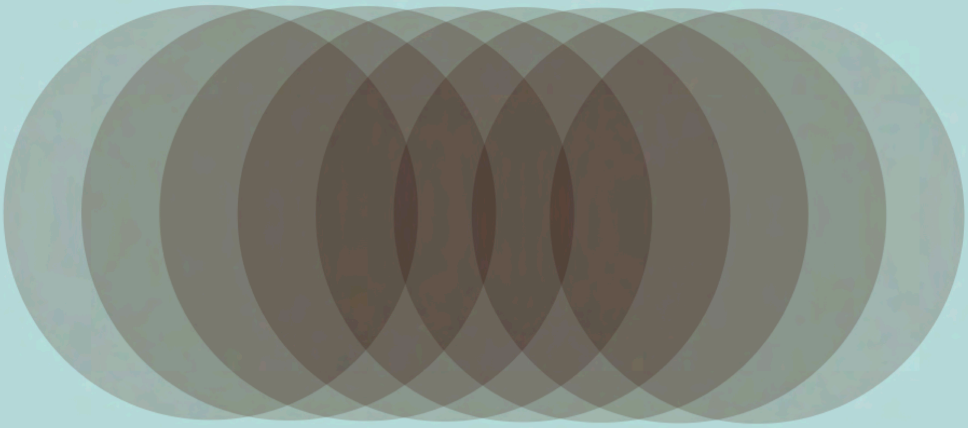
The Post-Functional Paradigm

Leaving space in the design for an appropriating user



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Abstract

With this thesis we will give an overview of what we see is a paradigm shift for viewing technology. Using mainly theories focusing on philosophy of technology, we establish an overview of a rationalistic, deterministic stance towards technology that we call the Functional Paradigm. Applying this view to a series of Tactical Interventions, its shortcomings became evident mainly in the users' appropriation of the artifacts presented to—or taken away from—them. This enabled us to establish a shared understanding of what we call a Post-Functional Paradigm. This views technology as being a non-neutral, influential part of our lives that we need a deeper understanding of, rather than treating it as a rational, problem-solving machine. In conclusion, we establish the main principle of the Post-Functional Paradigmatic view as using technology in aiding the modern user in solving problems that cannot be reduced to entities existing in pre-defined Problem Spaces. We argue the novelty of computers must be washed away to view technology as a means to an end rather than being the center of our problem solving behavior.

“…the computer is here, and no doubt it is going to develop. Everybody, or almost everybody, seems a little uneasy about this, and why not? This is man’s first encounter outside himself with something that is exactly like some inside part of himself.”

— E. E. Morison

“People often assume I find computers and software interesting in themselves. I find them about as interesting as cars or washing machines.”

— William Gibson

Prologue

Studying within an IT-related field such as Information Management at a business school has proven to be an interesting mix, which has left us with impressions of the necessity of conducting research related to businesses' needs for competing better in the future through the application of user-friendly tools.

In this thesis, we have chosen to focus on areas that are not immediately linked to the traditional fields of study at business school, specifically financial and organizational subjects.

However, for us, there is a clear link between designing better products and improving the bottom line for the businesses that create something people use every day. There are still clear implications for focusing on the internal management of information in improving the efficiency for businesses but this will not be the focus of this thesis.

We argue that while Information Management in itself is more relevant today than ever, having an offset in that field from our bachelor's degree has left us with a level of understanding in the fields of organization theory, information technology and communication that has given us further insight into the relevance of focusing on design to improve product-related areas.

By focusing on the design-related issues we hope to give an impression of how we think this field is being formed today—and how it should develop. We see a paradigm shift happening and there needs to be a clear understanding of the value of design if businesses want to gain insight into how they can embrace the changes that are already happening in the information age.

“We're designing for this kind of machine dialect.

And how far can you take that?

You can take it really, really far.”

— Kevin Slavin

“I'm an operator, with my pocket calculator.”

— Kraftwerk, “Pocket Calculator”

Introduction

Since the first digital computers were introduced we have seen a change from calculation devices to an ever more powerful and pervasive use of microprocessors in every facet of life. We interact with transistors when we least expect it, while still maintaining a conceptual model for computers that rarely goes beyond the desktop or the immediate vicinity of the home and work space.

This thesis will give the reader an understanding of how we came to think of computational devices as efficiency-driven technology that have clearly defined boundaries and possibilities. The human-computer interaction has gone from (often female) operators called *human computers*, to punch cards and through monochrome screens to pieces of glass and aluminum that you carry with you everywhere and use in every situation. This has clear implications on how we approach technology and apply it to our everyday needs. And more importantly, how we see the shift from a Functional to a Post-Functional Paradigm that is currently taking place.

We will provide the reader with a perspective on the Post-Functional Paradigm that will enable her to make better decisions when designing for a user that is no longer expecting to be told how to use the technology, yet still expects something that can be picked up and put to use immediately and without hassle.

Research Question

To structure the path towards a definition of the Post-Functional Paradigm, we have chosen the following research question:

> *If we assume we are in the midst of a Post-Functional Paradigm where the design-use relation is established by the user's appropriation of the design rather than a paradigm where the technology is constituted by the notion of form following function, how has the user's role then changed?*

Technological development has so far been dominated by a rationalistic tradition that is both deterministic in nature and with an assumption that technology is neutral. The American philosopher of science and technology, Don Ihde, argues that we have always used tools to technologically enhance our everyday life—he went so far as to give his book "*Technology and The Lifeworld*" the subtitle "*From Garden to Earth*" to reflect this notion. He is also the author of what is seen as the first North American work on philosophy of technology, *"Technics and Praxis"*, released in 1979, thus rendering him one of the founding fathers of the philosophical stance towards technology.

Both Ihde and Andrew Feenberg, the Canada Research Chair in Philosophy of Technology in the School of Communication at Simon Fraser University, focus on the Industrial Revolution and the new technologies introduced in this period which changed how we transport ourselves, how long we live and how we organize ourselves around work.

Throughout the 20th century, computers underwent quantum in their level of sophistication and the highly influential English mathematician, logician, cryptanalyst and computer scientist, Alan Turing, even proposed an *"Imitation Game"* (which is now better known as *"The Turing Test"*) to see if we could build machines that were as intelligent as to be indistinguishable from human beings. Artificial Intelligence, or versions thereof, was used as ways of marketing computers for managerial use to achieve higher levels of insight in decision-making.

Computers were seen as tools that could heighten efficiency, and development revolved around making previously tedious, manual tasks much easier, to ensure that every organizational employee was used to their full capability.

We argue that this functionalistic paradigm is still at the forefront of most computer technology manufacturers' minds when designing new tools for the modern-day user. The problem is that it relies on a set of premises that belong to a technological period we argue is now obsolete. We now live in the Post-Functional Paradigm that no longer rests on solving *decision problems*.

What implications does this have for how technology is created, purchased and used today? And how do you design for this paradigm shift if pure function is less relevant than what the user makes of your technology, and how they make it their own?

To answer those questions, we establish the Functional Paradigm using theories from writers such as the previously mentioned Don Ihde and Andrew Feenberg, as well as the author of several works on *Cybernetics* and *Post-Humanism*, Katherine Hayles, and American professor of computer science Terry Winograd in cooperation with Chilean engineer, entrepreneur and politician, Fernando Flores. These will provide us with the historical overview of how technology has evolved from the “Garden” to the fully inherited “Earth”, as Ihde proposed, with a vision of computers on the way to becoming self-evident and with human-like intelligence.

Having established the Functional Paradigm, we turn to a range of Tactical Interventions that will provide us with an insight into how users appropriate technologies—and how the premises of the Functional Paradigm are evident in their use of technology.

We will look at how two users make a rubber band fit their needs (or whether they will fail in doing that) as well as how a software developer will use an Arduino-powered button in relevant settings to fit different, everyday purposes. Lastly, we made two typical users of the popular online social network, Facebook, give up their access to the site for a week to see how they coped with being cut off from their primary access to their friends' status updates.

The Tactical Interventions will be used as a starting point for an exploration of the premises of what could be defined as the Post-Functional Paradigm. They will provide us with a starting point for a *hermeneutical-phenomenological* discussion of how users appropriate technologies in a *design-use relationship*.

As a sum-up of the thesis, we will provide a working definition of the Post-Functional Paradigm as related to the design-use relationship. This will enable both designers and users to critically reflect on their own use of technologies that are conceived as if they were part of the Functional Paradigm but belong to a reality that has greater demands for their optimal use.

“Something is happening here

but you don’t know what it is,

do you, Mr. Jones?”

— Bob Dylan, *“Ballad Of A Thin Man”*.

Introducing the Functional Paradigm

If we are to claim that there is a shift happening from a functional towards a Post-Functional Paradigm, we must establish a clear overview of how the paradigms are defined. Moreover, it can be helpful to look at pivotal events that, in our view, can be discussed as being the ones that helped set the paradigm shift in motion.

Throughout this thesis we will mention technologies that are not based upon computational means, but in general, when we refer to technology, it will refer to the kind of technology that incorporates microprocessors, and, more often than not, a Graphical User Interface (GUI).

The reason for doing this is to ensure a proper scope of the critique, as the paradigm shift is most evident in our use of the highly sophisticated, modern technology that is the Personal Computer. Moreover, we see the Functional Paradigm as being established in the post-war period, most evidently in Europe. Already during World War II, Alan Turing was developing methods for deciphering German war messages with the aid of computational machines.

After the war, computers were still supporting calculation tasks that were written by whom the American philosopher of science and technology, Don Ihde, refers to as "*quantitative thinkers*". He writes in his book, "*Technology and the Lifeworld: From Garden to Earth*": "*Most of the practitioners of technical processors are themselves quantitative thinkers. Situations equal problems which imply solutions, the means of which are rational (calculative) processes.*" (1990:178)

This means that scientists testing hypotheses were the only users of computers and, more importantly, also the only ones who knew how to program for them. This

somewhat natural restriction in usage inevitably leads to a view of the computers as being able to solve the rational problems of mathematics, which users were trying to solve. Moreover, the technological development followed a progress that enabled them to do computational tasks ever faster, thus getting more problems solved at a higher rate. At some point, the computers even became able to accommodate more than one user at a time.

Even when the users moved on from *being* the operator called a *computer* to using *punch cards* and later having *terminals* sitting at their desks within the span of a few decades, or even years, the computer was still seen as a machine made for solving rational problems more efficiently, built on the same *Boolean* logic established by the *von Neumann architecture*.

In the following part of our thesis we will establish a shared understanding of what this rationalistic, deterministic view on technology still means for the users of computers today.

Determinism

Feenberg writes in his book "*Questioning Technology*" (1999) that *Determinism* is based on two premises:

1. **Unilinear progress**
2. **Determination by the base**

The *unilinear progress* implies that technological advances merely follow a process where the inevitable next steps of advancement will come naturally. Ihde (1990:5) continues the description of the technological deterministic worldview by stating

that in the deterministic view, *“once invented, technologies simply follow a line, almost context-less.”*

Such progress fully determines how technology progresses from simplistic to advanced configurations, and thus leaves little or no room for deviations from the intended course. Klaus Krippendorff, a Professor for Cybernetics, Language, and Culture at the Annenberg School for Communication at University of Pennsylvania, writes in his book, *“The Semantic Turn”* (2005:7): *“Products for everyone had to be of universalist aesthetics, culture-free and valid for everyone.”* If this is true, it becomes apparent why it is not uncommon for companies to educate their users in the right use of a given product. The principles of *unilinear determinism* will necessarily dictate that there is but one purpose, or correct use, that cannot be compromised. This is why manufacturers of products make long manuals and spend large amounts of money on certifying users.

Employing the view of technological determinism and training your users in how they should use it inevitably expose an underlying principle. If the organization behind the design and manufacturing of the artifact has to train people in using it, before they find out in which way they can make use of it, is it really something the end-user wants? One could argue that even though the intentions behind bringing a certain technology to market might, almost by coincidence, fit some needs of the customers', a design that facilitates the same universal aesthetics Krippendorff mentions, would require a need to fit into every context it is applied to as well. This fits neatly with the scenario of scientists and their students working with computers to solve a particular kind of problem, but one can easily see the issues that arise when doing manufacturing for the masses that come from different backgrounds and with different technical skills.

This technological perspective also provides us with a set of assumptions on the predominant design paradigm of the *industrialization*. The turn that is imposed by more advanced technology is about more than just adapting to technological process.

German philosopher, sociologist and political theorist, Herbert Marcuse and French philosopher, social theorist and "historian of ideas", Michel Foucault—two of the most influential philosophers in the 20th century—opened a space for philosophical reflection on social control of technological development. They argued that technology is a form of *power*; a power that must ultimately still be seen in the light of the deterministic perspective, in which the task for a designer is to convey the purpose of technology as close as possible to originally intended (Feenberg, 1999:6).

It is, however, important to note that both Marcuse and Foucault reject the *technical rationality* that dominates determinism in that they challenge the notion that there is such a thing as a destined path or goal for technology. They argue that the rationality should address the *social discourse* that takes place between the user and the technology (Feenberg, 1999:7). This leads to a critique of the famous quote by the architect Louis Sullivan that *"form follows function"*.

If we are assured that the essence of technology is that its functions fully influence the form of it, the designers are enforcing the social control and power that Marcuse and Foucault speak of. This also means that there is only one use of the technology and that in order for an end-user to take full advantage of it, educating the user will be necessary. This way the designer can ensure that the setting in which the user will take advantage of the technology, will be the one they had in mind when designing it. Creating a program for solving mathematical problems that you and your colleagues face every day when walking up to a computer the size of a house,

makes it easy to ensure that everybody knows the intentions and the desired outcome of using the program. That simply cannot hold true today when the users are much more diverse in their technical skills and the backgrounds they come from are vastly different than those of the uniform user group.

Problem solving and decision making

In line with the established views in the introduction to this section, the technical rationalistic views implicitly commits designers to define design as *problem solving*. It aligns well with the worldview during the first period of using computers but it greatly simplifies the design process and outcome of same. Feenberg (1999:75) further argues that such pessimistic views on *Modernity* stem from the German sociologist and political economist, Max Weber's theory of *Rationalization*, in which he defines the *Iron Cage of Bureaucracy*. From his standpoint, deterministic premises leave no room for *Democracy*—the same underlying democratic principle that suffers as described in Marcuse and Foucault's view on social control and power exhorted by the designer.

One could argue that democracy is not as relevant in a design context as in a sociopolitical context, and Feenberg does indeed have a great interest in a political angle on philosophy of technology, as a result of, among other things, his works on the Parisian student revolts in 1968. However, it is what might be defined as the *democratization of technology* by allowing regular users to take advantage of computers that informs what we will define as the Post-Functional Paradigm in relation to design. For Krippendorff, determinism is also seen as bounded to the *Industrial Revolution* and the following structure built around manufacturing. Feenberg describes determinism as the inevitable path of development that is discovered through a continuing search for efficiency. This pursuit of *efficiency* can

be seen as the result of following a problem-solving approach, and the aim to ensure that the technology design is applied in the right way, as intended by the designer.

It is this search for efficiency Feenberg criticizes because it symbolizes the reduction of e.g. factory workers to *cogs in the machine*, rather than individuals that have a free will. His views on this are strongly influenced by the works of, amongst others, the political philosopher, Karl Marx. We will, however, in this thesis focus more on the personal relations to technology as opposed to the political motivations behind designing technology to optimize workers' efforts in a capitalistic society.

If we look at the American philosopher of science, Thomas Kuhn, we will find that, in *Kuhnian terms*, the deterministic *paradigm* is focused on efficiency, or what might be defined as *normal science*. This is problematic if indeed we are at the verge of a *paradigm shift*, as it implies those who follow the thought of a unilinear progress lack the categories with which they need to comprehend what is changing. If rationalistic, deterministic worldviews are focused on solving problems with higher efficiency, one could argue that the real issue lies in the fact that they might be solving the wrong problems, albeit at incredible speed (Feenberg, 1999:77).

This brings forth interesting questions, however. What will happen if the worldview and interests on which the designer has formulated the existence of the technology do not align with the intention the user seeks to apply to it? Does the design take into consideration such deprecating behavior and can it act on this? Krippendorff (2005) argued that designers used to deal with this by educating the users and developing roles of certified users to help guide others. But what happens when the user expects to use a technology without being trained extensively? How does the designer then ensure that the intended purpose is understood by the user?

It is clear from this that we can assume that the argumentation Feenberg outlines relies on the users to interact with design in the same rationalistic sense as the designer.

Essentialism

The principle of exposing the one true meaning intended by the designer is the focal point for Feenberg in *"Questioning Technology"*. He describes it as *Essentialism*: that technology is *"essentially functional and essentially oriented towards efficiency."* (Feenberg, 1999:VIII) Moreover, in Essentialism there is only *"one essence of technology"* and it will thus act *autonomously* (Feenberg, 1999:VII, 3). This is not to imply that technology will become self-aware and wreak havoc as seen in science fiction movies. Rather, the implication is that technology, once invented, is *neutral* and devoid of cultural meaning. We, as users, will in this view encounter technology as essentially oriented towards a use (Feenberg, 1999:211).

To the German sociologist and political economist, Max Weber, as well as the Canadian philosopher Marshall McLuhan, the *epistemological* event that unleashed this essence of technology can be traced to *Modernity*. The rise of evidence-based science and culture's separation from nature lies, according to Feenberg (1999:3) behind the focus that made us efficient and purely rational. It is, however, important to note that in Weber's and McLuhan's view, this is seen as a *dystopian*, *complexity-stripping* turn.

Terry Winograd, American professor of computer science and Fernando Flores, Chilean philosopher, debate in their seminal work *"Understanding Computers and Cognition: A New Foundation for Design"* (1986) that there are three characteristics of the *rationalistic tradition*:

1. The rationalistic tradition stems from *rationalism* and *logical empiricism*, which can be traced to Plato
2. It is effective in *hard science*
3. It is based on *deterministic mechanisms* whose principles can be captured in *formal systems* (Winograd & Flores, 1986:15)

Feenberg (1999:202) goes even further than this with his *Instrumentalization Theory*, a two-level theory that focuses on the *Primary* and *Secondary Instrumentalization*. For now, we will focus on the Primary, as the Secondary concerns the *Social Constructivistic* views on technology that we will analyze thoroughly in the latter part of this thesis.

To Feenberg, *"Essentialism offers insight into the primary instrumentalization by which functions are separated from the continuum of everyday life and subjects positioned to relate to them."* (1999:202) This is directly opposite to the purposes of *Constructivism*, as it *"introduced difference into the question of tech."* (1999:X)

In short, focusing on Essentialism is to neglect the *Secondary Instrumentalization* that will arise through use and focus solely on the deterministic, rationalistic functions aimed towards higher efficiency in problem solving as found in the *Primary Instrumentalization*.

On the subject of Social Constructivism, Feenberg writes that: *"Technology is not considered an appropriate field of humanistic study because we are assured its essence lies in technologically explainable functions rather than a hermeneutically interpretable meaning."* (1999:83) This point is supported by Winograd & Flores, who write: *"Some critics say that everything that can't be explained rationalistically or*

through hard science is some kind of mysticism, religion or fuzzy thinking. That is, a throwback to earlier stages of civilization." (1986:16)

This tells us that those focused on a rationalistic worldview focus on capturing the essence behind the problems they encounter and solve them rationalistically. Language and *semiotics* are an important part of what Winograd & Flores' critics define as *"fuzzy thinking"*, and the clash with rationalistic tradition is described as follows: *"The rationalistic tradition takes language as a representation—a carrier of information—and conceals its central social role. [...] Language can not be understood as the transmission of information, [it] is a form of human social action [...]."* (1986:17) To them, capturing language in bits and pieces defies the purpose of it. They further argue that *"the rationalistic tradition regards language as a system of symbols that are composed into patterns that stand for things in the world. Their ultimate grounding is in their correspondence."* (1986:17)

Winograd & Flores' definition of language as a carrier of social responsibilities goes against the rationalistic tradition's view on breaking problems down to *transferable information* that can be solved by rational means. In essence, *"rationalism refers to discursive practices that promote the notion of separation of mind, mental processes and ideas from any material manifestation or embeddedness."* (Winograd & Flores, 1986:24) Thus, in the rationalistic view, technology is autonomous, neutral and fully determinate in its development towards a predetermined future state.

Having established the foundation for the technologically determinate and rationalistic tradition technology has been built upon so far, we will advance the argument further by discussing the *scientific methods* stemming from the rise of modernity, before moving on to the theories on *Bounded Rationality* and *Artificial Intelligence*. This will leave us with a clear overview of the history of the

technological development that has followed in the wake of the rationalistic tradition, as well as a foundation for the *Tactical Interventions.* Finally, we will analyze the implications it has on our argument whether we are in fact in a Post-Functional Paradigm.

The scientific method

The scientific methods that have been developed over the years have dealt with many traditions in understanding the relationship between the physical world and mental processes. In this thesis we aim at incorporating both the rationalistic as well as the philosophical technical and humanistic traditions. Over the years we have seen how the scientific traditions have influenced technological development and the way science has perceived the role and use of technology. This part of our thesis seeks to understand the complexities that the scientific method entails on what *constitutes valid reasoning*. By nature, this type of discussion is predominantly philosophical but it is important that we gain an understanding of the adherence to the scientific methods employed and traced back to the studies of Plato (Winograd & Flores 1986:14), Aristotle and Descartes.

The scientific method described by Maturana (in Winograd & Flores, 1986) involves the following operations:

(a) *observation of a phenomenon that, henceforth is taken as a problem to be explained;*
(b) *proposition of an explanatory hypothesis in the form of a deterministic system that can generate a phenomenon isomorphic with the one observed*
(c) *proposition of a computed state or process in the system specified by the hypothesis as a predicted phenomenon to be observed*
(d) *observation of the predicted phenomenon.* (Maturana 1978)

This type of methodological framework positions the theory on thought with an emphasis on the nature of the processes by which they are logically applied. (Winograd & Flores, 1986) For example, in mathematics and logics these rules are essential for understanding how we think, perceive and act.

