coffee using an infrared (IR) thermometer to read the temperature of

the coffee press and an RFID sensor, which reads a series of numbers from a readable disc attached to the users cup.

Once again, this is another important aspect to maker culture technology. This board has many tutorials and resources to learn how to use it and example code to help you get going on using various sensors and other hardware, i.e. infrared sensors, RFID sensors, and etc.

Software:

Pure Data (Pd) – A graphic programming interface, Pd uses objects like oggcast~ and ogamp~ which are used to stream Ogg Vorbis encoded audio over the internet. Pd also reads the Arduino data to allow tempreture readings and RFID to control when the stream is heard, and which streams you are connected to.

This software is open-source and runs on the Raspberry Pi. It has a wide range of capabilities including audio and video processing. The fact that this runs on the Raspberry Pi means that highly mobile, low-cost interfaces with power similar to smartphones can be developed relatively easily using resources from within the Raspberry Pi, Pure Data and maker communities.

Giss.tv Icecast2 streaming server – Giss.tv is a hosting website that allows you to register for a free Icecast2 server, which can be used to stream compressed Ogg Vorbis audio over the internet using Pure Data.

This group embraces internet freedom and open-source coding. The fact that this service is free vastly increases access, creating opportunity for the Brewcast interface to be in operation in areas that may not have much access to commercial banking (for online payment, credit etc.), or companies that provide streaming service in their region of the world. This system is also very easy to use with the Pure Data patch I have created, requiring the user to only fill in their given password and streaming channel address to connect.

Audio Processing:

RN52 Bluetooth breakout board – This circuit board syncs with a computer in order to stream audio from Pure Data to a remote object, in this case, the Brewcast interface.

The use of the RN-52 Bluetooth breakout board will be a research area with many potential applications for my research because of its ability to cheaply create two-way audio stream over a wireless network. If this board is coupled with a solar panel and microphone, a small unobtrusive unit can be placed in a forest or outdoor location to allow for remote listening anywhere in the world over the internet. These boards can also be paired to a cheap Android smartphone and be used to stream a live performance or public talk to allow a better streaming experience for listeners, instead of the traditional speakerphone.

Breakdown of Organic Materials in Work

Reclaimed wood from the Barn Board Store in Toronto, Ontario, was used for the main building material in the Brewcast project. This material possess live edge, which in interior product design describes the non-planared surfaces of a piece of cut wood, often the edges, with at least one surface planered flat, which I use to place a coffee press and cup. This style gives the wood an organic warmth, one that is synonymous with the warm and inviting aesthetic of many cafes/coffee houses, i.e. Dark Horse Espresso Bar in Toronto, Ontario.

Relationship to Theoretical Framework

My work can inhabit a space outside of the "continuous, homogenous and uniform" (McLuhan, 1988, p. 33) products like Teenage Engineering's OD-11 speaker system and Ortho Remote through my material practice, which emphasizes the "discontinuous, non-homogenous, resonant" (McLuhan, 1988, p. 33) qualities of reclaimed, untreated wood as the main construction material and modular visible electronic components.

There is a metaphorical connection that I want to emphasize through the untreated reclaimed wood, that still possess its live edge the sides of the wood often made up of bark, worm/beetle damage, etc. This metaphorical connection might lead a user to feel a connection to organic material or feel part of a community of coffee drinkers that frequent cafes that utilize this aesthetic. McLuhan describes the use of these ideas in the new

acoustic space, stating that, "Older cliches are retrieved both as inherent principles that inform the new ground and new awareness, and as archetypal nostalgia figures with transformed meaning in relation to the new ground." (McLuhan, 1988, p. 105) The design of the Brewcast interface looks to embody these older cliches and aesthetics, while combining technologies to create a narrative around the use and aesthetic of the interface.

Reflexive Consideration of Methods

Using computer technology that remains "hidden" with a semi-familiar interface that controls and facilitates the social communication, I hope to create a unique user experience that can offer an abstracted communication experience. An experience that doesn't fit cleanly in the category of telephone, text/message or other contemporary social media systems.

The concept of acoustic space allows for this expansion, and a system of *tetrad* analysis helps to contextualize past and current technologies to attempt to find a method of design that can speculate around potential user experience like the one I am trying to create. My design methodology allowed me to learn through doing and adjust the design of the interface. I had to work through problems in the code of the Arduino and Raspberry Pi and adjust the function of the Pure Data software, all of which came from a continual process of making.

Chapter 4: Conclusion

Implications of Work

Ubiquitous computing, IoT and ambient interfaces, the design methodologies and theories outlined in this paper, can be used to creatively imagine, speculate, and make artefacts, a process that creates a narrative, creating an emotional quality as well. The cultural object that this method of design creates can be understood through Dunne's notion of cultural object. As he states, "Perhaps the "object" can locate the electronic in the social and cultural context of everyday life. It could link the richness of material culture with the new functional and expressive qualities of electronic technology." (Dunne, 1999, p. 19) By creating a diegetic prototype for a post-smartphone design fiction I can connect the cultural motivations for the kind of technological change that makes Brewcast possible. The Brewcast interface also introduces new culturally based ways to interact with networked objects, concepts that fit within the emerging fields of Internet of Things (IoT) and ubiquitous computing (ubicomp). The retrieval of certain technological paradigms, like the oral telecommunication of times before the internet and the obsolescing of hardwired or individualized communication technology (each person with their own smartphone) can give rise to a more connected and ubiquitous form of internet enabled communication.

The knowledge shared in the repository for Brewcast helps contribute to knowledge within the Pure Data, Raspberry Pi and Arduino communities. This is an important feature for open-source technology makers. The open-source maker community

is always in need of feedback, updates and application research because they do not have the resources found in the research and development (R&D) departments of large corporations.

Future Research

My future research can lead me to learn more about the histories of ubiquitous computing and other early user interface design practices and paradigms. One of these new sources for research can be found in Mark Weiser, who worked as a researcher in ubiquitous computing at Xerox PARC starting in the late 1980's. Weiser's ideas on calm technology reflect many important goals that I set out to achieve with Brewcast. "Designs that encalm and inform meet two human needs not usually met together. Information technology is more often the enemy of calm. Pagers, cellphones, newservices, the World-Wide-Web, email, TV, and radio bombard us frenetically" (Weiser & Brown, 1995). This shift in designing technology to calm the user and increase the user's ability to experience a large amount of periphery stimulus is an important part of where I could take my research. The increased focus on periphery stimulus could allow the user to exist more within an acoustic space, as I defined earlier, this space would continue the user's sensual experience of smells and tastes of the coffee, ambiance within their space, whether it be a coffee shop or outdoor park while engaging in conversation with another user or connecting to a remote location.

My future research will lead me to examine the way multiple "nodes" (connected points over the social network) can create new types of interactions i.e. adding audio streaming systems within trees, under water, under the ground, in the air for example. By creating a website that contains example code and plans, along with the potential to upload new content by users from around the internet, I could implement the ability for user-generated content. This could include new collections of code for the Arduino, Bluetooth unit or Pure Data. This would allow for collective learning and spreading of knowledge around these technologies. By creating an ecosystem, one that generates, consumes, and synthesizes knowledge around these technologies, the Brewcast system can expand and grow. An ecosystem like this can also sustain the project, by fixing bugs, updated code and software for new systems, all things that could contribute to a stagnation and eventual decline in the Brewcast system's use.

The networking ability and potential for emotional resonance caused by the sharing of acoustic space over distance could be an area for investigation between people and other elements within the ecosystem, in particular, bees. Bees can are an important part of the ecosystem I live in, Toronto, Ontario. Bees are also in danger due to rapidly dropping populations and the reduction of green spaces due to urban development and suburban sprawl. By establishing a sensual relationship that encourages a person to share in acoustic space with a bee or a bee community within a hive, a unique connection can be made that might increase a kind of empathy or understanding that can inspire a person to acknowledge the bees' presence and importance, or take action in the community to

help them survive. By monitoring the activity of bees, a person could gauge the effects of low bio-diversity in the region, which affects people (less flowers, fruits, etc.) and the bees (less food, less opportunity to polinate, etc.), this might cause a more empathetic relationship than was had previously. Shifts in attitude like this could lead to shifts in social activity and lead to a healthier environment within a community. Using technology to form bonds between people and bees, a narrative, and emotional resonance can be created. The empathy that comes from this kind of connection may be a valuable asset to groups looking to increase attention to environmental issues around bees. I could work with a group like U of T B.E.E.S. On the University of Toronto campus to create an open-source system that the public can contribute to and use, another way to increase attention to the group.