In relation to the mathematic world its purpose is built upon finding the truths in the hypotheses formulated on the basis of the phenomenon observed, as argued by Maturana. The only conceivable alternative to this is arguably the kind of *mysticism*, *religion*, or *fuzzy* thinking according to the rationalistic tradition (Winograd & Flores, 1986). So, in order for us to analyze the actions and decisions of individuals we must consider these frameworks represented in the rationalistic tradition as it has shaped the way that scientific method is being applied and take this into account in our analysis of what constitutes the Post-Functional Paradigm. What the rationalistic tradition taught us is that it is necessary to give primacy to the complexities that are constituted as valid reasoning in the interplay between the physical space and our behavioral experiences.

The heritage of Cartesian Dualism

It is clear that the rationalistic tradition operates with a rationale centered on the individual. Even though it is arguably the individual we are analyzing, it is only natural to understand the circumstances that pervades in the individual's activity sphere. However, the *Cartesian Dualism* (Guttenplan, 1996) tradition has been one from which many have distanced themselves or compared their hypothesis with. Descartes led the more modern objectives on dualism as he too was occupied with the constitution between mind and body, or, as he described it, *Substance Dualism*. The substance in the Cartesian sense referred to the properties that are spatially extended and the mind on which the property thinks (Guttenplan, 1996). The

discussion of *Cartesian Dualism* was centered on the legacy that was left by Aristotle and his conception of the shape of matter of substance. For Aristotle, matter depended on the form it had, i.e you cannot form a knife out of butter (Guttenplan, 1996). This reasoning is built on the understanding that the nature of the matter is a necessary condition for the substance.

The uncertainty that has been left by this conceptualization is to understand how we interact—how we can unite both thought and the physical extension of our body. The road that dualism, both in terms of Aristotle and Descartes, has tried to map is a scientific methodology into interaction that stretches from thought into action. Undoubtedly this has laid the grounds on which practice and activity theory have later established themselves—grounds that have conceptualized around the self in an individualistic sense, posing a clear understanding that there exists a distance between self and the material world, though these are inevitably interconnected and dependent on each other.

The critique that this tradition has met in earlier times, compared to the days of Aristotle and Descartes, has, among others, been expressed by Professor of Social Computing at Newcastle University, Peter Wright and Senior Lecturer in the Department of Applied Psychology at University College, Cork, John McCarthy in their highly influential book on user experience, *"Technology as Experience"*: *"In their attempt to radically undo Cartesian Dualism, practice and activity theories have replaced a solely individualistic concept of self, always separate from the material world, with a communitarian concept of self that is predominantly external and has only impoverished access to its own mental states."* (2004:43) What this critique proposes is that the same distance between mind and material world does exist, it is quite possibly more clouded than Descartes and Aristotle first assumed. We will elaborate later in this thesis on the arguments of Wright & McCarthy but for now we

will leave it as an establishment of the identification that mental and physical events are influenced by each other and that this influence is rooted in our daily experiences and the reason why we act behaviorally.

Bounded Rationality

On February 12, 2002, Donald Rumsfeld, then American Defense Secretary, gave an explanation on American foreign policy at a Defense Department briefing. It concerned how the military would have to change strategy to get more information on areas they did not know about. It goes like this:

"We know there are known knowns: there are things we know we know. We also know there are known unknowns: that is to say we know there are things we know we don't know. But there are also unknown unknowns—the ones we don't know we don't know." (Defense Secretary Donald Rumsfeld, Defense Department briefing, February 12, 2002)

It is certainly a tongue-twister when said out loud and the quote itself can be found many places on the Internet, nominated as a "dumb quote" (indeed, we found it in a list of *"25 dumb quotes from the Bush administration"*). One could still argue that the idea behind it is quite clever as it perfectly describes the issues at hand when dealing with *Bounded Rationality* and the issues of making decisions on incomplete information.

Before looking at Bounded Rationality, we will establish an understanding of the term *rationality* and its history, as it deviates slightly from the *rationalistic* understanding we have used until now. Rationality derives from economics and the *rationality as optimization* model which states that decision making is a fully rational process where, using the information available, the person must find the

best choice given the circumstances to reach what the person finds is the most *desirable state*.

Models focused on rationality are found commonly in economics, where it is assumed that people will act rationally when presented with a set of choices to make. Rationality in this regard is the action of looking at the options that are presented to you and basing a decision *rationally* on what will be the preferred outcome of your choice.

This is a highly idealized situation, especially when taking the behavioral aspects of economic rationality into consideration. The American economist, Richard Thaler (1980), coined the term *Endowment Theory*, which states that when people have bought something, they will demand more to give it up than they would be willing to pay for acquiring it. It is part of the range of behavioral theories within economics, as it explains our lack of rationality in our decision-making process. If we were as rational as it is idealistically described above, we would be able to determine fully objectively the value of an object and let it go for the price it is worth to a buyer. We do not, however, act rationally in that situation as the emotional connection we have to the artifact will make it feel as if it was worth more to us than it is to others.

Bounded Rationality as simplifying strategy

As we have described in the section on rationalistic, technological determinism, there is a tendency to look at technology as following a predetermined development cycle, or linear progression. One might argue this is because we cannot cope with the possible future situations that might derive from a technological development we have not anticipated. In the words of Donald Rumsfeld, it is a situation of *“unknown unknowns”*.

Herbert Simon, whose research was spread across areas such as cognitive psychology, cognitive science, computer science, economics and philosophy of science, talked about *Simplifying Strategy* as part of Bounded Rationality. He stated that in a decision-making situation we have a tendency to grasp the possibilities presented to us in a greatly simplified manner. There are many reasons for this, and Simon (1957) includes *lack of information* (that we may or may not know we do not have), *inadequate time* or simply *cognitive limitations*. In the situation where a manager has to take a decision on the strategy of the company, the decision that will be reached is based upon simplified ideas of what can and, more importantly, should happen in the future.

The decisions taken in any given situation are, according to Simon (1957) not based on the full knowledge of the situation because of human limitations. We do, however, still take decisions, otherwise we would not get anything done and just stand still, completely perplexed by not knowing what to do before we have every piece of information available at hand. Thus, we make decisions that we feel are "good enough" based on the information we have.

Simon (1957) called this situation *Satisficing*. We are satisfied with making a decision in the situation based on the level of information that we have to reach the preferred set of consequences, because obtaining the rest of the information that could be used to make an optimal decision is deemed too expensive or hard to get.

In Winograd & Flores (1986:20), they state that the idea of taking a rational decision that is fully optimized on a level of complete information is an idealization. There are too many uncertainties that the decision maker cannot, or does not, know about.

When making a decision that can be characterized as *Satisficing*, however, Simon (in Winograd & Flores, 1986:146) defines how we make that decision. As previously stated it is about reaching a preferred set of consequences, but he also characterizes it as *"a hermeneutic search among alternatives in a Problem Space of possible causes of action"*. The theory of *Hermeneutics* is something we will describe extensively later in this thesis, but for the purpose of this explanation it will be introduced briefly here as well.

Hermeneutics was originally the act of interpreting a text but has since evolved into covering interpretations of situations and both verbal and non-verbal communication as well. (Ihde, 1990) Thus, the hermeneutic search among alternatives is a person trying to grasp what each alternative will mean if they make a decision based on that particular set of consequences. For a manager in a company, it could be whether they should raise the prices on their goods to accommodate fewer items sold, fire people to meet the lower level of revenue or keep prices at the same level and the people employed to see if the economy in general will change. Those three alternatives will be interpreted by the manager as having different consequences; will people buy fewer goods with higher prices? Will we be able to meet demand if we fire people and sales go up soon? Will the economy be better in six months so we can just wait for the revenue to go up again?

In the example above, the manager is trying to determine the consequences facing her *behind* each decision. She acts within what is described by Simon as a *Problem Space* defined as the information she currently has, e.g. whether it is just a slight dip in sales, or if the government is helping her as a small business owner etc. Everything she has at her disposal regarding the situation she finds herself in, refers to the Problem Space because she has to take a decision based on that

information. Thus, the *causes of action* refer to what she is trying to read *hermeneutically*. Satisficing in this regard is a gamble, as the causes of action are unknown—maybe even an unknown unknown, because something could happen that the manager did not even know would have a consequence on her actions.

If the manager is facing the same kind of problem multiple times, however, she might start to make decisions based on a set of *Heuristic Principles*. Hammond, Keeney & Raiffa (1998:120) talk about ways of making decisions within Bounded Rationality, but based on *Experience*. They called them Heuristic Principles, as people gain experience in making decisions based on what they have previously experienced were the outcome of their actions. In the example above, the manager might have been in a situation before that resembled the one she finds herself in at the time of decision-making. Then, she might have had a successful strategy for dealing with declining sales by laying off a couple of employees to come through the economic turmoil without too much damage done to the company. Thus, she might turn to the same actions again as they have worked before.

However, because of the nature of Bounded Rationality, many other factors might influence her; such as Experience, Simplification and Satisficing, which will lead her to a bad decision. She just might not know it before she has seen the consequences of her actions as the problem-solving space was filled with information and input that did not help her make a sufficiently efficient decision in the end.

Bounded Rationality as a theory and concept can be seen as a way of describing the shortcomings of people's ability to make decisions based on rationality and what they might think is all the information possibly available to them. The reason this is relevant to our thesis, and in particular the Functional Paradigm, is that the technological determinatively oriented theories regard technology as following a

straight line of development that is inevitable in nature. We build something that spawns a new creation and that is the only way it could be.

However, Herbert Simon argues that we make decisions based on the information that is available to us, and we cannot possibly know what the world will look like in the future. We can create inventions that will lead us to a new state but we cannot know what it is before we arrive at it.

The notion behind Bounded Rationality is what lies close to the ideas behind *Artificial Intelligence* and why especially Winograd & Flores dismiss the idea that computers can eventually obtain human-like intelligence.

Artificial Intelligence

A recurring theme throughout a vast majority of the material we have read for this thesis is a critique of the rationalistic goal of creating a sentient machine; a computer with *Artificial Intelligence* (AI) that possesses human-like cognitive abilities.

Ihde (1990), Feenberg (1999) and Winograd & Flores (1986) in particular, all reach the conclusion that computers cannot mimic human thought processes, and although they reach that conclusion in different ways, they agree it is rooted in the definition of *Problems* and the language games people engage in through discourse. In this section of the thesis we will focus on the problem-solving space and, based on the conclusions reached in the previous section on *Bounded Rationality*, how the rationale applied to computational models cannot be used for mimicking human thought processes.

Definition of problems

To establish a working definition of *problems*, we will look toward Allen Newell, who was a researcher in computer science and cognitive psychology at Carnegie Mellon. Newell contributed to two early examples of Artificial Intelligence programs: *The Logic Theory Machine* in 1956 and *General Problem Solver* in 1957—the latter with the previously mentioned Herbert Simon. They were both awarded the A.M. Turing Award in 1975 (New York Times, 1992). In 1972, Herbert Simon and Allen Newell wrote the book *"Human Problem Solving"* in which they defined *"general problem-solving behavior"* in the following way:

"A person is confronted with a problem when he wants something and does not know immediately what series of actions he can perform to get it.... To have a problem implies (at least) that certain information is given to the problem solver: information about what is desired, under what conditions, by what means of what tools and operations, starting with that initial information, and with access to what resources. The problem solver has an interpretation of this information—exactly that interpretation which lets us label some part of it as goal, another part as side conditions, and so on." (Newell & Simon, 1972:72-73, in Winograd & Flores, 1986:22)

The take-away with this definition is that it concerns a *situation* in which the person does not immediately know *how* to get what she wants. There has to be some information that the desire for a new situation is based upon, otherwise the conflict between the current and future state will not exist. Moreover, sifting through the information that the desire is based upon has to be interpreted to separate the goal from the side conditions etc. to ensure that success criteria can be established properly.

Elaborating on this, a related view of problem solving is provided by Winograd & Flores (1986), who define four key elements:

1. Task Environment — The Task Environment refers to the characterization whereby the problem solver is able to identify the current state of affairs, actions that can change it and the goals from which rational actions can be derived.

2. Internal Representation — The problem solver has a form of *Representation* of the Task Environment. It is made up of *Symbol Structures* that are parts of the constitution of the problem solver—this being both experience, code and beliefs.

3. Search — Before making a choice, the problem solver will go through a process of analyzing information related to various courses of action.

4. Choice — Finally, the problem solver will decide which one of the courses of action directly applies to reaching the desired goals.

If we have in mind the definition of *Bounded Rationality*, we will see the issue facing us when building computers defined as having *Artificial Intelligence* based on the principles above. A computer's *Internal Representation* will be limited by the amount of information that is available to it, as well as the scope of its code—it is, in other words, bounded by its rationality.

When we create programs for the computer, we are taking advantage of this specific type of rational behavior. The programmer will choose a programming language to write code in, and thus make the computer act in a specific way. These patterns of behavior will determine how the user can interact with the computer and what the specific program will do. It will still, however, require input from the user before it

does anything. A simple math program could for instance be used to create graphs, a to-do program will show a list of things the user writes on the list and a painting program will let the user draw pictures.

These programs do nothing in and of themselves. The blinking cursor will—as is also the case currently while writing this sentence—wait for the user to take initiative and give input. The user cannot simply tell the computer to write a paragraph on Artificial Intelligence without e.g. programming it to find the most quoted sentences from a range of scientific journals on the subject as well as defining what a meaningful sentence looks like. Winograd & Flores (1986:87) state that *"as a programmer, one views the behavior of the system as being totally determined by the program."* Unless there is an unintended *bug* in the system that makes it unable to run, or show unexpected results, it is fully determined to do what the programmer has programmed it to do.

Defining Artificial Intelligence

Why are we then so interested in the idea of *Artificial Intelligence*? If the programmer knows that the behavior of the program is totally determined by what she has stated it should do, why are we even thinking about the possibility that computers might be as intelligent (or more) as us?

One answer could possibly be found in the principles behind the famous *Turing Test*. Alan Turing was, among other things, and as described previously, a cryptologist employed by the English government during World War II at the Government Code and Cypher School. He was responsible for breaking German ciphers, and headed the Hut 8, a group focused on conducting naval cryptanalysis on German communications. (Copeland, 2006)

After the war, Turing became more interested in computers (his Manchester Mark 1 was one of the first *stored-program computers*) and began to research the problems surrounding Artificial Intelligence. The Turing Test is interesting in its setup, because, one could argue that it will not prove that computers can think but that humans have failed to tell whether they are talking to another human or a computer. Hayles (1999:XI) defines the test as follows: *"If you cannot tell the intelligent machine from the intelligent human, your failure proves that machines can think."*

In his book "The Most Human Human", the author Brian Christian, who holds a double degree in computer science and philosophy, tells the story of the annual Loebner Prize competition that has been held since 1991 in various places. In this particular year in which he is a *confederate*, that is a human participant that has to convince a jury they are not computer programs trying to mimic human conversation, it is in Brighton, England. He ends up winning the award for being "the most human human" but in 2008, one particular program was only beaten by a single vote, so in that sense, we have come close to failing the Turing Test in the Loebner Prize competition.

One could argue, however, that if the premise is to fail to identify the computer as non-human, the Turing Test has already been failed numerous times. Joseph Weizenbaum, a computer scientist at MIT, wrote a program in 1966 called ELIZA, simulating a therapist that was programmed to talk to patients in a natural language. The program would pick up on key words from the sentences uttered by the patient and reframe them as either questions or comments. E.g.: *"I'm unhappy,"* the patient would say. ELIZA could then reply: *"Tell me why you're unhappy."* These conversations could, theoretically, last forever, as the program would have a

fallback mechanism when it did not understand the utterance along the lines of *“Tell me more.”* (Christian 2011)

Thus, if failing the Turing Test is to be fooled by computers into thinking that we are talking to another human being, it happened decades ago. This poses the question, though, what Artificial Intelligence really is, if the Turing Test is focused on fooling humans into thinking it is not a binary machine writing at the other end of the screen.

Winograd & Flores (1986:126) with their focus on cognition and computer science, list a range of ideas about what Artificial Intelligence can do (which, even though it is written for their contemporary audience, is still highly applicable today):

1. Aid decision-making
2. Do reasoning, make judgments and learn.
3. Going from data to information, from information to knowledge and someday even knowledge to wisdom.
4. Act as a cognitive simulator

The advertising regarding computers and their intelligent abilities evolved around the idea that they could crunch numbers for the manager to act upon. They would make the managers and business owners capable of seeing all-new patterns in their finances that were previously hidden. Computers could go from showing data to establishing meaning around them and present information-backed reasons for taking action on a problem. It would even discover patterns that, based on previous experience it had learned from, enabling it to predict what situations would look like going forward. (Winograd & Flores, 1986:126)

There is a range of issues in the above stated paragraph with the way computers capable of Artificial Intelligence would work. There is a presumption that computers can jump to conclusions based on the information presented to them, which, according to the American cognitive scientist, Marvin L. Minsky, is not possible.

Minsky (as quoted from Winograd 1974:75 in Winograd & Flores, 1986:113) brings forth an example of jumping to conclusions in a human sense: *"Tommy has just been given a new set of blocks. He was opening the box when he saw Jimmy coming in."* In the text, there is nothing that refers to what is in the box—we jump to the conclusion that the set of blocks might come in a box, and since Tommy has just been given them, they are still in an unopened box. A rational computing system will not be able to make that conclusion except in a situation where it has been presented with a situation that looks like this previously and stored that information—or if the programmer has put it into the source code for the program.

The problems, as we see it, with the four principles outlined above are the focus on jumping to conclusions. Minsky's example shows that computers do not possess the logical process of taking incomplete information and making a balanced judgment on the basis of it. It can in some sense aid decision-making, as it might process mathematical calculations faster and more reliably than a human being, and thus give insight into statistics used to base decisions on. Moreover, one could argue that it "learns" if the programmer has decided that whenever the program encounters something that has not already been stored in its database, it should add it and base further "decisions" upon this information as well.

Christian (2011) elaborated on this point as he found through his research for the role as *confederate* at the Loebner Prize that the modeling computers are based

upon are mimicking those of a *mathematician*: *"It's modeling the way a person solves a problem, not the way he recognizes his mother."* (2011:64) This also means that it is not possible for the computer to paraphrase and use enthymemes to create a synecdoche of the situation either—there will, as was the case with the example of Tommy's new set of blocks, be no way for the computer to fill out the gaps in the situation described. Christian described this difference as *computability theory* that is resting on the mandate to *"Produce correct answers, quickly if possible"*, as opposed to *complexity theory*: *"Produce timely answers, correctly if possible."* (Christian, 2011:156)

Also in relation to this, the American cognitive scientist Daniel Dennett, who has researched extensively in philosophy of mind, science and biology, is credited with coining the term *Intentional Stance*. It refers to attributing intelligence to machines because in doing so, you are taking an Intentional Stance. He states that with this Intentional Stance you will claim *"on occasion, a purely physical system can be so complex, and yet so organized, that we find it convenient, explanatory, pragmatically necessary for prediction, to treat it as if it has beliefs and desires and was rational."* (Dennett, "Mechanism and responsibility", 1973:246 in Winograd & Flores, 1986:106)

Attributing computers with beliefs and desires is, according to Winograd & Flores (1986:106), a source for confusion when at the same time attributing them with rationality *"in the formalized sense"*. Focusing on the domain of human discourse, they argue that computers can never enter commitments and be responsible in the sense that human beings can be. They seem to argue that what sets us apart from computers is that "other people" are not necessarily rational but responsible beings —we are responsible for entering commitments, computers are not.

Wright & McCarthy (2004) turn from technology as dominated by *rationalism* to domination by *practice*. They point to Winograd & Flores (1986) as well as Coyne (1995) as literature to which people can turn for a foundation of the critique that technology is too focused on rationalistic thought. Moreover, they focus their work on *technology as experience* and thus state a critique of the rational thinking behind Artificial Intelligence as pointed out above. They argue that by treating technology rationalistically, *"in many cases incurably and sometimes paradoxically 'cognitive' treating the people who use technology as unlikely to experience technology, resistance, doubt, ambiguity, or suffering."* (Wright & McCarthy, 2004:25)

The argumentation behind *domination by practice* will be used in the part on *Social Constructivism* as it relates to the point that it is in the use of artifacts meaning arises.

The argument against Artificial Intelligence is advanced further by introducing Coyne's four approaches to computer systems in the Rationalistic Orientation. The four approaches highlight the shortcomings of orienting oneself deterministically towards seeing Artificial Intelligence as a substitute for—or alternative to—human thought. The approaches are *cognitive modeling and Artificial Intelligence, Formal Theory*, *Methodology,* and *Empirical Studies*. Coyne argues that the focus on *Cognitive Modeling and Artificial Intelligence* brings forth the *main tenets of Rationalism*:

1. The separation of the inside world of the subject and the world of the object.
2. The essence of thought described in terms of formulas, production rules, and axioms, processed through context-independent reason
3. Communication seen as passing information from one subject to another through the medium of the external world

4. The priority of goal-driven, plan-directed human action that uses internally represented knowledge in plan execution.

These tenets all illustrate the same point that when programming a computer capable of displaying Artificial Intelligence, the focus is on creating a program that can reduce complexity to rationally solvable problems, not to create a program that will gain sentience and construct thoughts and beliefs. The programmer creates a computer that does not have *free will* but is bounded by its rationalistic structure of code.

One way of overcoming this would be if we could "just" upload our brains to the computer, thus, as the futurist and transhumanist, Hans Moravec, has proposed, *"you are the cyborg, and the cyborg is you."* (Hayles, 1999:XII) In this sense, the computer will be a repository of you, and whether this is even conceivable from a Functional Paradigmatic stance, will be discussed in the upcoming part on Post-Humanism.