I have begun to look at the research of Sarah Peebles, a Toronto-based American composer, performer, and installation artist, has several projects that work with local bee varieties by creating audio and sculptural based projects that involve the bees. Peebles' work, *Resonating Bodies* is a "series of mixed media installations and community outreach projects which focuses on biodiversity of pollinators indigenous to the natural and urban ecosystems of the Greater Toronto Area" (Peebles, n.d.). Peebles' work involves various installations that allow the viewer to observe the activities of bees, for example, through a cross section of a wood log covered by glass that allows the viewer to observe the bees' natural habitats, along with microphones inserted within the bees' nest in order to hear the nuanced sound of the scratching, motion and processes of the bees.

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The public outreach found within the project is an inspiring use of educational tools, art and design, *Resonating Bodies* coincided with the release of Toronto's first guide to native bees, *A Guide to Toronto's Pollinators*, by Laurence Packer, Professor of Biology at York University (published by the David Suzuki Foundation) (Peebles, n.d.).

Works Cited

Ashton, K. (2009) RFID Journal. *That 'Internet of Things' Thing.* Retrieved from
      http://www.rfidjournal.com/articles/view?4986

Bleecker, J. (2007a) World's Slowest Instant Messenger. Retrieved from
      http://blog.nearfuturelaboratory.com/2007/04/02/worlds-slowest-instant-messenger/

Bleecker, J. (2007b) Slow Messenger Prototype (II). Retrieved from
      http://blog.nearfuturelaboratory.com/2007/10/28/slow-messenger-prototype-ii/

Bleecker, J. (2009) *Design Fiction: A short essay on design, science, fact and fiction.*
      Near Future Laboratory.

Buchanan, R (1992) Wicked problems in Design Thinking, *Design Issues, Vol. 8, No 2.*
      Cambridge, Massachusetts, United States: MIT Press.

Cross, N. (1982) Designerly ways of knowing. *Design Studies, Vol. 3, No. 4.*
      Butterworth & Co. Ltd.

Dunlap, D. (2014, April 30) The 21st Century Is Calling, With Wi-Fi Hot Spots.
      The New York Times. Retrieved from http://www.nytimes.com/2014/05/01/
      nyregion/the-21st-century-is-calling-with-wi-fi-hot-spots.html?_r=1

Dunne, R. (1999) *Hertzian Tales: Electronic products, aesthetic experience, and critical design.*
      Cambridge, Massachusetts, United States: MIT Press.

Dunne, A. and F. Raby (2001) *Design Noir: The Secret Life of Electronic Objects*. Basel, Switzerland: Birkhauser.

Dunne, A. and F. Raby (2013) *Speculative Everything: Design, Fiction, and Social Dreaming*. Cambridge, Massachusetts, United States: MIT Press.

Fried, L. (2005) *Social Defense Mechanisms: Tools for Reclaiming our Personal Space*. Cambridge, Massachusetts, United States: Massachusetts Institute of Technology.

Homebrew (n.d.) Homebrew. Retrieved from http://brew.sh/

Kirby, D. (2009) *The Future is Now: Diegetic Prototypes and the Role of Popular Films in Generating Real-world Technological Development*. Sage Publications.

Kostelanetz, R. (2003) *Conversing with Cage*. London, England: Routledge. 70.

Langill, C. (2009) La Fondation Daniel Langlois. *Shifting Polarities: Interview with Doug Back*. Retrieved from http://www.fondation-langlois.org/html/e/page.php?NumPage=1954

Langill, C. (n.d.) ASPECT Magazine. *Small Artist Pushing Technology*. Retrieved from http://www.aspectmag.org/works/small-artist-pushing-technology

Lovell, S. (2011) *Dieter Rams: As Little Design As Possible*. London, England: Phaidon Press.

Made In The Future (n.d.) Overview. Retrieved from http://madeinthefuture.co/

McCarthy, L (n.d.) Us+. Retrieved from http://lauren-mccarthy.com/usplus/

McDonald, K. (n.d.) Bio. Retrieved from http://kylemcdonald.net/

McLuhan, M. (1988) *Laws of Media: The new science.*Toronto, Ontario, Canada:
        University of Toronto Press. 98.

OpenStructures (n.d.) Home. Retrieved from http://www.openstructures.net/

O'Toole, M. (2013, September 17) Why Toronto city councillor Josh Matlow wants free wifi in
        public spaces. *Nationl Post.* Retrieved from
        http://news.nationalpost.com/2013/09/17/why-toronto-city-councillor-josh-
        matlow-wants-free-wifi-in-public-spaces/

Peebles, S. (n.d.) Details. Retrieved from http://sarahpeebles.net/resonating_2.html#description

Poppe, I. (2006) Rhizome.org. *Norman T. White*. Retrieved from
        http://rhizome.org/discuss/view/23260/#44678

Sullivan, G. (2010) *Art Practice as Research: Inquiry in Visual Art, Second Edition.* Sage
        Publications. *65-92*.

Suri, J.F. (2003) The Experience Evolution: Developments in Design Practice*. The Design
        Journal, 6/2,* 39-48.

Teenage Engineering (n.d.) Contact. Retrieved from http://www.teenageengineering.com/contact

Weiser, M. & Brown, J. S. (1995) *Designing Calm Technology.* Retrieved from http://
www.ubiq.com/weiser/calmtech/calmtech.htm

White, N. (n.d.) The NorMill. *Art Page*. Retrieved from http://www.normill.ca/artpage.html

YZO (2006) Year Zero One. *About Us*. Retrieved from http://www.year01.com/about

YZO (n.d.) The Helpess Robot. Retrieved from http://www.year01.com/archive/helpless/

Appendices

Appendix A: Brewcast Logos
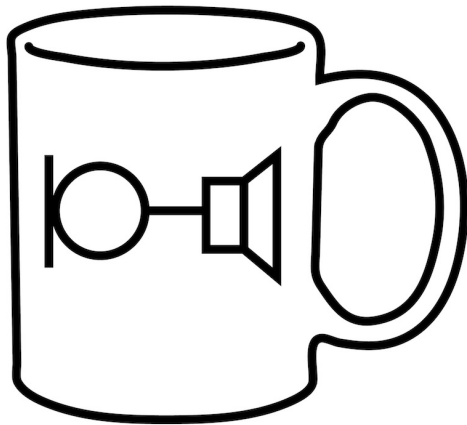
Appendix B: Brewcast Initial plans
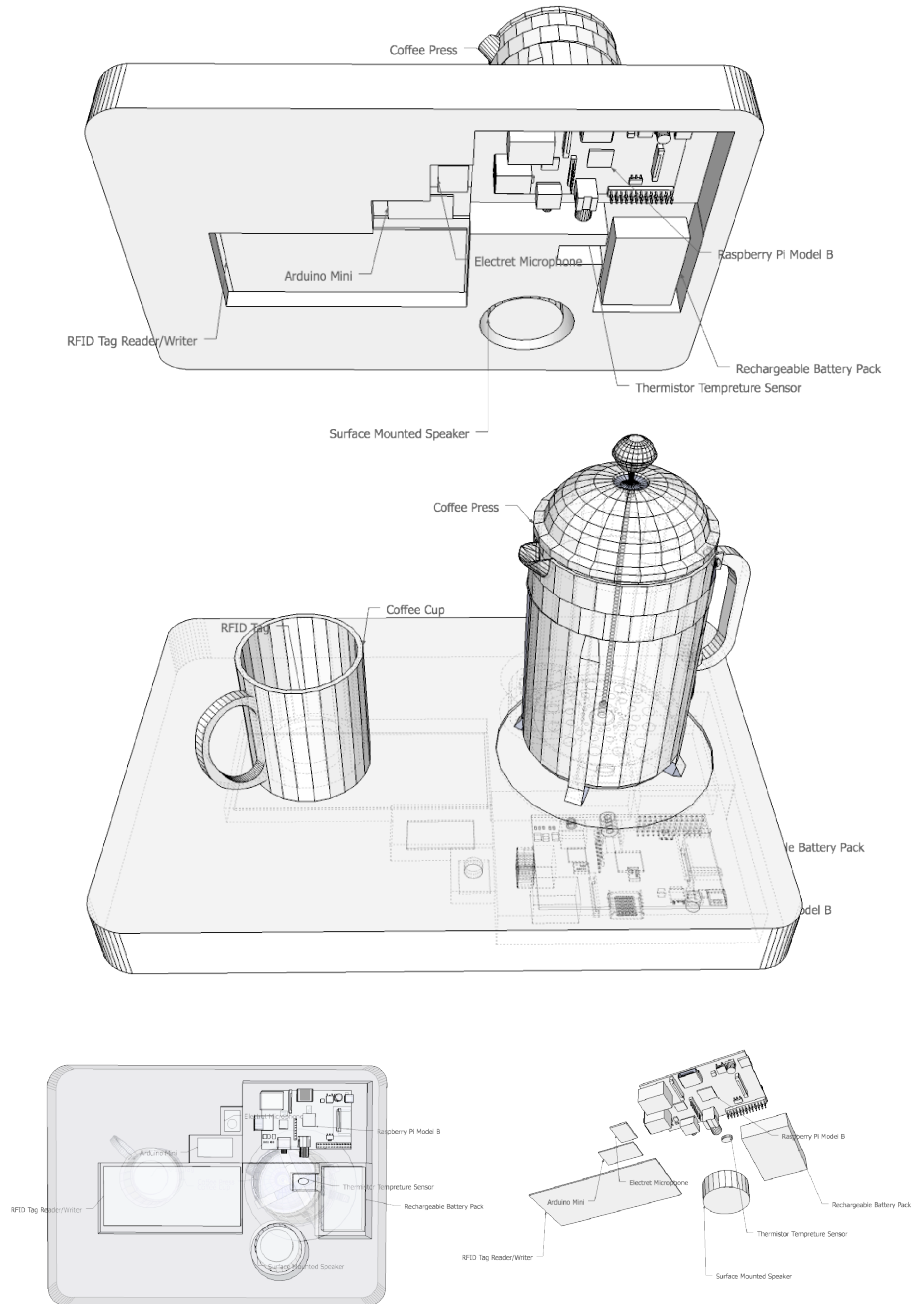
Appendix C: Brewcast Materials and Process