Post-Human Artificial Intelligence

Katherine Hayles, in her book "How we became Post-Human", sets up the argument that we are already Post-Human. She defines Post-Humanism through four assumptions. They are by no means exhaustive but serve as a descriptive means of understanding Post-Humanism (in this regard also as the idea of Artificial Intelligence as something more than a computer bounded by rationality).

First is the idea that the Post-Human is characterized by what Hayles (1999:2) calls *"informational pattern over material instantiation"*. In this view, it is merely an accident that the mind is biologically connected to the body—it is a result of historical happenstance more than the inevitability of life. Second, the mind is

viewed as an entity that tries to *"overtake the whole show"*, when it is essentially only part of it. Hayles calls it an *Epiphenomenon* (a phenomenon that occurs in parallel with a main phenomenon) which is a view within the philosophy of mind stating that mental states of mind cannot have an influence on physical states (Taylor, 1991). Third, if it is merely an "accident" that the mind is connected to the body, we might define the body as *"the original prosthesis we learn to manipulate"* so extending or replacing the *home* constituted of flesh and bones we started out with, would merely be a continuation of a process that is already initiated. Fourth, the Post-Human view treats intelligent machines as capable of articulating human beings well enough for any difference between bodily existence and computer simulation to be eradicated. There are no clearly defined boundaries between *cybernetic mechanisms* and *biological organisms* nor *robot teleology* (explaining phenomena by their purpose rather than by what has caused them) and *human goals*. (Hayles, 1999:3)

In essence, the Post-Human view allows the human mind to be separated from the body and, according to Hayles, there is no reason why it should not be possible to manifest that mind in something other than the meat and flesh it currently resides in. However, at the same time we should be aware that an unaltered Homo Sapiens in its current form is also Post-Human, as there is no way of separating any *self-will* from an *other-will* according to the Post-Humanist view.

The Swedish philosopher at the University of Oxford, Nick Boström pulls this argument of separating mind and matter to the fullest extent. He proposes in his paper *"Are you living in a computer simulation?"* that at least one of the following theses is true:

> *"(1) the human species is very likely to go extinct before reaching a 'Post-Human' stage; (2) any Post-Human civilization is extremely unlikely to run a significant number of simulations of their evolutionary history (or variations thereof); (3) we are almost certainly living in a computer simulation."*

The somewhat pessimistic stance of the human race being extinct before reaching the Post-Human stage entails that we will simply annihilate ourselves before we become intelligent enough to build a machine that mimics human thought processes. Ray Kurzweil, the American futurist, has suggested that we will reach the *"Singularity"* around 2045, in which the information-processing capabilities of the human race will be unable to keep up with the amount of incoming stimuli generated by a then greater-than-human technological intelligence. Thus, if we are to fail the first of Boström's theses, we would have to annihilate the human race before we reach the *Singularity*. (Kurzweil, 2005)

The second thesis is much harder to specify the timeframe for. He argues that once we reach the Post-Human stage, we will begin to run simulations of our forefathers (and ourselves), much as the science fiction movie *The Matrix* depicted the human race existing in a *computer-simulated reality* but unaware thereof unless awakened.

So, unless we make ourselves extinct before our computers reach the ability to run simulations of a reality, and unless we are the first generation that will create computers capable of such a feat, Boström's thesis is that we are in fact living in a computer simulation.

This is clearly an exercise in stretching the mind and grasping possible future scenarios of what we might able to do with the computing power we seem to

heading towards, if we are to believe that Moore's law of doubling the computer power every two years will prove to be true for the decades to come.

Returning to the discussion of Artificial Intelligence and by looking at both the proponents and opponents, we have clearly seen that the Post-Humanist view is leading the pack with the belief in an ability to fully separate subject and object, mind and matter. A range of theories we have presented suggest that because of the rational nature of computational abilities, the Artificial Intelligence that is indistinguishable from human logic is still not a reality. We might fail the Turing Test by chatting with a computer program that is designed to stimulate a therapeutical, vanity conversation about oneself, but blending the brain and uploading the conscience as described by Hayles (1999) might be some way off.

Moreover, the rationalistic view makes computers highly efficient at solving the problem they are faced with and we might optimize them in this problem-solving behavior. But as Minsky (in Winograd & Flores, 1986) illustrated, computers cannot jump to logical conclusions in the same way we as humans can. Winograd & Flores (1986:148) further illustrate this point using an example of a commuter's car breaking down. There are many decisions to take in bringing the car back to life; it is an old model, it will be expensive to repair, a new car is too expensive etc. Once the commuter has used public transport to get to work for a few days, she finds out that it is actually more comfortable than she had imagined and she might actually start taking public transportation regularly.

This move from *Irresolution*, being stuck in a Problem Space of what to do about the car, has been *Dissolved*. The commuter focused so much on solving the problem of what to do with the car that she did not see the problem she tried to solve was indeed the wrong one. She should not have chosen between the options related to

repairing or acquiring a new car, but instead generate new options and solutions for her to pursue. Winograd & Flores (1986) call this process going from *Irresolution* to *Resolution* a *Deliberation*.

In the next section of this thesis we will carry out a range of *Tactical Interventions* that will enable us to look at what happens when we present a group of participants with situations of *Irresolution*. This will enable us to follow the trail of thought laid out by Winograd & Flores (1986:8) who go against the rationalistic tradition of thinking about what computers can do. Rather, their focus is not on the possible intelligence of computers but on establishing an understanding of how designers can create computer tools that move towards human use and purposes.

“They created a paper simulator!”

— Ted Nelson

“Institutions will try to preserve the problem to which they are the solution.”

— Clay Shirky

Defining the Functional Paradigm

We started out by looking at the history of computers, as it is modern technology we are most concerned with in the Functional Paradigm. However, we argue that because of the legacy of the Industrial Revolution and the focus on productional efficiency throughout the industrial period, we are still heavily influenced by the prevalent mindset of this period.

It becomes ever more apparent in the post-war period, as the rise of computers gave us opportunities to see advances in problem solving at incredible speeds. The first users of computers were not just consumers that brought the instruments into their homes, but quantitative thinkers focusing on solving scientific problems through *logical empiricist methods*.

The view of computers in this period is still heavily reliant on the modern view underlined by *Cartesian Dualism* of a distinction between mind and body, so the problem-solving behavior is thus still rationalistic. This comes under increasing pressure with the influx of computers in peoples' homes and the programmers are confronted with the task of making the technology increasingly easy for people to use.

There is still a prevalent theme of the need to educate the user, however, and there is still a focus on certifying the user in using the technology, and producing massive manuals for every possible use case.

Within the business world, there is an idea of computers being able to assist in the decision-making process and give insight into previously hidden patterns. However, by applying the theory of Bounded Rationality, we saw that because of the way

computers are built, they are unable to mimic human thought processes and decision-making capabilities. They are not in their current form able to jump to conclusions and apply logic in the same sense we as humans are.

Attributing beliefs, desires and human-like properties are not in our view the ultimate goal in using computers to aid our everyday life. The deterministic view of technological advancement as following an inevitable path of development also implies that technology is neutral. This is a predominant view in the rationalistic, technologically determinate tradition and fuels the notion that there is but one essential use of technology. This then implies that form necessarily follows function, and the designer has the power over how the technology should be adopted.

We found this to be a problematic notion if the problem-solving behavior exhibited by people is different from computers in its ability to go from Irresolution to Deliberation.

This brings us to a set of three characteristics of the Functional Paradigm that will guide us in the upcoming parts of this thesis:

- Rationalizing of problems that arose from the designers' conceptual understanding of the architecture of the computational technologies and the resulting products brought into the world by them as a result.
- Viewing technologies as being essentially oriented towards one use with an inherent focus on efficiency as the ultimate goal.
- Because of the determining rationality, the boundaries of a Problem Space in which the technology is already intended to be used will be defined by the designer as the only suitable place for applying the technology.

Tactical Interventions

After establishing a shared understanding of what constitutes the *Functional Paradigm*, we will test the characteristics outlined on how technology has been designed in that paradigm.

We have chosen three *Tactical Interventions* that will be put to the test by a select group of subjects. The Tactical Interventions are chosen specifically so they can give us a range of perspectives on the Functional Paradigm.

By introducing a rubber band as a tool for *everyday hacking*, we will seek to explore how two subjects, both with a background in interaction and user experience design, can apply it to help *"make something in their everyday life a little better"*. We also gave an experienced software developer, and self-pronounced *hacker*, a Big Red Button built using an Arduino-board and a button normally used to open gates and doors, e.g. the doors on a ferry.

[insert picture of from Claus]

Lastly, we chose to conduct an experiment on two regular users of the online social network, *Facebook*. We revoked their access to the site to test how they fared without their primary communication channel to their friends.

All three experiments point towards the same goal; to see how well the subjects managed to create ways to circumvent the established methods for reaching goals and go from Irresolution to Resolution.

Setup

As we began these experiments our primary goal was to establish empirical findings that embrace the diversity, complexities and contextualizations of technology. The experiments were created on the basis of providing what could be called interventions in which the test subjects interact with their artifacts. These interactions are the primary focus of our analysis and will serve as the foundation of our empirical study, as they are the focal points of the relationship that is constituted between user and technology and the design-use relation.

The structure of these interventions is based on the premise that we are examining the broader perspectives of the design terminology and how it is constituted. Therefore we give primacy to several interventions that will approach different perspectives in order to account for the falsifiability of our research question. Such interventions can be seen as *Ethnomethodological* studies (Garfinkel & Sacks, in Wright & McCarthy, 2004:40) that seek to unveil how primary descriptions are assembled and deployed in local circumstances. It is research in the domain of everyday practices and methods employed by and constituting the individual world perspective in a sensible manner. Garfinkel applied the e*thnomethodological* studies as an inquiry into sociology as his and Sacks' studies aimed at understanding the practices and methods by which social order is shared and constructed (Wright & McCarthy, 2004).

The reason for choosing three different Tactical Interventions is to understand how various everyday procedures are influenced by our interaction with technology, or in one case, taken away . Inspired by the argumentation upon which Garfinkel builds his premise for ethnomethodology is a *"central recommendation that the activities whereby members produce and manage settings of organized everyday affairs are identical with member's procedures for making those settings*

'accountable'" (Garfinkel 1967:1, we incorporated a premise that the way our test subjects interact with the artifacts is rooted in the same procedures that address the practices of our design term (with reference to our research question). So, these Tactical Interventions should study what our test subjects *do* in particular situations and the practices and method they *use*, with relation to the *social context* they are in.

René & Louise K and the Rubber Band

For the first of our three interventions we aimed at creating a context stripped of any technological complexity and centered around an artifact that was as open as possible with regards to the practices it is traditionally employed for. It was important for us that the role of technology (in a traditional sense) was kept at a minimum in at least one of our interventions in order to see if the principles investigated could occur in such a setting. The physical context and interaction with the artifact was the focal point of this intervention and therefore the emergence of the rubber band came to mind as a fitting artifact in this study.

The reason we picked the rubber band was that it was one of the objects that we had experienced being applied in many different variations—none of which required any sophisticated technology involved. This notion was especially important in regards to our expectations as to what degree these interventions would reveal any potential findings that could fit our take on *Social Constructivism*. The rubber band experiences showed great diversity in the ways of finding meaning in an artifact. Such diversity can turn out to be valuable when understanding the practices that come into play in the relation between user and the artifact. Our expectation for this Tactical Interventions was that our test subjects would find many different practices in the exploration of the rubber band. Practices that may

vary greatly in how easily or conveniently each adaptation with the band progresses, and in the level of thought that goes into thinking up each form of use.

The task that was given to René and Louise K, our participants in the rubber band experiment, was rather simple, short and broadly formulated: *"Use the rubber band to improve something in your every day life. Take pictures or video of what you use it for."* The intentionally broad formulation of '*improving*' was an attempt to not influence René and Louise K as to what direction they should take with the rubber band. Equally intentional was the lack of examples or specific requirements that could be given as part of the task objective. The only thing we stressed was that they should try to implement it as part of their everyday routines and practices. These routines are some of the most eminent practices that, in the words of ethnomethodology, are bound by sensible and accountable actions in everyday life. Therefore the rubber band intervention should presumably face some of the same challenges that any other artifact, purposefully designed or not, would ideally face.

Claus and The Big Red Button

The second intervention had a more technological focal point in order to form a counterpoint to the more passive and simple nature of the rubber band. In the

perspective of a technology taking a greater part of our everyday experiences, it was important to us that our empirical data would resemble this development. For this purpose we sought an artifact that would both be able to accommodate a technological integration with everyday routines, yet without neglecting the physicality of these routines. The artifact should be highly customizable and give primacy to a range of different integrations in everyday practice.

It became obvious that the Big Red Button – a simple button device powered by an *Arduino*-board (an *open-source* electronics Prototyping platform built on cheap and flexible *hardware*) that was able to connect with a computer through a standard USB plug, was a suitable choice for this intervention. Because it is powered by a particular version of the Arduino-boards, it restricts the button to only control one command on the computer it is connected to – a command immediately activated by pushing the button. The button had no resemblance to a traditional computer button as it is both larger and have more in common with buttons used in gates or on ferries. The distinct structure of the button, both in terms of the physical dimensions and the distinct red color, creates a reason to believe that it would be easy to notice in a given installation.

The task given was very similar to the one used in the intervention with René and Louise K: *“Use the button to improve something in your everyday life.”* Again it was important that our test subjects documented the process with pictures and preferably video about their time with the button. Something that would be used in the evaluation and interview process afterwards when they reported back to us. The task description we gave to Claus deliberately said nothing about the button actually working with the computer. These interventions were designed to simulate the situations, methods and thoughts that go into implementing a given artifact into one’s everyday life. As long as the ideas, thoughts and Intentionalities surfaced in the interview process, the actual functionality of the setup was secondary.

Louise AB & Stine living without Facebook

In the last intervention we chose to focus on the reflections that come to mind once the technology is not present or available to us. Many argue (Ihde, 1990, Feenberg, 1999, and Suchmann, 1987 in Wright & McCarthy, 2004) that insights into the individual experience can only truly surface when you are no longer present in it. Retrospective reflections are far stronger and more detailed after some time has passed.

Therefore the intervention was built on the premise that our test subjects had to live without a technology they normally have a great deal of interaction with. We went through a range of possibilities such as mobile phones, TV, computer etc. before settling on the social network Facebook, which both test subjects use several times

daily. A deal was made in which we were changed their passwords to the social networking site, preventing them from gaining access.

Again, the nature of the task was rather simple. Live without access to Facebook during the intervention process and try to remember the situations, details and thoughts that come to mind when you are unable to access Facebook, and how that made you feel. We encouraged both test subjects to take notes, pictures etc. in order to remember the situations and thoughts. We then agreed to interview the two of them at the end of the process and have them tell their stories and thoughts on the experiment. The focus was on the situations that led them to think of checking Facebook and their intended purpose with connecting to Facebook at that exact time. Our questions would then focus on areas such as whether they had adopted supplementary technologies to Facebook and if the experiment had changed anything in regards to the importance they put on Facebook as a communicative means.

Methodology

Contextual Inquiry

To gain insight into the knowledge accumulated from the interviews with our test subjects, we used the method of *Contextual Inquiry* (Wixon, Flanders & Beabes, 1996). It is a synthesis of *Ethnography*, *Field Research* and *Participatory Design Methods*, aimed at providing designers with knowledge of users' actions at a detailed level. Conducting *Contextual Inquiries* will enable the designer to frame questions on the user's individual situation and how they have used an artifact in their own way to reach their desired goals.

Using questionnaires is a useful method aimed at gathering a great amount of data on a specific use of an artifact by a large group of people. However, given the nature of our experiment, we sought to find a methodology that would give us the opportunity to frame our questions according to what the individual user had used the artifacts for (or how they worked in their absence).

Contextual Inquiry is part of a process called *Contextual Design*. The complete, traditional process of contextual design includes the following elements (Holtzblatt in Wixon et.al., 2002):

1. Contextual Inquiry to gather data
2. Work modeling to analyze data for a deep understanding of the user's work
3. Consolidation of models to produce a coherent and integrated view of the population and for sharing with a wider team

4. Creation of a work redesign vision to better understand how to support users' work, the details of which are worked out in scenarios that are storyboarded
5. User Environment Design to represent and integrate the entire system
6. Mocking up with paper prototypes to test the design.

This method can be used to drive a complete *System Design*. It will enable teams to conduct tests with users from a very early stage, even before a product has been created, to ensure that it responds to the needs of the users in the environment they inhabit.

Holtzblatt suggests, however, that if you have limited means and thus cannot conduct the full process, you can scope it down to fit your needs. She suggests that the team focus on a limited number of users, because *"the resources should match the questions at hand."* (Holtzblatt in Wixon et.al., 2002:881) At the same time, the process behind Contextual Inquiry makes strong assumptions, which are important to keep in mind when using this particular methodology.

There is an underlying assumption that it is only through dialogue with the test users that you will find the real intentions they have. The implication cuts off the possibility of doing out-of-context interviews or conducting quantitative research in the form of questionnaires or large focus groups. The reasoning behind this is that only when talking to the user in the use-situation will you be able to uncover their motives behind their actions and have them verify your understanding of their actions immediately.

Moreover, Contextual Inquiry differs from other usability methods because it is aimed at *discovery*, not *evaluation*. Holtzblatt underlines the importance of using the

methodology to generate new requirements, designs and products. It is not used to verify whether the current designs work or not—only to further their work in a certain direction based on the answers the team has gathered from the interviews.

When employing field data gathering techniques such as Contextual Inquiry, the data you collect will be highly unstructured in the sense that it is only contextually relevant to the conversations you have had with those particular test users.

The qualitative data is not as easily defined as would be the case with highly quantitative data. When using questionnaires to get insight from your users, every user will be presented with the same questions, or they will change very little according to their answers to some degree. They will in every way be structured to how you set up the study and you can find patterns by looking at the answers. This is not to imply that it is an easy task—we have no intention of concluding this in any way, as patterns might be difficult to find in any quantitative data—but it will fit into a structure that is predefined and thus the data will not be as contextually enriched as the qualitative data gathered through Contextual Inquiry.

By conducting the Contextual Inquiry, a design team is left with a great amount of data about the individual users. Rather than using this data in a *descriptive* way to find usability problems with specific problems, they can use the whole process of Contextual Design to address the *needs* of users because it will give a deep understanding of how the people using the product work with it in a specific context.

Holtzblatt & Beyer (1999) also propose that when conducting field research, one should create *Work Models* that show how the workplace is structured in an organizational model, as well as both the physical layout of the environment in

which the users work, and the tools they use to do their work. The work models are drawings that are used to overcome the gap between the researchers' understanding of the environment they are conducting their research in, and the one the workers are working in. They include the emotional context in which the work happens, the sequence of actions required to do their work and the roles they play within the organization.

The reason we have chosen to use the methodology of Contextual Design is to gather data through Contextual Inquiry, as it enables us to set a framework for talking to our test subjects with a clear purpose. They were set a goal and in using the method of Contextual Inquiry we were able to raise questions that uncovered how they had used the artifacts we had given them, or how they managed without, in their own environment. The two test subjects that were given the rubber band talked about how they had placed and used it in their workplace and at home, thus it became a natural course of the discussion to ask them about these settings. The same occurred with Claus whom we gave a Big Red Button; we talked extensively about the design and arrangement of his furniture, which uncovered his views of how the artifact would fit into his everyday life. Lastly, we changed the password on the Facebook accounts for the last two test subjects. In doing this, we ensured that they were unable to check their accounts on their mobile phone and had an opportunity to make sure they were completely cut off from their access.

The test subjects we provided with artifacts were asked to take pictures of the various applications they found for their artifact. This further enhanced the opportunity for us to gain insight and ask meaningful, contextually relevant questions on their use of the artifacts.

We did not, however, conduct the interviews with Louise K, René and Claus in the setting where they had used the artifacts but chose to meet them at their workplace or at a café. They had all brought the artifacts with them, so it was possible for them to demonstrate how they had used (or not used) it for their particular actions. We did, however, meet with Louise AB and Stine in Louise AB's apartment, to ensure a familiar setting for the inquiries. An important aspect of Contextual Inquiry, when conducting research for driving the design iterations of your product to the next level, is to stay within the environment a user would normally engage with the product in. We found that in our case, we would not be using the data gathered from neither the test subjects that were handed artifacts, nor the ones that we removed access to Facebook from, to iterate on a designed product. We conducted the Contextual Inquiry as a way for us to gain insight into how the artifacts were used, or how they reacted without them, and then analyze that data in relation to the theories presented in this thesis.

One could argue this goes against the notion of Contextual Inquiry as described by Holtzblatt above but we found that the contextually relevant questions helped us bring forth observations by the users themselves that we would not have gained access to otherwise. Moreover, we are not conducting a full Contextual Design process, thus we would argue that by picking the Inquiry as a tool for us to gather data by, we were able to use the method as a slightly more descriptive one than originally prescribed by Holtzblatt. It is still used as a tool for *discovery*, thus we would argue it is within the boundaries of the notion of Contextual Inquiry described by Holtzblatt.

Affinity Diagram

One method that can be applied to unlock some of the common themes in highly contextual, qualitative data are *Affinity Diagrams* (Holtzblatt & Beyer, 1999). Affinity

Diagrams are used to apply structure to the process of using field data for creating better systems and products.

Concretely, we conducted the interviews with our test subjects by placing a voice recording application on a mobile phone on the table in front of us. We then listened to the recordings in one sitting with only brief pauses between the sessions. While the recordings were played back, we wrote notes on Post-its whenever something was said in the interview that would have a relation to a theme we were exploring through the theories this thesis is based on. This was a combination of both theories, concepts and occasionally soundbites, or quotes, that reflected a position taken by the test subject towards either the artifact or the situation itself.