Above, the main two pieces of wood used to make the Brewcast interface are shown. The larger piece of walnut will house the microphone and speaker, the smaller piece of hemlock houses the RFID and temperature sensor.
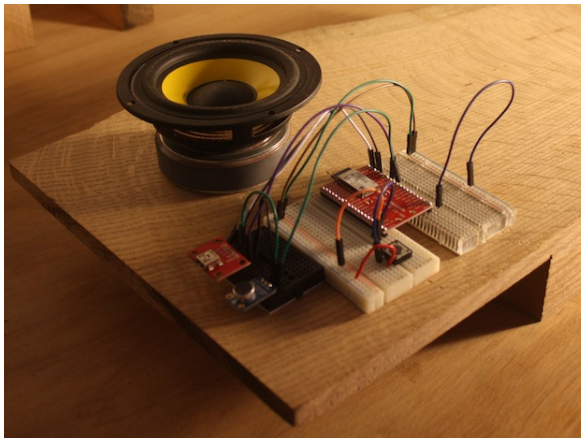
A view of the initial placement of the sound hardware.
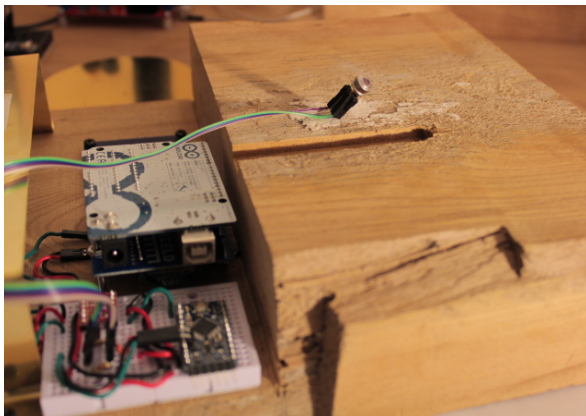
Left, a depiction of the heat sensing element being installed. This infrared heat sensor sits approximately 1 cm below the brass surface that detects the heat from the coffee brewing vessel, w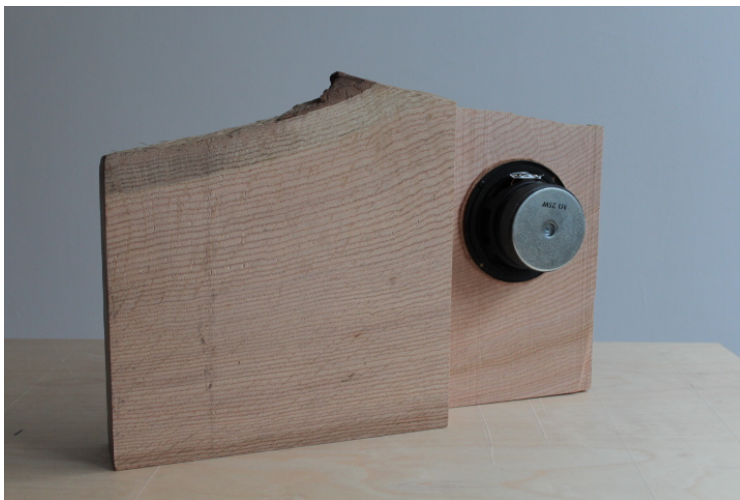hich in my example interface, is a Chemex brewer with a glass bottom that transmits heat to the brass plate very easily.
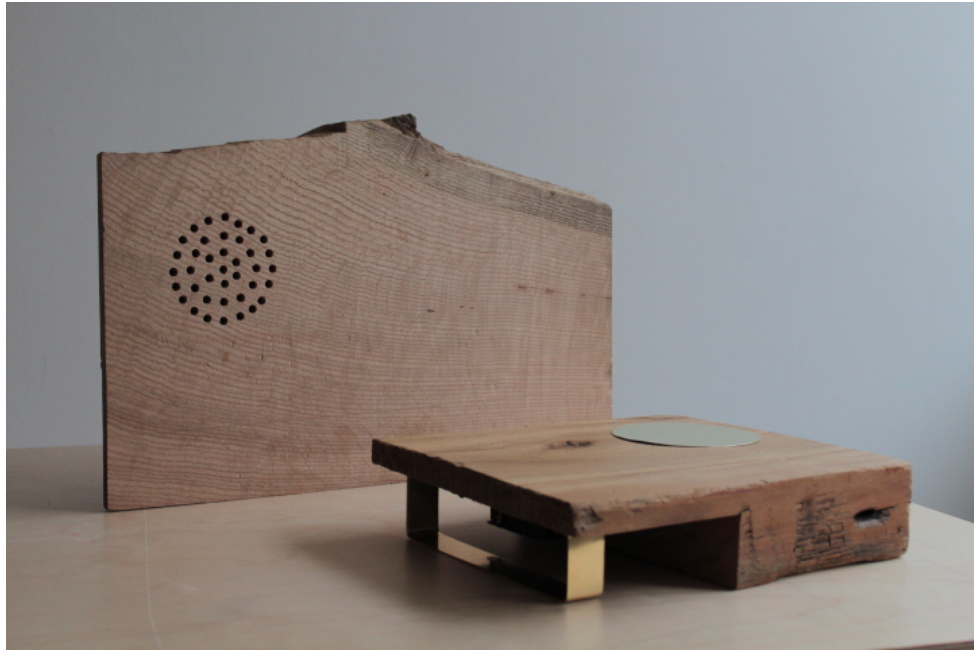
A view of the RFID (Radio Frequency Identification) enabled cup.