After this was done, we grouped the Post-its together and found that we had each written notes in different languages; one in Danish and the other in English (the interviews were in Danish). One could go into a lengthy analysis of how this could happen but to cover it briefly, we found that it was grounded in our note-taking techniques being quite different. One of us would relate the notes written on the Post-its to the subsequent analysis, and thus write the notes in English from the start. The other would relate to the data more and write it in Danish to precisely capture what was said, or how the reference to the theme was raised in the native tongue.

We found no problems with this approach in the subsequent work with the data, as we concluded it was a minor discrepancy, given we are both equally proficient in either language. We did, however, translate them into English during the digitalization process of the notes.

After the listening session, we would begin by grouping the Post-its together in what we found to be the most reasonable thematic scheme. At this point, the themes were not named precisely—it was solely based on what we decided belonged together. We started out by grouping the Post-its from interviews with the test subjects that were handed the rubber bands, as they were the shortest and thus it would be quicker to group the lesser amount of notes. Then we moved on to the interview with Claus, who was handed the Big Red Button.

What we found was that Claus' offset was quite different from Louise K and René who used the rubber band, thus a range of themes came forth that were not relevant in the case of the first two interviews. However, there were overlapping themes and it enabled us to group the excessive themes according to the already established themes from the first interviews.

Lastly, we moved on to the interview with Louise AB and Stine who had their access to the social networking site, Facebook, removed. Once more, the results consisted of themes that overlapped with what we had previously uncovered from the other interviews but there were other themes that did not fit every other category. This will be outlined further in the description of our findings.

Overall, we found that by using the methods of Contextual Inquiry and Affinity Diagrams we were able to ask questions that related directly to the environment in which the users had operated with the artifacts we handed, or took away from them. All the while, we did not fear that the data would not be usable as the theme-grouping of Post-its written during the listening session enables us to get an extensive overview of what was brought forth during the interviews.

One could argue that it would have been nearly impossible for us to construct a quantitative method of inquiry into their use of the artifacts, or their relation to how they applied the assignment we gave them to their everyday life. If we were to pursue such a task, it could consist of a larger group of test subjects that were all given the same artifacts to apply to their work or home environment. Then we could have constructed a questionnaire that would enable us to inquire about a set of predefined questions that would uncover a specific range of use-situations.

We find that this method would be most beneficial for teams who are to design a product based on the users' input. We, on the other side, used the methodologies described above as tools for uncovering central themes in the design of the artifacts and how they were applied to the situations of the users, without regard for how we could design a better artifact. Thus, constructing a larger test scenario would not have given us the kind of data that we can use in the thesis at hand for analyzing how these test subjects were able to creatively apply the artifacts we gave them, or circumvent the obstruction we introduced.

Findings

As written in the section on expectations to our findings, we had an idea of what would be discussed during the interviews with our test subjects. They were chosen for a reason but this does not entail that we had anything other than some preliminary expectations to the data that would be gathered. On the contrary, we were certainly surprised by the findings given the type of experiment and the behavior exhibited by the test subjects towards their artifacts or situations we established for them.

Louise K & René

We used the *Affinity Diagram* method to structure the results from the conversations we had with Louise K and René who both received a rubber band and instructed to *“improve something in their everyday life using the rubber band”*. This instruction was deliberately vague and open for interpretation so as to not imply which kinds of use cases we had imagined for them to pursue.

The inspiration for the rubber band came from a conversation with our thesis supervisor Mads Bødker, who told the story of using a rubber band to create a hook mechanism for his razor. That way, the razor could be hung on the faucet in the bathroom which was clearly not possible with the original design, and whoever invented the rubber band would never have anticipated this use case as a possibility. The *openness* of the designed object was something we found interesting enough to warrant further investigation, and given that Louise K and René both have a background and education in Interaction Design, we imagined they would find interesting use of the rubber band.

However, they were both perplexed by the vagueness of the rubber band's applicability. René said that when he received the rubber band he put it on top of a ticket for a music show to remember both things. Just before this, he had used it as a captain's armband used by football players *“just for the fun of it”*.

René did not use the rubber band for anything but placing it on the ticket, as he found it too forced: *“I didn't use it at all. I would have loved to, but it was too forced to use the rubber band to solve a problem.”* Louise K agreed with this: *“I didn't use it for anything. It felt too forced and like trying to create a problem.”*

They were perplexed by the rubber band and attributed this to the nature of the situation we set up for them by handing them a tool to solve a problem. Louise K said: *“It felt as if the solution came before the problem,”* but she did, however, use the rubber band to hold together a case for her sunglasses that broke during the week she had the rubber band. She pointed out that it had been broken before and she had previously used an elastic hair band to keep it from falling apart.

Another thing they agreed upon, despite being interviewed separately, was that they could probably have sat down and *“designed something for it”* deliberately. René stated that in itself the rubber band *“wasn't unique enough to be functionally applicable”* as there were *“many complementary alternatives.”* He kept asking himself *“what does this solve for me?”* and reflected on the openness as it *“gave nothing to the problem domain”*.

Louise K did, however, tell a story related to this type of application of everyday objects to situations where they did not immediately fit in:

During the winter, her apartment can become quite cold because of the wind slipping through the cracks thus creating a bit of a draught inside. She would have to close the door in her living room to cut it off, but the door is too bendy to close completely. Therefore she used a large pillow to hold the door that had to be held on the other side of the door until it was closed almost completely and only then released onto the floor. It is this behavior we initially hoped they would both inhibit and show off in the interviews.

Moving on, the statements derived from the interview sessions focus mostly on the functional aspects of the rubber band but René also talked about the way he sees these types of artifacts through the lenses of *“problem-solving”* and *“artistic Praxis”*.

The first issue related to the *"functional solutions"* in artifacts while the other revolves around a *"meaningless aesthetic that creates artistic value"*. He found that if he had sat down, he could have come up with an art installation featuring the rubber band (or 1,000 of them) in the form of e.g. a rendering of famous presidents or something similar. He also stated that we could have handed him anything in place of the rubber band, and he would have been faced with the same problem as he found himself facing in this experiment. The openness, however, is *"fantastic if the purpose was an aesthetic Praxis"* but in this case he failed to apply the rubber band in a functional way.

Continuing the focus on the functional aspects of the rubber band, Louise K stated that it was *"great that the elastics of the rubber band makes it do a certain amount of things"*. The fact that it has constraints were considered to be good and she called it a *"stretchable module"* with *"a limited range of possibilities"*.

Lastly, Louise K talked about a piece of critical design that she created for a project while studying, as an example of what she meant by sitting down and designing something with the purpose of forcing a reaction:

The file-sharing service *Kazaa,* used primarily to illegally share music, had a particular nomenclature revolving around the file-handling qualities. If you were copying a song from another user's account to your own you would press the button saying *"download"* and the progress bar would go from 0 to 100% depending on when the transfer was finished.

Louise K modified this Interface to reflect the critique aimed at Kazaa from the music industry that people were *"stealing"* the music and it cost the artists money when people shared their music with peers. Thus, the *"download"*-button was

renamed to *"steal"* and the progress bar would show $0 to $1 depending on how far along the file was from being downloaded fully. As such she did not change any of the features found in the program—it was solely a change of wording that enabled her to examine people's reaction to the symbolic representation made by the words "download" and "steal".

In conclusion, the last comment made by Louise K sums up her reaction to the experiment pretty well: *"I even lost the band. I have no idea where it is."*

Structure of the Affinity Diagrams

Having listened to the interviews with Louise K and René we began structuring the Post-it notes that we wrote down during the playback session.

Immediately, we found that a range of the notes would fit into one category focusing on the *functional* aspects of the artifact, and how its particular design had become a hindrance to them. At the same time, they talked about the *use* of the rubber band and which *activities* they had used or could use it for. Those were different than the functional considerations they made, and were grouped elsewhere.

Lastly, especially René had considered the *aesthetic* properties of the rubber band and how it could have been explored further in an artistic direction. The functional aspects of the experiment were described separately to the aesthetic aspects, thus making the distinction between the two clear to him (and us as listeners).

The Post-its were thus formed into three groups that we named *"Use/activity"*, *"Function"* and *"Aesthetics"*. This would constitute a triangle that formed the basis around which we placed the subsequent notes as well—something we will return to in the coming parts of this section of the findings.

Claus and The Big Red Button

The second interview we conducted was with Claus, a software developer with a strong interest in hacker culture. To clarify, *hacking* in this sense in no way implies a relation to what constitutes the illegal behavior exhibited by security experts that gain unauthorized access to governmentally owned, industrial or otherwise closed computer systems. *Hacking* refers to the act of reverse engineering, extending and modeling technology to fit a specific need not immediately intended by the designer or programmer but still within the boundaries of the law and for the purpose of testing the possibilities of the technology.

Claus, who is the organizer of a bi-monthly meet-up for hackers in and around Copenhagen, has worked in a wide range of roles. In the past few years, he has primarily focused on mobile and health technology.

We handed Claus an object known as “The Big Red Button”. It is a big red button, as it says on the box, that you would usually find in places such as ferries to open doors, warehouses to open gates etc. In this case, the London-based design studio “Tinker”, which was formerly run by Alexandra Deschamps-Sonsino, made a button powered by an Arduino-board for Russell Davies, of the Really Interesting Group, for his presentation at the Lift 10 conference in Geneva, Switzerland. An Arduino-board can easily be programmed to do specific tasks—in this case, it served the purpose for Russell Davies to mimic the spacebar on his keyboard, thus enabling a change of slides on his presentation. (russeldavies.typepad.com, 2010)

Claus' first project was displayed at the conference *"Community Day"* for which he built a boxing game for the game platform, Microsoft Kinect. *Kinect* is a motion-sensing input device by Microsoft for the Xbox 360 video game console that has proven to be usable by hackers who want a cheap option of motion capturing—a feat that was previously extremely expensive but has become somewhat commoditized by the arrival of the Kinect. (Wired.com, 2011)

The point of the setup Claus created was to punch towards a screen as fast as possible and become the *"strongest person of the day"*. Once you had finished your punch, you could hit the button and it would record your 3D-photo and send it to your email. Thus, the button became an Interface for the Microsoft Kinect.

Mood application

A second invention by Claus is a *mood application*. It will allow him to hit the button once when he sees something he likes, and depending on the situation he is in, it will mark it as a favorite on the micro-blogging platform, Twitter, *like* it on Facebook, share the link on his blog or save the bookmark to an online bookmarking service.

To him, the button enables him to save what he calls the *"heightened moments of the day"* and give him a *"better memory"*. It becomes a sort of TV-meter that is used to record how many minutes of each program you watch, only in this sense it will give him a way of looking at the data he consumes and which of it was noteworthy.

At the same time, the mood application will be able to register a series of rapidly consecutive punches. This will give the opposite input to the application in that what he just encountered was bad, and he wants it to go away. He even named this the *"machine-fire push"* because of the sound of the rapid punches.

The idea for this stems from the desire for a *pressure-sensitive keyboard* that will register the force with which the keys are pressed. If you hit the *“Enter”*-button with regular force, it will still ask for confirmation on particular actions. E.g. *“Do you want to empty the Trash?”* if you punch it hard, it should just, in Claus’ words, *“do as it is told. A human would never ask for confirmation like that.”*

Technically, the application is basically an *event-listener* that monitors a *public port* on his network that is triggered when he punches the button. He found the technical limitations of the button to be a bit frustrating for him personally, but he said that *“for everybody else, it is perfect.”* The Arduino-board used in the base of the button to make it act as a keyboard restricts it to use just one key-press, which he would have liked to expand upon.

Sound recorder

Another application Claus is working on is a sound recorder that will enable him to create snapshots of conversations throughout the day, after they have occurred. This is done by constantly recording what is being said, and when he pushes the button down, it will cut out the past 30 seconds and create a file of that recording. Claus said: *“The problem with sound snapshots is that you can never take them. You always think of them after they have happened, and then it's too late.”*

Street Photo Booth

A simple application that monitors the sound levels on the street and registers if the levels go up or down. Pushing the button will activate a camera that takes a snapshot of what happens in the street. Claus lives on a lively street in Copenhagen where there is a lot of street activity happening late at night because of the nearby

bars and locals hanging out. Normally, he does not spend a lot of time looking down on the street so placing the button in the middle of the room enables him to catch a glimpse of what happens when he would otherwise not be looking at the street.

Gamification device

The last invention we interviewed him about is what he calls a “gamification device”. Gamification refers to applying game play mechanics to non-game-relevant actions. E.g. selling the largest amount of newspaper subscriptions will get you to the top of the leader board at the office.

Claus does not like to follow the practice of keeping a list of things to do during the day with the popular methodology *Getting Things Done* (GTD) as he *“does not have time to play [his] own secretary”*. One way of getting some of the tedious chores over with would be to implement a way for him to get rewarded when he accomplishes

some of them. E.g. taking down the trash, doing the laundry, vacuuming the apartment etc.

It should track his efforts so he could compare days, weeks and months and see if he had done better at keeping up the routines of exercising or cleaning out the apartment regularly.

Affordances

Our talk with Claus evolved around the subject of *Affordances* which were mentioned numerous times. For the sake of understanding the main idea behind the term, it refers to the qualities of an object that are immediately, or through experience, visible to the user as a possible course of action. (Norman, 2010) E.g. a doorknob *affords* grabbing, ropes pulling and buttons pushing.

In the case of the button, Claus states that it was *"nice that the button is so mechanical. It brings forth the* inner trucker*, like when you grab a horn in your truck. It wants to be pushed, and you can punch it hard without breaking."* He then referred to the difference between the Kinect used in his boxing game and the joystick used for the Nintendo Wii, where you have to grab a piece of plastic with buttons on it while punching into thin air. He sees this as an advantage for the Wii as you grab something physical as opposed to just *"waving like a fool."* It created some confusion, however, because some of the people who tried the boxing game had previous experience with the Wii. He likened this to the doors in the Danish regional trains, the *IC3*-model, where you have to wave your hand in front of it to open. Often, in his experience, people unfamiliar with the doors in the Copenhagen S-trains were used to just waving their hand and overlooked the 1x1 cm2 button on those doors.

Claus also found it to be practical that it had a long cord attached to it (3 meters), because it allowed him to, both at the conference and at home, place the computer out of sight. He linked this to the fact that he sees his computer (an Apple Mac Mini) as a *"data refrigerator"*—something that should just hold a lot of stuff for him, without getting in the way.

The button itself, however, is, described metaphorically as a *double-edged sword*. On one side, Claus named his setup *"living with buttons"*, and he stated a desire to have buttons all over his apartment, enabling him to do different things. It should become part of the furniture, and the physical shape of it makes it *"a radically different Interface than if it was small. It becomes almost* industrial chic*, but it can never become just a piece of furniture as it never calms down completely. It is not like a faucet."*

This *dualism* between the color and physical shape of the button goes against the fact that, according to Claus, it is still passive and mechanical. He describes it as the opposite of an Apple iPhone, which was present on the table at the interview, because that is in his opinion a piece of technology that will never *calm down*. *"It is* warm *and it can vibrate at any time, unexpectedly."* (stemming from McLuhan, 1964)

Because of the physical shape of the button, Claus states that the *"Interface is not neutral. It wants to be pushed. The sheer presence of the button provides an* Affordance.*"* The button, however, does not show the information you interact with when you punch it, and as such we relate to the button, according to Claus. He continues: *"The Affordance becomes extra relevant because the immediate medium that passes it on is so concrete."*

On the question of whether a user would understand the impact of their action when pushing down the button, Claus says: *"If you move feedback to another place it's bad. You'll want to control something instead of letting it become a hidden technology. Distance is murder for feedback—it doesn't convey well over distance."* In this sense, the feedback is the long travel of the button when pushing it down, and the fact that *"it's incredibly nice it's red—it works because it's red,"* so the focus is not the storage of input because of the push when talking about feedback.

He ends this notion with saying that *"the button becomes a campfire you meet around, so you'll want to have some ceremonial feel running around it. The* alter-effect *should be there."*

Cognitive Price

Following the talk about Affordances, Claus also circled around the topic of *cognitive pricing*—that when a user performs an action, it has a price that is not monetary but

related to attention. He says that *“the cognitive price is damn relevant because interruption is free. You can change the dynamics of a room by changing the price.”*

He goes on: *“The problem with the office environment is the transformation of Praxis to norm which transforms rewards to conformity. The cognitive price will eventually reach zero and if the cognitive price is zero, it's uninteresting.”* In his opinion, *“it's not a problem if it costs something. That goes for sound and energy as well as pressure.”*

In relation to the button, he had so far been focusing on the immediate feedback, thus we posed the question of what would happen if we placed the button in a group situation. Then, according to Claus, the dynamics of the room would change over time because instead of pushing the button to receive a reward, in the end it would transform into *“what we do”* and the attention given to the recipient of the reward becomes a commodity.

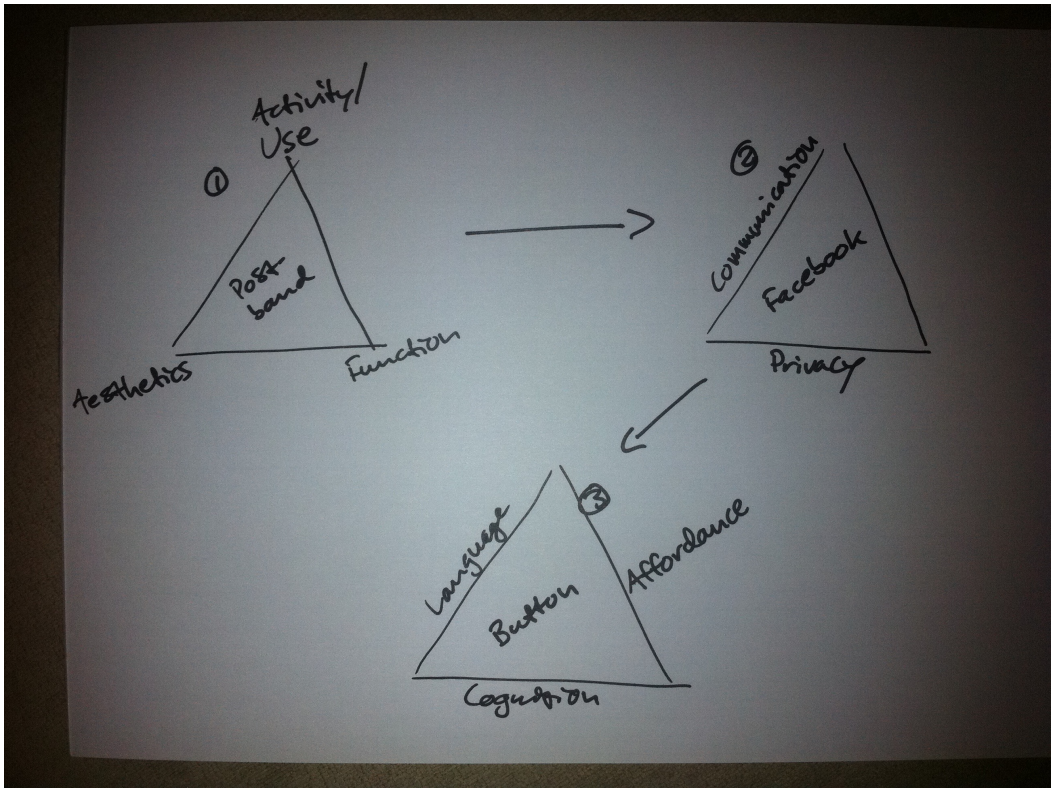
However, he said that it would work if the button was installed as a *stewardess button* on an airplane, meaning next time your co-worker, or manager, would notice the lamp is red, they would be able to come over and attend to the problem without being taken out of their immediate zone of focus. That way, *“it costs a little.”*

Triangle and Affinity Diagrams

After the first interviews with Louise K and René, we split the Post-its we had written into a triangle with the subjects *“Activity/use”*, *“Function”* and *“Aesthetics”*.

We found that a large part of the notes from our interview with Claus fit this distinction well but we would need some additional categories to fully describe the scope of the conversation. Thus, we included the categories *“Affordance”*, *“Language”* and *“Cognition”*. They still fit into the triangle, albeit on the edges

between the three main areas from the first interview and acted as a categorization that lies in-between the other three:



Louise AB and Stine

For the last Tactical Interventions, we restricted access to the online social networking site, Facebook, for two frequent users, Louise AB and Stine.

We asked them how they viewed their use of the site, as well as the communicative practices that evolved around the site and how restricting the access had changed those habits. Lastly, we inquired about their thoughts on privacy.

How they used Facebook

They both described themselves as frequent users of the site, and had been for more than three years.

Louise AB said that she used it mostly for events, both creating them herself for birthday parties and weekly dinners with girlfriends as well as the ones created by bars and clubs around town. Stine said that she had a list of five sites she visits every time she accesses the Internet. They range from traditional news sites run by the Danish newspapers to her private and school email as well as Facebook. She visits those sites multiple times each day and it has become a force of habit for her to visit them in the same order and to "catch up". She did not see Facebook as a place where *"you knew what you were going to see, but rather a series of impulses"*.

Louise AB recounted that she does not use Facebook for publishing status updates, only for consuming information and communicating, mostly with a close range of friends that she either meets up with frequently, or who are currently living abroad. Stine explained that she used it in much the same way, and added that she sees it as *one-to-many communication*, given that she often writes messages to her classmates about homework and other school-related issues as well as after-school socializing.

Using Facebook for both school-related and private purposes has given both Louise AB and Stine the sense that it has a *"hidden obligation."* To them, *"the more [they] use Facebook, the more [they] depend on it."* It has, in their words, become *"the main way of keeping in touch with most friends, apart from 3-5 of the closest ones"*.

They use Facebook to keep in touch with friends they have already, and they do not see it as a place that is *"suited for getting to know people that they only met through Facebook"*. They knew of people who have used it that way, as *"a sort of dating site"*. In their opinion, however, *"Facebook can't mediate the nuances of professional/non-professional relationships"* and *"technology can't convey the same first impression as face-to-face will"* so they did not consider it fit for this purpose for them.

Expanding on the issue of using it to keep up with friends they know already, Louise AB stated that a replacement for Facebook *"would have to focus on the group messaging function"* with Stine stating that it is used for this purpose because *"everybody is on [Facebook] and you expect them to see [the messages]."* Louise AB even stated that *"it's weird when people don't have a Facebook-account,"* thus confirming the view that, as Stine later stated, *"Facebook becomes some sort of a way to stay friends with those outside your immediate group of friends"* besides communicating with a select group of friends through the message function.

Using Facebook for the group of friends outside your closest range of friends provides some other problems too. Stine: *"Facebook can remind me of people I haven't spoken to recently. Sometimes it ends up in grabbing a coffee an hour later."* Louise AB: *"When we organized our birthday party, I invited at least 10 I wouldn't have thought of if it wasn't for Facebook."*

Lastly, on the subject of how they use Facebook, Louise AB addressed the issue of getting a guilty conscience over not using it for publishing status updates: *"I can get a pretty bad conscience over not keeping in touch with people. I don't get it over not posting status updates, as it's just not part of the way I use Facebook."*

Communicative habits that were changed with the intervention

Being cut off from using Facebook had some implications for the way Louise AB and Stine used other pieces of technology to reach their friends, as well as confronting them with a new view upon how they used Facebook. These are addressed here:

Stine found that she had often *"taken Facebook for granted. It was really annoying to miss out on, but [she] also saw that maybe [she] didn't have the need for it as much"*.

At the same time, she said that *"I'm pretty sure my curiosity will win, though, so I will probably use it as much again as before the experiment"*. The absence was most notably seen in her daily routine when visiting the range of news sites and email accounts that she used to.

In particular, she had to call a friend to know what was happening with an event she was attending because she was afraid of missing out on some information in a message thread about it that was started before her access was cut off. Louise AB, on the other hand, found that she was *"sorry to miss birthdays"* which are announced extensively on Facebook. Moreover, she said: *"I've missed Facebook because of my friends living abroad. I thought about sending an email, but Facebook is faster. It just seems less demanding than sending an email. I also use Skype, but the advantage of Facebook is that you can continue the conversation."* She later added that *"without Facebook, [she]'d probably use Skype more. But it's a different kind of contact to call people"*.

Stine also noted that she was *"missing the scaleability of Facebook when communicating with friends on text messages"* because it quickly became unclear who said what to whom and what they ended up agreeing.

Privacy

There have been many instances where privacy-related issues have come up in the case of Facebook (boyd, 2006) and thus we spent a lengthy amount of time talking to Louise AB and Stine about exactly that.

Stine told about a friend who *"wants to control her usage of Facebook in exam periods etc. so she temporarily disables her profile"*. Stine stated that to her, restricting the profile was about cutting off access for strangers and people who she

did not want to be able to see her profile: *“I think about the fact that my profile is closed, yes. Mostly because of my future workplace. They don't need to get an impression of me before we meet.”*

Both say that they haven't found new friends only through Facebook, and that they find it *“creepy when people [they] don't know add them as friends.”* Louise AB elaborated on this: *“Facebook is not for dating. It's a bummer when gross dudes write messages, when I don't know them. That has happened a couple of times.”* Continuing along the lines regarding the openness of her profile she stated that *“it's creepy that they added the function so you can see where people are. One friend tagged another at a café one day, which was unfortunate because she had called in sick for work that day.”* Stine also said that *“giving my boss access to my profile would be to cross the private vs. professional relation for me.”* Louise AB agreed: *“I use Facebook privately and not to show off my skills.”*

They do not only restrict the profiles for their colleagues and managers, however. Louise AB did not find it suitable for her parents to be following her profile. *“Not because there's anything they don't know but they just don't need to see it all. There is as such nothing my parents aren't allowed to see, but I just find it unnecessary. Besides, my dad's friend shows it all to him anyway,”* she said.

They manage their friend lists continuously but in different ways. Facebook has a *News Feed* that shows recent activity for the people on your friend list, and you can choose to hide certain people from that view so they will not show up. Louise AB uses this function to manage what she sees, whereas Stine actively removes people from her friend list instead. This is because *“the people are out of [her] group of friends and probably were not a part of it in years anyway.”*

They also both had some thoughts on the friends that they follow and how they present themselves on Facebook. First off, Louise AB stated that *"it's a bit creepy that you know so much about so many people without necessarily having met them more than a few times."* However, at the same time she added: *"I think a lot of people present themselves in a certain way to be seen in a particular way."* Stine commented on this by saying: *"They keep writing to uphold this instantiated picture of themselves."*

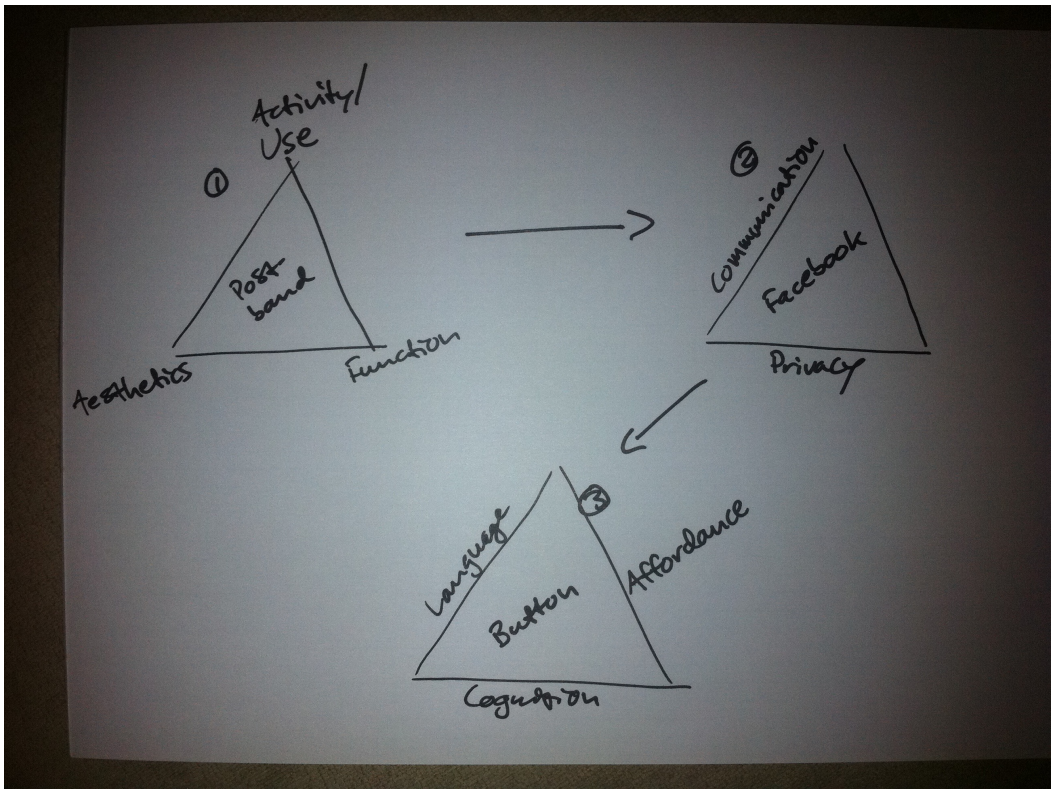
Inquiring about the difference between the impression one could get from meeting someone out in town one night versus looking at their (in this case, completely open) Facebook profile, Stine argued that *"when you sit down to talk to somebody, they can't pretend to be someone they're not. You can select what information to show on Facebook, as opposed to face-to-face."* She later added: *"When reading people's updates, I do think about that they put themselves in a certain position deliberately."* Louise AB found this particularly evident with the new function where you can *check in* to certain places to show your friends where you are right now: *"The check in function is used to show you're at a cool bar or café. You wouldn't check in somewhere uncool."*

Lastly, Louise AB contemplated about her reaction to Facebook as a whole, and the direction she felt it has moved in recently: *"To me, it doesn't have to be such an open forum. I think it becomes more and more open with time and that might leave some people more passive."* Going back to the issue of parents, Stine stated that her dad only writes messages using the chat function so as to not post public updates that will be read by her friends. The messages, Stine explained, were usually of a *"chatty kind along the lines of 'what's up?' and to catch up briefly."*

Affinity Diagrams

Once more, we found that the established order of the Post-its were of great use and we could apply the notes produced during the listening session for this Tactical Interventions in direct relation to the ones already put up, albeit none under the label *“Aesthetics”*.

However, as was the case with the interview with Claus, we found that they were drawing up issues that were not related to the already established order. In particular, the conversation revolved around issues of *“Communication”*, *“Absence”* [of the tool] and, to a large degree, *“Privacy”*. This forced us to make another addition to the lines on the triangle:



Sum-up of findings

The Tactical Interventions set in place by us were meant as both artifacts that would spawn new ideas simply by being present in the test subjects' minds, as well as a way of reflecting upon the use of an everyday communication tool in its absence.

We had some expectations as to what we would find, and as is the case with experiments that are as rich in nature as these, the findings were both along the lines of what we expected to find as well as hugely surprising. That the interaction designers were not able to find any real use in the rubber bands came as a huge surprise at first, but given the nature of the experiment, it became evident that we handed them a solution to a problem they did not have (yet).

Giving Claus the *Big Red Button* was something we immediately became excited about. We had an idea about what he could come up with but the range of the experiments he conducted and the types of applications he was building was just astonishing to us. At the same time, he is articulate about his work and as such it was a pleasure interviewing him and finding that he had a deep understanding of what he set out to do.

Lastly, obstructing the everyday use of Facebook for two users was an interesting intervention as well. There are many more experiments to be conducted in the field of dependence upon technologies of that kind, but even during our limited study we made some interesting discoveries on how they see people present themselves and how they found ways of communicating with friends anyway.

There is always a level of uncertainty when conducting studies like these. However, we found that the test subjects were able to articulate their thoughts about the situations we had put them in. And using the method of *Contextual Inquiry* to unravel their reactions to the experiments, and then gathering the answers using *Affinity Diagrams,* enabled us to get valuable feedback from them as well as structure it into coherent data that we will analyze in the coming sections of this thesis.

The reason for doing the Tactical Interventions is not to give us insight into how hundreds or thousands of people use a particular tool, but how a select group of participants react in the situations we put them in. They were conducted to illustrate the thinking evident in the Functional Paradigm, and how we must change our behavior if we are to cater for a user that will appropriate technology in ways that cannot easily be conceived if the designer is still in the mindset of the rationalistic, deterministic tradition inherited from the Industrial Revolution.

“Hackworth was a forger, Dr. X was a honer. The distinction was at least as old as the digital computer. Forgers created a new technology and then forged on to the next project, having explored only the outlines of its potential. Honers got less respect because they appeared to sit still technologically, playing around with systems that were no longer start, hacking them for all they were worth, getting them to do things the forgers had never envisioned.”

— Neal Stephenson, “Diamond Age”

“When you sit down to design something, it can be anything, a car, a toaster, a house, a tall building or a shoe, what you draw or what you design is really a culmination of everything that you’ve seen and done in your life previous to that point.”

— Tinker Hatfield

Introducing the Post-Functional Paradigm

In the first part of this thesis, we introduced and defined the Functional Paradigm, which worked as an starting point for conducting our Tactical Interventions. It would enable us to examine the validity of having the Functional Paradigm as the prevalent understanding of use of technology when that technology is taken out of its normal, intended context and put to new use by a range of test subjects.

We were able to conclude that we are unable to understand the issues raised by our test subjects when viewed through the lens of what we defined as the Functional Paradigm. The modernistic break between mind and body as well as culture and nature, is unable to give us a full account of what goes on in the situation where our test subjects are applying their own understanding to the problem-solving behavior that is needed for them to apply the artifacts we handed (or took away from) them meaningfully.

The interventions were specifically established so they would give us a snapshot of the interaction that is constituted between the user and the artifact in order for us to examine how they acted in the context-laden situations. They were not just situations in which they were tasked with solving a rationalistically determined problem in the Problem Space defined by the designer, but situations that went beyond what the designers could have through of as applicable uses.

Moreover, we found a discrepancy between having a starting point in the Functional Paradigmatic approach to computer technology, and the requirements needed for understanding what happens when it is used for e.g. accessing online social networks. If a technology such as computers is used to establish relationships between the user and her friends, what then is the role of the technology?

To better understand this, we turn towards an understanding of design as moving from a limited to an expanded view, as well as a look at how the Social Constructivistic view gives a new understanding of the role technology plays in the contexts inhabited by the users of technology. The methodology applied throughout this analysis should be seen as an exploration of the role of design in the Post-Functional Paradigm.

Defining Technology and Artifacts

Starting out, we need to define what we mean by the terms *Technology* and *Artifact*. They are used interchangeably in everyday language, and in the literature used for this thesis we encountered phrases such as *“pieces of technology”* where another writer would say *technology* and others *artifact*.

Technology can be defined in many ways, depending on the way you look at the basics behind the word. When we talk about technology as tangible material, there is a range of concepts that make up the technology. Simondon (in Feenberg, 1999) talks about *Technicity*. Technicity is his description for the aspects of technology that makes it *technical*. Ihde (1990:73) defines technical as the *physical features* of the technology, which can be designed or discovered. The difference between the two is that Ihde talks about the physical features of the technology which may be *external* or *internal*, while Simondon focuses on the *fact* that it is technical. Let's take an example: A mechanical watch is made up of a wristband, a case, gears, hands and (occasionally) a battery. The gears and the fact that it is mechanical is what Simondon refers to when talking about *Technicity*. Ihde goes further than this and talks about the designed aspect of the watch—the fact that it is mechanical, not digital; that the hands are lines, not dots; that the gears are large and not small to accommodate the size of the watch etc. Thus *technical* is a description of its features, not just the fact that it has gears.

We will focus on Ihde's definition of *technical* throughout the thesis, as it lies closer to our view of technology as designed objects, while Simondon's view on *Technicity* is a given in most cases we will examine.

Moving on, Jonas (in Ihde, 1990:6) states that *"technology is artificial as opposed to natural"*, meaning technology in his view will always be designed. The level of sophistication in the design might be questioned but we will elaborate more on this in the next section on the definitions of artifacts.

What is an artifact?

For Ihde, technology is always *material*. They are *"artifacts of material culture that we use in various ways within our environment."* (1990:1) Here, Ihde uses the term artifact to describe the materiality of a piece of technology that is used within our environment. This is a reference to his argument that *"[a] technological object becomes what it is through its uses. Technological properties become part of the human-tech relativity. They take on significance in the use-context."* To Ihde, technology *is* the artifact once we use it within our environment. The artifact itself may come from anywhere and be of any material kind, but *"any object may become a technology if it can be brought into the range of human Praxis."* (Ihde, 1990:71)

Hayles (1999:15) elaborates on this point by stating that *"an artifact materially expresses the concept it embodies but the process of its construction is far from pervasive"*. A stick, picked up from the ground, has a material expression that defines it as e.g. heavy, long and crooked, but the process of making the stick might in itself be accidental. Picking up a chair, the object once again *"expresses the concept it embodies"* but the construction process is pervasive in the *Technicity* of the artifact, albeit not immediately viewable for the person picking it up.

Krippendorff (2005:15) discusses the importance of the *Technical Properties* of the artifact being open for the users: *"The form of devices are no longer derivable from how they are produced and what they do, but from their users' ability to conceptualize and handle them."* Ihde (1990:70) fully agrees with this when he states: *"A*

technological object becomes what it is through its uses. Technological properties become part of the human-tech relativity. They take on significance in the use-context." This view of technological objects as obtaining significance through their uses is of great importance to our definition of technology and artifacts.

When we in this thesis use the word *artifact*, we refer to material objects. That material object will have technical properties that will ensure its significance in the use-context over other artifacts. In the wider view, one can apply many different artifacts to the same situation, but for the artifact to be useful in a particular use-context, the unique technical properties of a particular artifact, is what mean when we mention artifacts.

A noteworthy deviation from this definition is Krippendorff's (2005:20) *cultural artifact*. In his view, *"language is a cultural artifact that enables humans to coordinate their conceptuations."* If we are to refer to artifacts as objects of materiality, we will need a shift in understanding that enables us to regard language as an artifact with material-like qualities while retaining the sense of immateriality. The *hermeneutically oriented gestalt shifts* is an area that will be analyzed later in this thesis, but it is an important exemption in the sense that for Krippendorff materiality does not equal qualities present in the physical world.

Do we need to know how it works?

In the section on *technical* and *Technicity*, the question about whether it is even relevant to know how the artifact works "behind the scenes" is not answered. Wright & McCarthy (2004:6) takes up this question in relation to computers when discussing the works of Winograd & Flores: *"[Winograd & Flores] argue one has to understand how it works functionally [...]."* One could question how relevant it is to have extensive knowledge about the binary functions of the modern computer but

Schneidermann (in Wright & McCarthy, 2004:16) makes an argument for why we should at least care about technologies in themselves: *"Technologies must support relationships and activities in ways that enrich people's experiences and their sense of togetherness."*

If we are to enhance experiences through technology, they become a part of what Feenberg (1999) refers to as our *Lifeworld*. Winograd & Flores continue: *"The domain in which people need to understand the operation of computers goes beyond the physical composition of their parts into areas of structure and behavior for which naive views of objects and properties are clearly inadequate."* These arguments stem from the idea that we should look deeper than the technical level to see the implications a technology has on our behavior. What if the technology is such a big part of our lifeworld as to influence pervasively and we become emotionally attached to it? Ihde (1990:100) argues against this: *"Technological otherness is weaker than the otherness found in the animal kingdom, but stronger than mere objectness."*

He uses the example of a horse for riding as a thing (perhaps even a piece of technology) that exhibits otherness but is something we can form strong relations to. A shovel used for digging, on the other hand, has a technical otherness that lies closer to the mere objectness.

Emmanuel Levinas calls this otherness *Alterity*. In philosophical terms, it refers to the knowing that there is an Other. phenomenologically, it is in the recognition of Other that we acknowledge there are alternative viewpoints. (Wright & McCarthy, 2004:26) In relation to technology, it is important when one looks at the way in which technology is used by multiple users, and their own relation to the technology itself. We will elaborate extensively on this point later in the thesis. It is, however,

relevant when looking at the relation we have to technology, both in *utilitarian* terms as well as *culturally*.

Could we live without technology?

At this stage it could be relevant to ask if we could live without technology completely. Ihde structures his whole book on the notion of the technology-free *"Garden"* and the *inherited "Earth"* in which we use artifacts to improve our everyday lives. He calls this use of technology *Technics*. It is defined as *"human action employing artifacts to attain some result within the environment."* (Ihde, 1990:12)

For the sake of argument, Ihde lists all the ways in which we use technologies in our inherited Earth as opposed to living in the Garden. It would mean we could not use writing instruments, roads or fire. The Garden would have to be ecologically stable, fairly isolated and well protected. We could not cook food using fire because *"ovens and stoves are technologically externalized stomachs."* (Feebleman in Ihde, 1990:157)

The control we would have over our environment would be limited as the technological reality of having left the Garden to inherit the Earth renders the idea of a stable, isolated, and protected Garden as a *Utopia*.

Control

The question of whether we could live without technology also invokes the ideas of controlling both nature and technology.

Ihde (1990:140) states that *"to enter any human-tech relation, is to both control and be controlled."* In the example mentioned above with ovens and stoves as

externalized stomachs, we enter the domain of the French anthropologist and ethnologist Claude Levi-Strauss, and his idea of the opposing placement of *natural* vs. *cultural* (in Ihde, 1990:19). The meat, stripped from the bones of the animal, is the raw encounter, while the cooked meat is the result of a cultural norm that has been applied to the situation.

Today, we would rarely eat raw meat and only on a special occasion where we actively choose not to have it cooked (e.g. a steak tartare). One could argue that this is a trivial exemption, which is why Ihde's example of birth control is more relevant as an example of *control* vs. *non-control as conscious decision*.

In the Western world, using birth control pills has become the norm for many women, and often the decision to have a child is the result of actively choosing not to use the available technology. It has become standard to use technology when available and generally we live in a technologically textured ecosystem—what could be termed as a *technosystem* (Ihde, 1990:2).

At the same time, there are plenty of societies in which the same reliance on technology (not just birth control pills) has not been established. If Ihde's argument is that we now live in the inherited Earth, how does he view the fact that not all cultures have the same norms? We already established that the technology-free Garden is a Utopia that has no chance of existing in its purest form.

The implications of living in a technosystem will be discussed further in the last part of this thesis, as it is heavily related to *Hermeneutics*, *Phenomenology* and especially *Social Constructivism*.

Before that, we turn to an examination of the way designers can approach the problem-solving behavior that is necessary for them to explore the implications of bringing something *artificial* into the world.

“Indifference towards people and the reality in which they live is actually the one and only cardinal sin in design.”
— Dieter Rams, “As Little Design As Possible”

“So long as considerations of utility are neglected or overridden by considerations of ornament, there will be not true art.”
— Frederick Law Olmsted

“Design dissolving in behavior.”
— Naoto Fukasawa

Design

You often see things described as “good design”, “bad design” or even “over-designed”. But what really lies behind the term, and how do we plan on using it in relation to our thesis of a Post-Functional Paradigm? That's what we will seek to expound in this part of the thesis, with a clear focus on what design means to us. This way, it will enable us to analyze the Tactical Interventions we conducted and how we might start thinking of design in a different way if we indeed are in the Post-Functional Paradigm.

The simplest explanation of design of those we have come across is Herbert Simon's definition (in Krippendorff, 2005:26): *“The natural science is concerned with how things are—design is concerned with how things ought to be.”* In this sense, design is concerned with the *artificial* as opposed to the *natural*. We already touched upon this in the section on our definition of artifacts and technology, as one could argue something is designed the second it is used for a purpose different than its original, natural state. We used the example of a stick that comes from a branch on a tree where its *natural purpose*, so to speak, is to allow leaves to reach the sun’s rays but in the case of being used as e.g. a walking stick, it is used for supporting a human whilst walking.