The bottom of the tablet that contains the RFID and temperature sensing.

The back side of the audio element of the Brewcast interface.

Above, some initial ideas around the way these objects would look during use.

Above, a photo of the Brewcast interface. The Chemex brewer is pictured beside the RFID enabled cup. The brass plate, adjusted to the diameter of the Chemex brewers base can be seen to the right, underneath the Chemex.

The Raspberry Pi and accessories are shown. With this system, I could run Pure Data, streaming audio over Wi-Fi, with audio input and output. Being powered by a solar powered USB battery pack.

A highly directional microphone is attached to the amplifier, connected to the Raspberry Pi. This makes it easier to record distant birds while reducing ambient noise.
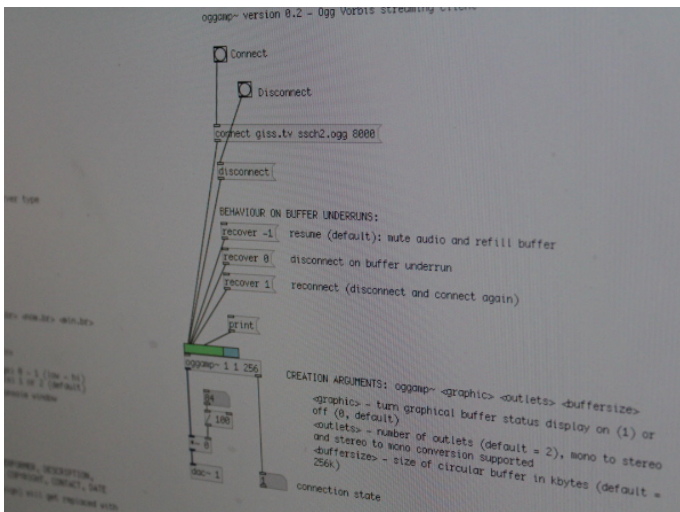
Pure Data is used on each computer involved in the project. Here it is seen on an iMac (OSX), though the same program runs on the Raspberry Pi (Linux/Raspbian) making it easy to develop, share and learn the programming involved in Brewcast.