Don Ihde (1990:69) talks of the *intentional fallacy* in this regard. That something is *“hermeneutically designed for one use, [but] phenomenologically there is no thing in itself, only things in context.”* It is in its use that the artifact gains its relevance. Designed objects still have to be used which Krippendorff (2005:introduction) addresses by stating: *“Design is sense-creating which claims perception, experience and perhaps appearance as it is a fundamental concern.”* In other words: *“Design is making sense of things [and] are to be understandable to the user.”*

To him, design is applying artifacts to situations to understand them better. In this sense we use artifacts to gain insight into the state of things that *could be*, which aligns nicely with the notion of design as concerned with the artificial, as opposed to inquiring into the state of the way nature already *is*, which science is concerned with.

One could ask cheekily whether design is only concerned with making things *pretty* —whether it is but a matter of aesthetics, or art. The interpretation from the Industrial Revolution, as described by Krippendorff, is to view *"design as applied art."* (2005:introduction) The above-mentioned definitions of design actually do fit this description, if engaging with art in this sense is a sense-making act that *"claims perception, experience and appearance".* Wright & McCarthy might hold the key to unlocking why this is certainly not the case: *"Aesthetics are refined forms of everyday, prosaic experience in which the relationship between the person and the object of experience is particularly satisfying and creative."* (2004:18)

If we move across the aisle and ask ourselves if design is then only used to create tools that can be applied to a situation to ensure a desired outcome, we will find the argument from Krippendorff once more: *"Defining design as problem solving commits designers to a technical rationality."* This notion of problem solving has already been discussed extensively in the section on *Bounded Rationality*. In this situation, design is nothing more than a means to an end—it is the way in which we approach a problem and solve it more easily and efficiently.

The danger, one could say, of defining design as problem solving is underlined by Andrew Feenberg's example of the manufacturing machines that were half-sized compared to those found in factories today. This is because they had to

accommodate the workforce that was prevalent then: children. With this in mind, Feenberg (1999:139) argues that *"design comes to reflect a heritage of properly technical choices biased by past circumstances".* A machine designer of the period would not have considered it inappropriate that the machines were what we would now consider half-sized.

Feenberg goes on to argue that we need to step away from this technological thinking but if we really are to create a real break, we will need *"a conception of technology open to a wider range of values."* (1999:224) Krippendorff proposes that we should *"move from having to adapt to technological progress—[i.e.] designers making adaptation less painful—to humans able to influence the direction of technological development and for designers to find ways to support diverse practices of living."* (2005:13) It is not enough to state that the technological developments will happen inevitably and we as humans, and designers, should just try to keep up with this and make sure it is usable to the people who will have to use the artifacts.

With this view in mind, designing is not about *form following function*, as famously stated by American architect Louis Sullivan. Krippendorff (2005:15) argued that *"the form of devices are no longer derivable from how they are produced and what they do, but from their users' ability to conceptualize and handle them."* We should do as Jan Michl, professor of history and theory of design at the Institute for Form, Theory and History at The Oslo School of Architecture and Design (in Krippendorff, 2005:5) proposes by asking *"what [the artifacts] are to serve [and] where functions come from."* He calls designing by the device of form follows function *"a carte blanche, or a stable functionalist order,"* implying that when you only focus on applying form—or aesthetics—to the functions, you are not looking at the right questions to ask.

Winograd & Flores have been instrumental in shedding light on what they see as design; that it is not about finding "the one right answer" but asking *meaningful questions* (1986:13). They even go further yet: *"Design is the interaction between understanding and creation. What it does. Only by unconcealing the traditional design assumptions can we open up to new possibilities."* (1986:5)

To them, designing is as much about breaking down the traditional thinking that has gone into designing—in our case, the mindset resting upon the traditional rationalistic, deterministic Functional Paradigm—as it is about pushing it further towards an understanding of design that goes beyond the functions into the domain of understanding what it does. This is not to say that we need to understand the mechanics of a watch, or the way a CPU works to grasp the full level of possibilities an artifact present to us. Rather it is, as Feenberg states, to *"take the social dimensions of technology into account from the start [in a reflective design process]."* (1999:90)

Wright & McCarthy talk about the *felt experience* of technology in this regard. In their view, *"interacting with technology involves us emotionally, intellectually and sensually. Therefore those who design, use and evaluate interactive systems need to be able to understand and analyze people's felt experience with technology."* (2004:preface) According to them, it is not enough to take the functionalistic approach and make sure that *form follows function*. Using technology (or artifacts in general) is about the *felt* experience people have while using it. The social setting in which the use takes place is just as important to them as the political decisions that lie behind the rationale of making the artifact a particular color, size or shape. According to Feenberg, in these use cases it is even acceptable to feel *ambiguity* as a user. He states: *"Ambiguity is technical problems that must be solved through interaction between designers, purchasers and users"* and as such it is

an interactive process of overcoming these hurdles in the best way possible for every entity that is in contact with the artifact from creation to throwing it away. (1999:86)

Ambiguity

In the paper, *"Ambiguity as a Resource for Design"*, Gaver, Beaver & Benford explore the possibilities of using ambiguity as a driving force in designing artifacts. They write that *"if 'usefulness and usability are the twin goals of HCI research and development', then ambiguity would seem their nemesis".*

One could argue that, as a user, I should be able to pick up an artifact and immediately know how to use it, and how would that be possible if my first impression of it is ambiguous? Gaver et al state that, while ambiguity would be a desirable trait for some design, *"ambiguity should not, of course, be allowed to interfere with the accomplishment of well-defined tasks, particularly in safety-critical environments".* It is easy to imagine the issues that would arise if a nuclear physician had to think about what the blinking red lamp on the dashboard *really* meant…

Gaver et.al clarify their use of the word ambiguity in design, by stating that it differs from *fuzziness* and *inconsistency* because they are *descriptions* of the attributes of things, while ambiguity refers to our *interpretation* of the artifacts. In other words, the artifact itself should not be considered fuzzy and inconsistent (e.g. by swapping the clutch and brake in a car) but our interpretation of the artifact should be ambiguous.

To ensure a consistent interpretation, Gaver et.al distinguish between three kinds of ambiguity: Ambiguity of *Information*, *Context* and *Relationship*.

Ambiguity of Information is related to the interpretation one has of what is being displayed. Gaver et al use Leonardo da Vinci's “Mona Lisa” as an example. People have been wondering for hundreds of years what it is about the painting that makes it so special. Who is she? Why was she even painted by da Vinci? And what is it about that smile? da Vinci purposefully painted it using a method called *“sfumato”* where he reduced the focus around her lips as to withhold some crucial piece of information that would make it absolutely clear whether she was happy, sad, indifferent or even mischievous. It is in the lack of clear information that the ambiguity lies, and it only adds to the interest for the painting that we have to guess.

Regarding the Ambiguity of Context, it is not the lack of information that makes it unclear to the user what she is dealing with. Gaver et al write: *“Ambiguity sometimes arises not because things are themselves unclear, but because they may be understood in different contexts, each suggesting different meanings.”* They use the example of *Duchamp's Fountain,* which is in no way a particularly indecipherable piece of art as one might find in the abstract art forms. It is, simply, a urinal turned on its side.

“Seen as a sculpture, the Fountain’s graceful lines and intimate enclosure can be aesthetically pleasing. But it is, almost insistently, a urinal. Not only can it be perceived in different ways, but for many people these interpretations are incompatible.” (Gaver et al:4) The ambiguity found in the example of the fountain is in the way you perceive the art piece. It does not hide anything, rather it shows everything as it is but the interpretation of the meaning is highly ambiguous. Gaver et al state that to some people, the *graceful lines and intimate enclosure can be aesthetically pleasing* but to others, it will only ever be a urinal.

Lastly, ambiguity can be found in the *Relationship* between the user and the artifact. Gaver et al use Van Lieshout's *Bais-ô-Drôme* as an example. It is a *love caravan* that is undoubtedly very well built with incredible attention to detail. However, the *sleaziness* of the caravan can leave the viewer uncomfortable because it is incomparable to their views of what they think such a caravan "should" be. Thus, the ambiguity lies in the relationship between the viewer and the artifact—there is neither information withheld, nor is it a well-known artifact put in a different context. It is purposefully crafted to bring forth a feeling of ambiguity in the relationship.

In short, to accommodate the feeling of ambiguity in design, Gaver et al provide a range of suggestions as to what designers can think about when they create their artifacts:

Ambiguity of Information:

- Use imprecise representations to emphasize uncertainty.
- Over-interpret data to encourage speculation.
- Expose inconsistencies to create a space of interpretation.
- Cast doubt on sources to provoke independent assessment.

Ambiguity of Context

- Implicate incompatible contexts to disrupt preconceptions.
- Add incongruous functions to breach existing genres.
- Block expected functionality to comment on familiar products.

Ambiguity of Relationship

- Offer unaccustomed roles to encourage imagination.
- Point out things without explaining why.

- Introduce disturbing side effects to question responsibility.

All of these suggestions point to the purpose outlined by Gaver et al that ambiguity should in no way become an excuse for poorly executed design. We have all encountered designed objects that seem ambiguous at first, but once we find out how they are used marvel at the level of inconsistency from other technology in the same category, for no other reasons than aesthetics or “trying something new”.

An example of this could be *Alessi's* garlic presser (seen above). On first sight, it might not be immediately clear what the purpose of the artifact is. Once you pick it up, conceptually it resembles the known shape of a garlic presser and it can be put to use. However, its design is still flawed in the sense that because of the focus on ambiguous aesthetics, the designer has made the artifact such that cleaning it properly is very difficult. This goes directly against the point of not using ambiguity as an excuse for poorly executed design. Had they focused on creating something that did not get in the way of the task at hand, they would have successfully employed ambiguity of information by, amongst other things, *using imprecise representations to emphasize uncertainty.*

Gaver et al end the article by stating, *“the most important benefit of ambiguity, however, is the ability it gives designers to suggest issues and perspectives for*

consideration without imposing solutions". This aligns with the purpose behind our *Tactical Interventions* where we tried to give or remove artifacts so that the test subjects would need to reflect on the situations they found themselves in. The obvious difference being that we did not invent the artifacts ourselves, we just handed them over.

The upcoming part of this thesis will relate to the problems associated with *Interfaces* which are usually employed with little reflection on the helpfulness of ambiguity. The Interface, however, is an important part of the computer as it is the way in which the majority of users will interact with it.

~~Graphical User~~ Interfaces

When designing artifacts, you often face the problem of designing a Graphical User Interface (GUI) that will be controlled via peripherals such as a keyboard and mouse that is connected to a computer and a monitor.

This is a typical situation where the approach prevalent in the Functional Paradigm can alienate users by being centered on how the system works rather than focusing on what the user is trying to achieve. Winograd & Flores (1986:96) attack this problem by stating: *"When creating programs, the programmer creates a systematic domain which embodies the programmer's interpretation of the situation in which the program will function."*

The key words in the quote above are focused on the *programmer's interpretation*. If the programmer believes that function A is the most important one but the user will find function B more useful to their task, a discrepancy will arise. Thus Winograd & Flores (1986:85) define *successful programming* as *"designing a representation and set of operations that are both veridical and effective".* This has been far from the

dominant case in programming in the Functional Paradigm. Krippendorff addresses this as a recurrent theme during the *Industrial Revolution*, where it was (and is) not unusual for manufacturers to train certified experts in what they designed. This way there was only one correct usage and this aligned with the producer's intentions (Krippendorff, 2005:7). This has, in his view, been solved by *(re)configurability* where an important feature of the Interfaces became the ability to tweak it to better fit the needs of the user—you would try to make it possible for the machines to behave like the users wanted them to.

But is the term *Interfaces* only relating to the *GUI* that is projected onto screens we find at our desks, on our mobile phones and in ever more places around us? Jef Raskin, the highly influential American human-computer Interface expert responsible for amongst other things the Macintosh project at Apple in the 1970s, wrote in his seminal book, *"The Humane Interface"* on this confusion of terms: *"Many people assume that the term 'user Interface' refers specifically to today's GUIs, complete with windows and mouse-driven menus. For example, an article in Mobile Office magazine said, 'Before too long, you may not have to worry about an Interface at all: You may find yourself simply speaking to your computer.' As I pointed out in response, a voice-controlled system may have no windows, but neither do telephone-response systems, and they often have hellaciously bad Interfaces. The way you accomplish tasks with a product—what you do and how it responds—that's the Interface. […] As far as the customer is concerned, the Interface* is *the product."* (Raskin, 2000:2) This, however, is what Krippendorff would define as Human-Machine Interface: *"The design of Interfaces shifted designers' attention from a concern for the internal make-up and appearance of technology to what mediates between users and technology, the betweenness in which Interfaces evolve."* To him, the focus is on the interaction, while Raskin defines it as the whole product (or artifact) the customer (or user) is engaged in a use-situation with. One could argue

they talk about the same aspect (the importance of not alienating the user engaged with the artifact), although one focuses on the *actions* and the other on the *physical* qualities of the (albeit digital) artifact.

Raskin's view on Interfaces as essentially being the product (or artifact), because it is what the user (the *customer* in Raskin's words) sees, sets high expectations for the *usability* of the product. If we really are moving from the Functional Paradigm where users would become certified in using the products sold by manufacturers, Krippendorff's (2005:20) definition of usability (*"The degree to which specific users can achieve specific goals, in a particular environment with effectiveness, efficiency and satisfaction."*) would have to be the goal to strive for.

Krippendorff argues that there are three main pillars of Interfaces: *Interactivity*, *Dynamics* and *Autonomy*. *Interactivity* refers to the actions made by the users engaged in the Interface—what he refers to as *"the give and take that is inherent to the human use of machines"*. *Dynamics* refers to the fact that, as a user, you rarely move to the "point of departure" again, once you have used the Interface. You might have reconfigured the Interface to suit your needs, or used it for a sufficient amount of time to move permanently beyond the blank slate facing new users. *Autonomy* implies that the user can actually use the Interface without intervention from the outside, meaning that the user will engage autonomously with the Interface and does not need to be educated in the use of the artifact. In other words, the completely opposite principle of training certified users to ensure proper use.

One could argue that advocating for a total and all-encompassing break with the underlying principles of the Functional Paradigm is the reason behind defining a Post-Functional Paradigm but it would be wise to follow Winograd & Flores' view of seeing technology as a transformation of tradition (1986:29). They state that

“Ontological design is necessarily both reflective and political. It looks both back and forth”. So technology designed to change the existing situation to reach a preferred one is changing the *Ontological* view one has of the situation you are in. Herbert Simon even went so far as to say that: *“Everyone designs who devises causes of action aimed at changing existing situations into preferred ones.”* (in Krippendorff, 2005:25) So when you, as a user, bring technology in to your life, and apply it to existing situations that you are hoping to change to preferred ones, *you* too become a designer.

If we take this thought and advance it with the principles outlined by Raskin, we will find that there is a clear break between his notion of the *Humane Interface* and the rationalistic, technologically deterministic tradition found in the Functional Paradigm. He states that *“a computer should not waste your time or require you to do more work than is strictly necessary.” (*2000:6) This also aligns perfectly with Krippendorff's principle of Autonomy that implies you should be able to walk up to an Interface and start using it immediately.

Having reached this conclusion, we propose a shift in views; from the technologically deterministic rationale in problem solving to a focus on the human as a center of attention in the application of technology to reach a desired situation.

We have moved from focusing on the *form* of the technology, whether it is for purely usable means or as a solely aesthetic delight, to a focus on establishing *meaning* for the human in their use situation. In Krippendorff's words this will raise awareness to the view that *“'human-centeredness' is about acknowledgement that meaning matter.”* (2005:13)

With this in mind we will analyze the implications of when the user is no longer on the receiving end of instructions on how to use an artifact, but actively engaged in establishing meaning in the use situation.

Analysis of the Tactical Interventions through Design Thinking

The primary reason for conducting the tactical inventions in the way we did was to introduce—or remove—artifacts related to the everyday life of our participants. We were particularly interested in discovering how they responded to our challenges, not necessarily just what they ended up doing. To us, it was more about focusing on the process behind their reasoning rather than the final solutions.

Looking at the rubber band as a tool for *"improving something in your everyday life"* the test failed miserably. Both Louise K and René ended up being too dumbfounded to come up with tasks the rubber band could solve and only Louise K ended up actually applying the rubber band to something: helping keep together a case for sunglasses that could not close on its own. René talked about using the rubber band on top of a pair of concert tickets to ensure he remembered both when he left the office.

The rubber band in itself offers no technical properties that were too hard for them to grasp. The rubber band is simple in that it can stretch to a certain degree before snapping and has a particular size that enables it to hold some stuff together if it is not too large or heavy. All in all it is a simple tool, yet they were unable to apply it meaningfully to a situation in their everyday life.

We can look at this situation from two angles. If we take the approach that goes along with *form follows function*, we can start out by defining the rubber band from its intended functionality derived from the problem solved by its designer (whom

we unfortunately does not have the identity of). It is intended to hold together a stack of postal items such as letters, magazines etc. Thus it had to be elastic so it could be wrapped around the whole stack, and strong enough to not crack when being applied.

These are the technical properties of the rubber band, and the constraints under which Louise K and René had to work. We deliberately kept the assignment as open as possible to avoid giving them ideas for how they should apply the rubber band in a use situation. This proved to be problematic as they described the troubles they had in finding the value in carrying it around. In a sense, it could be argued that giving them the artifact was equal to giving them the solution to a problem they did not have yet. Louise K described the situation where she used a pillow to keep her door closed as another example of applying something extraordinary in an unintended situation. Had we handed her the pillow and said the same thing as with the rubber band, it is fair to assume that she would have had the same problems finding an applicable use case.

The technical properties of the rubber band or pillow do not matter in the situations in the situations they were used in because they were outside the small scope in which the designer intended them to be used. As such, there is nothing wrong with either artifact—they did not break during use or otherwise fail achieving its full potential solely based on what was “promised” by its technical properties.

However, it would not entirely fit the description of what we have so far established as a foundation for the Post-Functional Paradigm. It is designed from the view of someone working from a Functional Paradigm; that there is a problem of holding letters together, and it will be solved by the application of the rubber band to that situation. And it solves that problem just fine—it is when we take the artifact out of

that situation it becomes problematic because of the constraints in the technical properties.

Looking at the Big Red Button we gave to Claus, however, we see a design that is closer to fulfilling what we see as something that derives from the Post-Functional Paradigm. In itself, the button's technical properties are thought through by the designer. Claus mentions many times that it has a *“nice travel,”* meaning that it feels nice to press down the button. There is nothing hindering the main function of the button form working perfectly. It is in the situation of actually applying the artifact to a meaningful situation that the interesting part of the Tactical Interventions is revealed.

Pushing the button is easy enough but it is an open-ended design where you have to apply whichever function you feel the button should have to make it work properly. In Claus' case he describes how he made the button send off an email when you punched it hard enough in his Kinect game, or how he could hammer the button when something memorable was said in the room he was present in. Or when he was angry about something, he could press on the button thrice in succession to ensure a different outcome than the one press indicating something positive. It is in the situation where he has ascribed the button an emotional function that it becomes meaningful.

You could argue that the form of the button follows its function, pressing down the red top, but we would argue that it is a focus on technical aspects. The button *works* from a technological standpoint but it is the emotional significances placed upon the button that make it an artifact applicable to a human-centered design.

Lastly, in the example of removing Facebook from Louise AB and Stine, we meant to force them into a situation where they had to go about solving a problem in a different way. In the example laid out by Feenberg (1999:77), he described how problem solving is often about solving the real problem most efficiently, when it should be about viewing the problem from a different angle to ensure it is the right problem you solve. For Louise AB and Stine, it became apparent after we removed Facebook that they could still get in contact with their closest friends through other communicative means (texting on their mobile phones, calling via the voice-over-IP program Skype etc.). Moreover, they found that they did not *need* to see the information presented about their friends through Facebook, which was something they had not considered before, given that it was a habit to check the social network daily.

If the problem solved by Facebook was for them to keep in contact with their friends, seen from the perspective outlined in the Functional Paradigm, Facebook did solve the problem well. It was only when we removed the artifact that the participants found that other tools solved that problem equally well, and they did not need to use Facebook. However, they both agreed that they would still continue to visit the social network to stay connected to some of the fringe acquaintances who they did not see as often as their closest friends because Facebook let them follow their online activity easily without them having to seek out the information.

One could argue that using their phones' text messaging functionality as well as Skype for chatting etc., they were able to solve the tasks they needed. E.g. meeting up for dinner on a weeknight. Reading about what people not in their closest group of friends are up to becomes a connotation they ascribe to using Facebook—it affects them emotionally and socially in ways that cannot be described by focusing on facts such as "Facebook has a messaging functionality" or similar.

Placements

The discrepancies we have found in the previous section between what is intended by the designer compared to the understanding made by the user can be analyzed further by the theory of *Placements* proposed by Richard Buchanan, Professor of Design, Management, and Information Systems at the Weatherhead School of Management.

In his paper *"Wicked Problems in Design Thinking"*, he outlines how designers solve problems creatively. He begins by outlining the points made by the American philosopher and developer of the philosophy of *pragmatism*, John Dewey, on the relation between art, science and practice: *"[If] modern tendencies are justified in putting art and creation first, then the implications of this position should be avowed and carried through. It would then be seen that science is an art, that art is practice, and that the only distinction worth drawing is not between practice and theory, but between those modes of practice that are not intelligent, not inherently and immediately enjoyable, and those which are full of enjoyed meaning."* (Dewey in Buchanan, 1992:7) As Buchanan points out, Dewey pointed towards science as art rather than treating them separately.

The implications of this understanding are immense but first it is crucial to understand what Dewey means by *art* in this regard: *"After a period in which natural knowledge progressed by* borrowing *from the industrial crafts, science entered upon a period of steady and ever-accelerated growth by means of deliberate invention of such appliances on its own account. In order to mark this differential feature of the art which is science, I shall now use the word 'technology.' ... Because of technologies, a circular relationship between the arts of production and science has been established."* (Dewey in Buchanan, 1992:7)

For Dewey, *technology* means carrying out *intentional actions* as opposed to the general understanding of technology as a physical artifact. To him, the fact that you are doing *something* is evidence of applied technology, not *what* you are carrying out that something with, whether it is a stick or a computer.

Going that far in your definition of technology is certainly debatable, and Buchanan uses Herbert Simon's view of treating *design as a science* as an example of the opposition. Where Buchanan agrees with Dewey is in the notion that *design thinking* can, and should, be applied in ever more situations to fully understand the possibilities in those situations. However, the focus for Buchanan is still on making design as a discipline better understood as something more than fuzzy thinking and *"creative accidents"*. This is where his theory of *Placements* is applicable.

Buchanan gives an example of four broad areas in which design has an impact on everyday, contemporary life (despite the article being published more than 20 years ago has no impact on the validity of these in our view):

1. Symbolic and visual communications
2. Material objects
3. Activities and organized services
4. Complex systems or environments for living, working, playing and learning. (Buchanan, 1992:10)

The *symbolic and visual communications* have taken inspiration from design in the way they go from *"confusing parts to orderly wholes"*. The signs and images that are used in the symbolic and visual communications stem from a need to navigate through *material objects*, who in turn are influenced by the way we take *action*

based on the signs and images. They become inter-combined through a *unifying thought*. Moreover, the material objects can influence how we conduct activities that in turn will play a role in the design of e.g. *complex systems for living*.

Let us take an example. In a multi-story office building, it would be helpful to have signs telling you where the different departments of the organization inhabiting the building are located. The signs influence the material objects in the sense that in getting from one floor to the other, you will need a staircase, elevator, slide or even just a hole in the floor. Thus, the signs should reflect how you most easily get from one floor to the other. If the organization is focused on a particular type of activity that involves large groups of people gathering, there would need to be a room capable of fitting those people comfortably, e.g. an auditorium. And lastly, the people in the auditorium might have to conduct a specific set of tasks (listening, working together in small teams) and the room would then need to facilitate that (working/playing/learning) particular activity.

When you think about design in this way, and not just in the purely functional or aesthetic direction, we have come to Buchanan's conclusion that *"designers would no longer be viewed as individuals who decorate messages, but as communicators who seek to discover convincing arguments by means of a new synthesis of images and words. In turn, this will shift attention toward audiences as active participants in reaching conclusions rather than passive recipients of preformed messages."* (Buchanan, 1992:12)

What is it then that makes this synthesis of action-reaction sequences different from the *"creative accidents"*? In Buchanan's argument, it is the essence of *Placements*, as opposed to what he calls *categories*: *"Categories have fixed meanings that are accepted within the framework of a theory or a philosophy, and serve as the basis for*

analyzing what already exists." (1992:13) As we have already concluded in previous parts of this thesis, this is the background for the scientific methodology in which hypotheses are tested rigorously based on current knowledge to gain new knowledge. It is also how the technologically deterministic orientation will regard technological development: as incremental improvements of already established categories of technology. They are in this way bounded by their own rationality and cannot jump to the conclusions necessary to gain insight to solve the problems they did not know existed.

Placements on the other hand reference exactly this issue of Bounded Rationality and problem solving in the domains inhabited by the ones looking for a problem: *"Placements have boundaries to shape and constrain meaning, but are not rigidly fixed and determinate. The boundary of a placement gives a context or orientation to thinking, but the application to a specific situation can generate a new perception of that situation and, hence, a new possibility to be tested. Therefore, Placements are sources of new ideas and possibilities when applied to problems in concrete circumstances."*

What we were trying to force Louise K and René to do was think in alignment with the Placements found in the rubber band. The constraints are in the technical properties and we hoped they would come up with ways to apply it to give them a new perception of that situation. However, we found that in the Tactical Interventions with Louise AB and Stine they were able to take the constraints of the situation and apply their problem-solving skills to generate a new perception of the situation. They found that they could still call and text their best friends, but also found that they were fine with not receiving the information about their fringe acquaintances they would usually get through Facebook.

In relation to Placements, the most interesting observations we made were how Claus applied the Big Red Button. The object itself fits Buchanan's description of objects based on Placements perfectly; the boundary of it shapes the meaning of it (*”press this down”*) but the applications are multiple and a constant source of new possibilities to test out. If he had kept the button for a longer period of time, he might have found out that it worked best when placed somewhere in the room that he walked by often, or closer to the desk if the wanted to use it for his sound recording application.

In general, the theory of Placements fits well within the Post-Functional Paradigm as an example of how designers think if we are indeed correct in stating that the premise for designing artifacts has changed. Rather than trying to solve a well-defined problem through a set of specifications, applying design thinking to the problem-solving process will expose that they are indeed what Buchanan refers to as *Wicked Problems*. Wicked Problems were first described by the mathematician and designer, Horst Rittel, in the 1960s and is his definition of an opposing view to the linear model of design thinking that describe *Determinate* problems with *Definite Conditions*—exactly the view found in the Functional Paradigm.

However, the notions of Wicked Problems refer to a fundamental *Indeterminacy “in all but the most trivial design problems.”* (Buchanan, 1992:16) Indeterminacy is in no way the same as *Undetermined*, but refers to the fact that there is no definite solution or limit to the design process. Buchanan argues that the designer must define the *particular* subject for the design, which is what sets it apart from the scientific methods that are interested in exposing the underlying principles, laws, rules or structures embodied in existing subject matters.

Prototyping

The *Indeterminacy* described by Buchanan is what we see as the essential principle behind designing artifacts. Thus, a practical methodology can help aid the designer in the process of moving from abstract ideas to concrete tangibles. One of these methodologies is *Prototyping*.

In his paper, *"Design-Oriented Human–Computer Interaction"*, Daniel Fallman, associate professor at the Department of Informatics at Umeå University, outlines three main *Accounts* that can be applied to the creation phase the designer enters when encountering an undesirable situation that she wants to change:

- *The Conservative Account*
- *The Romantic Account*
- *The Pragmatic Account*

In the *Conservative Account "[to] be design-oriented is consciously to seek to intervene and manipulate, aiming to convert an undesired situation into a desirable one. Here, design is thought of as a* scientific *or* engineering *endeavor, borrowing methodology and terminology from the* natural sciences*,* mathematics*, and* systems theory *[…]."* (Fallman, 2003:2) This is, as has been extensively described, the main underlying thought behind the design processes in the Functional Paradigm. The designer is concerned with the *concrete* problem that is already a prerequisite for engaging in a design phase structured by the Conservative Account, and the solution will solve that problem as *efficiently* as possible.

Fallman states that the process begins with a *breaking-down activity* in which the designer analyses the situation before beginning the *building-up activity* that mimics a *synthesis* of a solution. This process is, according to the Conservative Account,

resembles *"that of an engineer or a natural scientist"* because of the methodology and structures it is based upon (Fallman, 2003:2).

Opposing the Conservative Account is the *Romantic Account*. Designers are viewed as *"imaginative masterminds equipped with almost magical abilities of creation."* (Fallman, 2003:2) This is far removed from the scientific foundations of the Conservative Account and more closely resembles that of *artistic* expression. Design becomes a *black box* in which *"[The Romantic Account] trades in creativity and individuality over methodology and control, aesthetics and individual judgment over transparency and logical reasoning"*. The Conservative Account is described in this regard as being a *glass box* in which rationality and transparency are the dominant factors, but the Romantic Account becomes an exclusive club that only the select few who *"possess the ability"* can really comprehend (Fallman, 2003:2).

The third route presented by Fallman is the *Pragmatic Account*: *"Design is about being engaged directly in a specific design situation. It holds that design is always carried out somewhere in particular. This 'situatedness' locates the design process in a world which is already crammed with people, artifacts, and practices, each with their own histories, identities, goals, and plans."* (Fallman, 2003:3) The designer will, in this account, design objects that are obviously still artificial, but they will engage in a lifeworld that is already full of relations to similar objects and situations of use that has presented itself previously.

In other words, the designer creates artifacts that do not fulfill a purely *aesthetic* need of the viewer or user, nor is it an artifact that is purely *rationalistic* and created without thought for the ecosystem of artifacts and meanings it will enter.

Defining the scope of the problem is, as has been discussed previously in the section on Bounded Rationality, a matter of knowing what the real problem you ought to solve is. In the example used by Winograd & Flores (1986:148), the commuter whose car breaks down finds that taking the public transportation system to work *dissolves* the problem they thought was prevalent—the question of which new car to acquire. The ability to follow that trail of thought must then be an essential skill to possess for a designer if they are to reject the prevalent thinking found in the Functional Paradigm.

A technique that could be useful in this regard is *Sketching*. The Oxford Dictionary defines sketching as *"a rough or unfinished drawing or painting, often made to assist in making a more finished picture"*. This particular definition focuses on the *outcome* of the act, rather than the *process* the designer engages in when creating the sketch, or, in other words, creating the artificial from scratch. Fallman (2003) as well as the former co-directors of the Knowledge Interaction Design Laboratory at University of Tokyo, Yasuhiro Yamamoto & Kumiyo Nakakoji, in their paper *"Interaction design of tools for fostering creativity in the early stages of information design"* (2005), argue that sketching is not so much about the *result* of the process but the *process* itself. It is a way of *thinking* and *working*, and Fallman even goes so far as to suggest that sketching is not a *tool*, *technique* or *skill* a designer should possess, but a way they should *think*.

Yamamoto & Nakakoji agree with this and write: *"Without having conscious images of what to draw, a designer's hand, holding a pencil, moves on a sheet of paper, producing lines. The designer sees the emerging lines and shapes, and listens to the situation talking back to him/her. While listening to the situation, the designer continues drawing. The design proceeds as a seeing-drawing-seeing cyclic process."* (2005:517) The process is defined here as one that involves *drawing* but as

Fallman stated, it is the *thinking* processes that are important. They help the designer define the *Problem Setting*, which is to say it is not about *Problem Solving*, but setting the right boundaries for the problem to be defined within. That does not have to be done by setting lines of ink or charcoal on a piece of paper but by *reflecting* on what has come up during the sketching phase and *reacting* on that.

In the Tactical Interventions, we found that Louise K and René were unable to find suitable settings for which the rubber band could be applied meaningfully. Louise K used it to hold together the protective case for her glasses but she said she could just as easily have used a hair band. René failed to come up with a use case at all, and in the light of the *Problem Setting* as opposed to *Problem Solving*, one could argue that if they were to apply the rubber bands, they would have to test different scenarios before finding out which one was the most appropriate. Instead, we handed them the solution to a problem they did not have, rather than giving them the opportunity to seek out solutions in a situation where a *Breakdown* had occurred. The significance of *Breakdowns* will be analyzed later in this thesis.

Claus, on the other hand, was given an artifact that was sufficiently open-ended for him to define the Problem Setting properly. It could be argued that there would be better ways for him to gain motivation to do tedious chores than pushing a button but he sought out situations where the artifact would help him solve a problem he did not know he had before he was given the artifact.

The same can be said for Louise AB and Stine, who found that communicating with friends could be solved easily through other media, and that the problem-solving behavior they were engaged in through Facebook focused on keeping up with the whereabouts of friends they did not need to keep up with. In other words, they found that they were efficient at the wrong task—a prevalent theme in the

Functional Paradigm—and only when they were placed in a new Problem Setting did they realize this.

If the designed artifacts that we engage with are indeed perceived as having some sort of function that is immediately clear to us, how do we describe what it is we pick up on? What do we recognize and pick up on as the main purposes of the artifact, and how are they displayed? Our test subject Claus mentioned the Big Red Button had a lot of *Affordances* that directed his use of the artifact towards specific activities.

Affordances

The term *Affordance* was coined by the perception psychologist J.J. Gibson in 1977 in his book *"The Theory of Affordances"* and introduced to the HCI (human-computer interaction) community in 1988 by Donald Norman in his highly influential book, *"The Psychology of Everyday Things"*. In the paper, *"But how, Donald, tell us how?"*, Djajadiningrat, Overbeeke & Wensveen describe Don Norman's Affordances as *"inviting the user to the right action"*. They state that the common interpretation of the term has been a focus on the *clues* in design that invite the user to perform a certain action. For example, door handles *afford* grabbing and pulling while knobs on faucets *afford* turning.

Claus describes the Big Red Button as *affording* a powerful punch. The button itself is colored bright red and when you place your hand on it, your hand will automatically close on top of it, as if the button was meant to be in the palm of your hand. As previously quoted, Claus mentioned that *"it's nice that the button is so mechanical. It brings forth the inner trucker, like when you grab a horn in your truck. It wants to be pushed, and you can punch it hard without breaking"*. What he describes is the fact that because of the physical design of the button, it *affords*, or

invites the user to use some force when hitting the button. Moreover, the button was described as having a *"nice travel"*, meaning that there was little bit of resistance when you hit it, so you really had to use some force to push it all the way down.

This is what Claus describes as the *immediate feedback*. What you see is the bright red color and the mechanical technical properties of the button. However, he used the button for a range of purposes, including a leader board for when he had done a tedious chore. In this situation, the purpose is not to just hit the button—that is to say that the reward is not as much in the punching of the button, but the resulting addition of points to his daily score. His comments on this fact are very telling: *"If you move feedback to another place it's bad. […] Distance is murder for feedback—it doesn't convey well over distance."* This is arguably true in his own example of the *mood application* as well; you push a button which affords a nice travel and a hard punch but what really happens is a change of numbers of a screen which the button does not convey easily.

Norman writes (2010) that he actually regrets calling it *Affordances* in the first place, because it invites designers to think about how they can just *"add an Affordance"*. He writes: *"The concept [of Affordances] has caught on, but not always with true understanding. Part of the blame lies with me: I should have used the term 'Perceived Affordance,' for in design, we care much more about what the user perceives than what is actually true. What the designer cares about is whether the user perceives that some action is possible […]"* (2010)

He argues that when discussing product design concerning tangible, physical artifacts, there will be both *Affordances* and *Perceived Affordances*, meaning e.g. the Big Red Button has an Affordance in relation to the *punching* and a Perceived Affordance of changing the score on the leader board.

The problem with Affordances vs. Perceived Affordances is more important when discussing GUIs (GUIs). For decades, a computer has used the *Desktop Metaphor* with files and folders projected on a screen and handled via a keyboard and mouse. When you move the mouse, you move an arrow icon on the screen, forcing you to keep a conceptual understanding of what it means to move the piece of plastic that is the mouse to what might happen to the icon. The Affordance in using the mouse as a *pointing device* lies in the fact that you can click anywhere on the screen using the mouse. However, it is only when you click on a file icon or a button drawn in the GUI that there is a Perceived Affordance for the user. Norman (2010) states that the importance lies in whether *"the user perceives that clicking on that location is a meaningful, useful action to perform?"*

Returning to Djajadiningrat et.al, we find a critique of Norman's use of Affordances to describe actions relating to GUIs. They introduce the concepts of *Feedforward* and *Inherent Feedback* to replace Affordances because *"inviting the appropriate action is a prerequisite for Feedforward but it is not sufficient. The product also needs to communicate what the user can expect."* (2002:1)

Claus' Big Red Button rarely gives an expectation of what the user can expect when pressing it. Describing the features of the button as having a nice travel, a bright red color etc. are only meaningful in relation to the *action* of pressing down the button. It does not give the user a clear picture of what will happen when the button is pressed, described by Djajadiningrat et al as being an important part of *Feedforward*.

As with the *Inherent Feedback* that is given to the user, the button returns to the same state as right before it was pressed down when you let go of it. There is no

change in the way the button looks to the user—it is only when looking at the leader board, for instance that the user will notice a difference from before the Big Red Button was pressed. The authors use a pair of scissors as an example of an artifact that gives *"visual, auditory and haptic feedback [...] which is a direct consequence of the user's action"*. There is no doubt to the user what has happened when they have cut through a piece of paper as opposed to the button that goes back to a state of readiness right after being pushed down.

The take-away from this discussion of Affordances, Feedforward and Inherent Feedback is that when the user performs an action, there should be indications as to what can be expected when pulling the handle, pushing the button or clicking with the mouse on an area of the screen. The term "*distance is murder for feedback*", as coined by Claus, is especially true if we are to follow Djajadiningrat et al's argument that the user has to be fully aware of what the implications of the *Feedforward* for the use of a certain artifact are.

“From this position, I can totally see what you mean.”

— LCD Soundsystem, *“Pow Pow”*.

“CUTTING UP AN OX

When I first began

To cut up oxen

I would see before me

The whole ox

All in one mass.

After three year

I no longer saw this mass.

I saw the distinctions.”

— Thomas Merton Zhuangzi, *“The Way of Chuang Tzu”*.

Interpreting Technology

To elaborate on what it means to have an interpretative stance towards technology, we will look at the theories of *Hermeneutics* and *Phenomenology*. This is done to further criticize the understanding that technology is neutral and deterministic in nature, as Phenomenology can, slightly simplified, be defined as a *"philosophical style that emphasizes a certain interpretation of human experience [which] concerns perception and bodily activity." (*Ihde, 1990:21)

In a rationalistic tradition, technology is deterministic and thus the relations we as human beings have to technology have no influence on the technology, nor the relation it has to its surroundings. phenomenological thinking goes against this notion, as Ihde (1990:25) states that *"Phenomenology is philosophical ecology but can never be studied from the outside because we are it." Ecology* is the study of relationships between biological organisms and their surroundings, so phenomenological studies are a philosophical take on how humans experience situations and our surroundings. We can, as opposed to studying ecology, never see it fully from the outside, since we are part of it—and so is the technology.

Edmund Husserl was the leading thinker in Phenomenology. He taught at, amongst other places, the university in Freiburg, where he had a great influence on the philosopher Martin Heidegger, who would later go on to further develop Husserl's thoughts on Phenomenology in what can be described as a *phenomenologically oriented Hermeneutics* (Ihde, 1990:21). Digging a little deeper in the roots of Phenomenology, we find another definition by Ihde (1990:46) that says: *"To examine both mediation and its differences is to enter the Phenomenology"*. Meaning it is not only the *relation* established in using the technology that is the object of

phenomenological examination, but also the *Situations* that could have been and the situation that will be.

Hermeneutics is closely related to Phenomenology. Winograd & Flores (1986:27) state that *"Hermeneutics began as the theory of interpretation of texts, particularly mythical and sacred texts"*. Ihde (1990:21) elaborates on this by explaining that it *"arose out of the disciplines of textual interpretation and later a (continental) type of language analysis."* Hermeneutics thus started as a theory that focused on how we interpret texts, and naturally the texts that were written centuries ago, to establish if the interpretations of the texts were in fact correlating to what the author might have meant the text to convey, but has since evolved into a broader understanding of meaning and language.

Ihde (1990:82) talks about *Transparency* in this regard, explaining that the text displays some sort of window into what the author meant when he wrote the text. Transparency in this context is obviously not *perceptual* transparency, as one can find in a window, but a type of *textual* transparency that is philosophically related to Hermeneutics. There are linguistic consequences for looking at texts hermeneutically, as it affects both *Semiotics* (study of signs and symbols and their interpretation) and *Semantics* (the meaning of words). This is an area that is relevant to our thesis of what constitutes the Post-Functional Paradigm as resting on an *interpretative* understanding.

Moving on from the textually and linguistically oriented interpretation, it is important to note that *interpretation* is not restricted to the before-mentioned orientations. Interpretation—in this case, the hermeneutic interpretation—will need to be taken as relevant to *Ontology* as well. Ontology is the *metaphysical* branch of *being in the world*. It is a philosophical orientation dealing with being and

existence, and the relations it forges. Winograd & Flores state that *"it is necessary to take interpretation as relevant to Ontology—to our understanding of what it means for* something *or* someone *to exist."* (1986:30)

We find it relevant as well, if we are to look critically at how phenomenological Hermeneutics can aid in establishing a critique of the Functional Paradigm as relying on outdated rationalistically, technologically deterministic worldviews.

Lastly, we will look at the relation *Experiences* have to the way we appropriate technology, and why this is an essential focus for the understanding of the Post-Functional Paradigm.

Computers

Having established that Hermeneutics go beyond just textual transparency and the interpretation of such, we can use the theories to apply to the technology we are most concerned with: *computers*.

Ihde (1990:155) writes: *"Contemporary communication technologies are as powerful as they are because they may be technologically complex but hermeneutically simple."* There are a lot of assumptions in this quote, which we will break down and interpret in pieces.

First of all is the idea of *contemporary communication technologies*. Ihde argues that when using computers for *communicative* purposes, we are engaging in behavior that is an extension of what we already do when engaging face-to-face. The next part relates to the *Technical Properties* we discussed in the previous section on the differences between *Technical* and *Technicity*. Ihde (1990:73) defines technical as the physical features of the technology, which can be designed or discovered. In the

case of *contemporary communication technologies*, this takes into account the binary foundation of the computer processing unit (CPU), the packet-switching foundation of the Internet (TCP/IP) and the Graphical User Interface (GUI). However, if using a piece of software for communications that is designed to transmit text sentences, what the user deals with is the technological mediation of language: *writing*.

All things being equal, the only thing the user has to deal with is reading what the sender of the text has written. This means the technological foundation for how the text appears on that particular screen is insignificant. Interpreting the text is the only level of engagement the user has to deal with—thus the high level of hermeneutical transparency.

Winograd & Flores (1986:87) share this view of the modern technology in computers: *"One of the properties unique to the digital computer is the possibility to construct systems that cascade levels of representation one on top of another to great depth."* This further underlines the notion that what is relevant in this regard is not the inner workings but the representations of intentions that the message's sender is trying to display to the receiver through language.

In our Tactical Interventions, we saw Claus, the software developer, creating a range of inventions that would enable him to reach a goal by pushing the button. He could push the button once in his *mood application*, and it would be shown on a leader board as a positive action, or he could hit it thrice in fast concession "like a machine gun" to display the opposite.

As we found out in our interview with Claus, the nicest thing about the button is that it is mechanical and has a long travel. It feels good to press it. However, that

was identical to all of his experiments, including the boxing app that would send a 3D-image of the boxer when pushing it.

The interesting situation here, in regards to the theory of Hermeneutics and reading the purpose of the Interface, is that the abstraction level is somewhat high, and no other user would understand what the button does, just by glancing at it. They would understand the design of the button from a Functional Paradigmatic view (that it is intended to be pushed down and, since there is a cord sticking out the back of it, it might do something somewhere else).

However, the interesting thing about his experiment is that it is intended as a reward system that gives him a plus, or a thumbs-up or whatever he wishes to display, for doing something positive when clicked. The function of the button, and its particular technical properties, is what enables him to easily reach the goal but, in Claus' opinion, that is not what is important in this regard. It is the fact that the leader board is affected and that, at the end of the day, he can look at how well he has done in the tedious tasks he would not normally do that is important.

If we look at the other situation where we gave Louise K and René a set of rubber bands to apply in a situation where it would improve something in their everyday life, we found that they could not make it fit in easily. The technical properties of the artifact, the rubber band, are incredibly simple. It is made of rubber, its radius is 20cm and it can be stretched by a magnitude of 4-5 before it breaks. This simplicity is what we initially viewed as its biggest strength but it turned out to be one of the major downsides.

We deliberately kept the experiment as open-ended as possible by stating that they should use it *“to improve something in their everyday life”*. We handed them the solution to a problem they may encounter.

They both described how they tried to leave the rubber band alone and see if “something came up” that they could apply it to. Louise K found that it was useful for the case in which she keeps her glasses as its hinges broke (again). Previously she had wrapped a hair-band around it and it is the technical properties of this artifact that make it suitable for keeping the case together after the Breakdown.

Because of the nature of the experiment, where they are handed a solution to a problem they do not currently have, the test subjects had a hard time figuring out how to apply the rubber band Claus used the Big Red Button as a means to reach a goal of rewarding himself for doing something tedious, while René and Louise K's rubber bands did not fit into their everyday life as a suitable artifact for reaching a goal.

Hermeneutically speaking, the level of reading they have to do, or the level of interpretation they encounter with the rubber band, is at a very low level. We saw this as an advantage by us before the Tactical Interventions, but it became a problematic situation for Louise K and René as the simplicity of the artifact prevented them from applying it in a meaningful way. The functional, technical properties of the rubber band left them confused and unable to fully relate to it.

They both described how they could have tried to conduct *aesthetically* oriented applications of the rubber band, as a way of getting meaning out of it. They both, however, did not pursue this as it was viewed as tedious work to “come up with something”, a clear indication that the premise we had for the Tactical

Interventions in this case was wrong. We initially expected them to find a wide range of ways to apply the rubber band but it was too simple in its technical design to be instantly applicable for them.

If we had given them an artifact that incorporated the rubber band in some way and told them to use that artifact to improve their day, the Tactical Interventions would have been entirely different. For example we could have given them a piece of wood formed as a pistol with two nails on top that made the rubber band act as a firing mechanism for bent pieces of paper. This way, the rubber band is already incorporated into an artifact in a way that was not originally intended by the inventor, but what Louise K and René would have to interpret is not how to apply the rubber band but how to operate the paper catapult.

In this case, their hermeneutic understanding goes from trying to solve a problem that does not exist yet, to how they can use the paper pistol appropriately both culturally and socially (i.e. not shooting other people with it). The openness of the design, when it is only concerning the rubber band itself, does not relate to the hermeneutic understanding of what it does as it is so evident from a functional, technical point of view. In the example of the paper pistol, the new artifact would have to be understood in a completely different way because the openness in this sense refers to how it can be applied in a culturally and socially acceptable manner.

Praxis

Returning to the Tactical Interventions with the rubber band, we saw that Louise K and René found it difficult to find applicable use cases for the artifacts we handed them.

Ihde (1990:36) discusses the concept of *Praxis* that will be of help to us in our analysis of why they found it difficult to apply the artifact in a meaningful way. Praxis stems, according to Ihde, from the *human-world relation* that in both philosophy and Phenomenology *"belongs to that family of Praxis philosophies arising out of Hegel, Marx, Pragmatism, and, in a derived sense, Existentialism"*. He argues that humans are what they are in the world by means of their actions—their *"existence is actional"*.

Artifacts (in Ihde's words, "technologies") are used in the *normative* roles, meaning they are dealt with in the way things *ought* to be. In essence, this means that the artifact we brought into the lives of our test subjects will only exist in a new sense if they are brought into action. This is what Ihde means by Praxis stating it is *"the process of putting a theory into practice"*. It is enacted in the sense that the theoretical use of the rubber band is brought into the world in the particular situation that the test subject is subduing the rubber band to be a part of, e.g. holding together a case for a pair of sunglasses.

Donald Schön (1991), American developer of the theory of *reflective learning*, talks of *epistemological practice* in which *action is reflection* is one way to understand this form of Praxis Ihde refers to. To Schön, in any given situation we form ways of acting that are thought of in that particular moment. We will constantly seek out ways of understanding if the situations in which we act are appropriate and applicable. Had Louise K and René actively sought to apply the rubber bands to situations that they might at first have deemed useless, or even ridiculous, it could, if we are to believe Schön's theory that action is reflection, potentially have led them to discover meaningful uses for the rubber band.

Schön's idea of *action is reflection* complements the *sketching* way of thinking we discussed in a previous part of this thesis. It becomes a way for the designer to engage in a *Problem Setting* behavior, constantly iterating on their solution after they have created something. The design *talks back*, so to speak. The designer reflects and then decides whether she is satisfied.

“We have these things in our pockets that cry, and we have to pick them up and soothe them back to sleep, and then we have to feed them every night by plugging them into the wall, right? And at no other time in history have we had these really strange non human devices that we take care of as if they are real.”

— Amber Case

“Any sufficiently advanced technology is indistinguishable from magic.”

— Arthur C. Clarke

“Magic has no mystery to magicians.”

— Christopher Priest, *“The Prestige”*.

Socially Constructed Understandings of Technology

We have argued so far that technology in the Functional Paradigm was seen as neutral and separate from the social bonds between people, or even without influence on them. Feenberg (1999:XI) argues that essentialists possess a dualistic view that differed between the *realm of technology* vs. the *lifeworld of meaning*. To them, they are opposing *Ontological* views of practices—e.g. in the form of the house as a "*concatenation of devices"* vs. the house *"as a human environment"*. Feenberg argues that there is a certain validity to the argument but he disagrees that technology can be separated from the society. They are merely *analytical* differences but because, as he argues, the lifeworld meanings are eventually *embodied* in technological design, they are difficult to separate.

However, he states that from a *Constructivist* point of view, *"design succeeds on the fit between devices and the interest and beliefs of the various social groups that influence the design process."* (Feenberg, 1999:79) Thus, a successful design will in the eyes of the *essentialists* seem inevitable in its application to the lifeworld of meaning they inhabit. The adoption of the technology has been so successful they are unable to distinguish between the technological past and the inventions that had to be undertaken in order for the technological progression to happen. What constructivism did was to introduce differences into the question of technology, so in this sense, *"technology always already incorporates the social in its structure." (*Feenberg, 1999:X, 210)

Moreover, Trevor Pinch & Wiebe Bijker, who are credited with starting the wave of Social Construction of Technology (known as *SCOT*), argue (in Feenberg, 1999:80) that *"technology does not equal determining because different interpretations by social groups of the content of artifacts lead [...] to different further development"*.

Feenberg then presents the *"sharpness of a knife"* as an example of the *connotations* that enable the social structure's view of the functions. From a rationalistic, deterministic view, the focus on the *"sharpness of the knife is only a* function *rather than a* hazard*, or a matter of pure indifference, through a Social Construction"*. Feenberg uses Ihde (1999:128) to refute the claim that might rise from this: *"technology as such is neutral but takes on its significance dependent upon different uses. [Such] a conclusion remains at most a kind of disembodied abstraction. The technology is only what it is in some use-context."* Thus, he concludes that speaking of the *Technical Properties* behind the technology as the essential element is misleading and takes away the focus from the social determination that lies behind the understanding of the technology itself in its social setting as well as its further development.

In relation to whether technology determines behavior, the author Douglass Rushkoff writes in his recent book, *"Program Or Be Programmed"*, that *"all media and technologies have biases."* (2010:7-8) An example of one of the most well-known examples of the deterministic attitude towards technologies might be the declaration that *"guns don't people; people kill people"* which Rushkoff disputes by declaring that while *"[that claim] may be true [...], guns are a technology more biased to killing than, say, clock radios."* Don Ihde calls these biases *Intentionalities*, and argues that while they have such Intentionalities, or biases, *"at the hermeneutic level such trajectories have not always been followed depending upon the wider and more complex cultural field"*. If the technology *"always already incorporates the social in its structure"*, how do we even know *how* to use the artifact if the use of it is shaped by the social norms surrounding it?

Ihde argues that by providing a *framework for action*, the users thereby form *"Intentionalities and inclinations within which use patterns take dominant*

shape." (1990:141) A bias, or intentionality, thus arises through the use formed by the *framework for action* but it will invariably still express the concept it embodies, even when the process that lead to its particular design is unclear to the user. (Hayles, 1999:15) Winograd & Flores refer to this as the *domain of action*, with which they define the computer as a *tool* since it is invoked by people engaged in a particular use that shapes the potential for what *can be done* and how they are *doing it*.

For a further review on the importance of understanding technology as non-neutral and socially constructed, we turn to the German philosopher, Martin Heidegger. Heidegger was highly critical of the history of philosophy from Plato to the 20th century. In his view, we have been too focused on *what exists* rather than what it *means to be*. His seminal work "Being and Time" remains a cornerstone of 20th century philosophy, and is a heavy influence on several of the authors we have presented in this thesis.

Feenberg describes Heidegger as a *Substantivist*, taking the stance that technology influences us. However, Heidegger saw modern technology itself as stripped of meaning as the *Technological Enframing* it presents *"deworlds its materials and summons"* (known as *Herausfordern*) (Feenberg, 1999:184, 193). In other words, when we engage with modern technology, we can no longer understand the full implications of the tool we engage with. We have lost the meaning of the materials that are used to create the tool we are using to solve our task at hand. The opposite of the *Herausfordern* is the work of a craftsman who through his work *"gathers the elements: form, matter, finality and brings out the 'truth' in the materials"*, known as *Gestell*. It is in the process of *Crafting*—in Heidegger's example a silver chalice made by a Greek craftsman—that the true nature of the materials are exposed, whereas the engagement with modern technology is described as *"turning everything it*

touches into mere raw materials", also known as *standing reserves* or *Bestand* (Feenberg, 1999:183-184).

For Heidegger, modern technology in this regard will not *open* as craftsmanship does, it will only *cause*. The German philosopher Jürgen Habermas, distinguished between *work* and *interaction* in the same way (Habermas, 1970 in Feenberg, 1999:188) and it then becomes a way for Heidegger and Habermas to separate the dimensions of human existence improved through the application of artifacts in reaching desired situations, from the meaningless celebration of an inevitable, technological progress and the interaction we conduct with the technology.

If we, in Heideggerian terms, see modern technology as hiding materials' true properties of from those who engage with it, the *enframing* becomes a way for it to exist in the world where it is able to be *seen* and *understood* (Feenberg, 1999:194). It enters into a relationship in which we are able to grasp its position.

As previously mentioned, Heidegger was highly influenced by Husserl, who founded the philosophical school of *Phenomenology*, with which he attempted to create a way to *objectively* study topics usually defined as *subjective*; i.e. turning phenomena experienced consciously into a scientific setting. Ihde (1990:23) describes Heidegger's attempt to create an *existentialization* of Husserl's early *science of experience* as a *"relativistic Ontology of human existence." Relativistic*, in this sense, is not necessarily a *Relativism* (the theory that there is no absolute truth) but an *account of relations*: *"In Heidegger's case, it was an account of the human-world relations which determine and outline the dimensions of human existence."* This account of *human-world relations* is what Heidegger called *Dasein*.

To make matters even more complicated, the realm of the relations, what Heidegger refers to as *"World,"* constitutes of *Geviert* (translated as *Fourfold* by Feenberg); *earth*, *sky*, *mortals* and *divinities*. It is in the activity these *things* are brought together in an *"ordered system of connections between things, tools, locations, enacted and suffered by Dasein."* In other words, the things one engages with in everyday practice constitute our world, and it is this relation we should examine, rather than the elements in themselves. Feenberg (1999:31, 54) furthermore stated that *"by splitting object and subject you deny the fundamental unity of* Dasein*,"* thus making the move away from the *Malthusian position* of treating society and the subjects occupying it as a natural object ruled by deterministic laws even clearer.

I—Tech—World

The reason we introduce Heidegger's relations is to be able to fully examine the implications using technology has on our understanding of designing for and in the Post-Functional Paradigm. Ihde, Feenberg and Winograd & Flores all write extensively about Heidegger's theories, which only further underlines the importance of bringing forth the relativistic stance towards technology.

Ihde in particular is interested in how our relations to technology influence us. He argues that technology, simply by being phenomenologically part of the relation, will transform our experience. He writes that the *primitive* of the system—the simplest unit—consists of relations: *I—relation—World* (Ihde, 1990:23). By introducing technology between the *I* and the *World*, the experience will always be transformed, however subtly. He uses the example of the naked seeing of the world from a mountaintop vs. seeing it through a window from a skyscraper. The view is the same (given they are next to each other for the sake of the argument, naturally) but the glass will necessarily stand between the I and the World, despite its transparency.

The same will happen if you wear glasses. The world is blurred until you put on the glasses, after which your view is improved and you will start getting used to seeing the world in sharp focus (again). Ihde (1990:25) calls this a *partial* or *quasi-transparency*, because it changes the *basic situation* and will thus never be fully neutral. The glasses become e*mbodied* and transform the *immediately experienced environment*—a transformation that, according to Ihde, must be the subject of investigation in the I—relation—Tech situation (1990:17). Moreover, *embodying* must be learned or in phenomenological terms, *constituted* before they will be actively embodied to such a degree they withdraw. In that situation, the relation will look as follows: *(I—glasses)—world* (Ihde, 1990: 73)

A similar transformation arises in the case of taking photographs—you will invariably always choose to frame the picture in a certain way, leaving a large part of the situation out and thus change what is being experienced by the viewer. (Ihde, 1990:165)

Ihde (1990:39) writes further on the experience of using technology such as glasses: *"The lived or virtual body as an experienced bodily spatiality can be extendible through artifacts."* Because the glasses will "disappear" for the wearer and alter the sight to such a degree it will feel as if they are not there, the *experienced bodily spatiality* will seem as being fully natural and not an enhanced version of reality (Ihde, 1990:39).

Moreover, in the example of looking at the world through the glasses, the technology (which, in this case is glass) can be described as an *explicit focal relation*. You focus on the world through the glass, but the transforming qualities technology have need not be as explicitly present as is the case for a pair of glasses. The *withdrawn, absent*

technologies of lighting, heating and cooling all change the way you experience the immediate environment, even with their "*background role in the fringe awareness,*" as Ihde writes (1990:116, 118). The conditions they afford still change the context in which the inhabitant lives and are described as being a *"present absence"*.

The *focal activities* that are central and foreground can be experienced through *Embodiment*, *Hermeneutics* and *Alterity* with an *implicit self-awareness*. In other words, you alter the way you see by putting on glasses that eventually become so integrated in your behavior that you "forget they are on your nose"—they become *embodied*. At the same time, you can be forced to create meaning *hermeneutically* when using a piece of technology. For instance, when "reading" the clock you establish a perception of time through the dials on your analogue watch or the dials on your digital watch. The relation then becomes *I—watch—time*, and Ihde (1990:63) argues that there is even a difference between whether you read it through an analogue or digital watch as you will have a faster understanding of where the dials are on the analogue watch compared to grasping the meaning of the numbers on the digital watch.

Talking about relations, and the *experienced bodily spatiality*, one can ask what the limits are for what will be embodied and experienced as an extension of one's body. Ihde starts out by using the example of a cane that acts as an extension of the wearer's arm to act as a third leg for better balancing. He mentions that cars can be embodied too—your bodily senses will extend to the perimeters of the car, when parallel parking for example you will "know" how far from the curb the wheels of the car as well as the cars in front of and behind you are. With this argument, one could imagine a truck driver or even an airplane pilot will have the same sense of understanding of the perimeters of their "devices" (Ihde, 1990:24).

At the center of one of the most famous examples of the implications established by the extension of Man through lenses, is the Italian physicist, mathematician, astronomer and philosopher, and *"father of modern observational astronomy"*, Galileo Galilei. (Singer, 1941:217) By pointing his telescope towards the moon, he changed our understanding of what it means to be but a small part of the vast universe. The telescope did not, however, become a constituted, embodied part of Galileo as it was in a position of *mediation* between him and the sky he was looking at. The relation was still *Galileo—telescope—Moon*. (Ihde, 1990:73)

When he looked through his telescope, he performed a *spontaneous gestalt shift* evident of a *perceptual Multistability*. He now *"inherits a culturally acquired special Praxis of geometrical thinking which he turns to new use in his physics." (*Ihde, 1990:35) There is still a difference between the *microperceptual* view of looking at the moon through a mediation such as the telescope, and the *macroperceptual* understanding Galileo overcame to be able to fully comprehend the meaning of his invention. The *microperceptual* view is the sensory input—a *direct microperceptual situation* is experiencing the immediate environment or surrounding world. It can be described as *direct* or *non-mediated perceptions*, in which case it will be an *I—world*-relation. Ihde, however, argues that there is no simple, naked seeing: *"There is only situated seeing that is both a seeing as ___ and a seeing from ___."* (Ihde, 1990:42, 45)

This is what is meant by the *macroperceptual* understanding. It is the view that is situated by the culture to which the viewer belongs. Because of the norms and rules in that society, the viewing will always be a *"seeing as ___"* and a *"seeing from ___"*. Galileo was able to overcome the limitations set forth by his culture and the Catholic Church in particular (even though was forced to withdraw his claims that the Earth was not the center of the world) and see the Universe in a different way than before.

One of the main differences between Husserl's early explorations of definitions of Phenomenology, and the further development by Heidegger into a *phenomenologically oriented Hermeneutics*, is, according to Ihde (1990:36) that *"Husserl's world of Praxis in this wider cultural world was clearly not Heidegger's actional kind. It was rather the intuited material, bodily and perceptual world of objects."* Heidegger's focus then, is more on the embodiment that happens when we employ artifacts to fit our needs than the cultural understandings that mostly concerned Husserl.

Ready-at-hand

As we have already outlined, Heidegger was a *Substantivist*, stating he believed technology influences us. This also means that all objects as such will have to be *relative to a context* and that there are no *objects in themselves*: *"In a use-object context there is no such thing as an equipment. The field in which is what it can be is a complex one filled with involvements or cross-relations."* (Ihde, 1990:32)

Because of the relations of a thing to the context in which it is put to use, as well as a result of the *macroperceptual* view, things will always be *in order to* ___ something else. *"In the in order to ___ as a structure lies an assignment or reference of something to something."* (Ihde, 1990:32) This is a rather complex view of the relations formed by Heidegger's action-oriented Hermeneutics but it is quite logical still. Because a tool will always be brought into a context, the moment it has been brought forth—and given Heidegger is right that it cannot be neutral—it will start being *in order to something*. It cannot stand alone and will as such influence the sum of relations it has become a part of. Heidegger further argues that in the structural relations lies an *assignment* for the tool. It has been brought into the relations because it has an

assignment—it has to *do* something, and will thus possess a form of *instrumental intentionality*, or *reference* to the *work project*. (Ihde, 1990:32)

The "network" of relations found in this view is related to what the French sociologist and anthropologist, Bruno Latour has dubbed the *"Actor-Network Theory"* (ANT). Without going into too much detail (making a complete account for ANT and its relevance to the socio-technical analyses would take up more space than we can offer), ANT treats technology as comparable to texts because they also *inscribe* a story. (Feenberg, 1999:114) By entering a relation with each other, both people and devices become nodes in the network, and it is the *story* the technology *inscribes* that makes it relevant to us. Feenberg (1999:85) gives the example of the story inscribed by a door closer:

The scenario could be a busy office where people tend to walk through often, a lot of whom forget to close the door behind them. The ones working in the office might grow tired of this quickly and try various ways in which they can remind the people that walk through to close the door behind them. They might try enforcing it violently by shouting or pushing the people who forget it, or they might tell them nicely to remember it, hoping they will remember it next time. However, they could also delegate the task to a door closer that you attach to the top of it, to ensure it will be closed. This is what Latour refers to as *delegating morality* because you will hand over the moral task of watching over the ones working in the office to a piece of technology such as the door closer. Feenberg (1999:85) refers to this as a *"Latourian equivalent of Hegelerian Sittlichkeit"* because it refers to technology not as a collection of devices determined by causal principles but also the objectification of social values in a cultural system—the main principle behind Sittlichkeit as formulated by the philosopher and co-creator of the school of *German Idealism*, Georg Hegel.

The *symbolic aspect* of technology taking a stance towards social values and meaning is what Feenberg (1999:84) calls *"a Hermeneutics of technology"*. Besides introducing Latour, he brings forth the work of Jean Baudrillard, the influential French philosopher, sociologist and cultural theorist, as quite different but complementary theories for understanding this aspect of technology as non-neutral. Baudrillard uses the concepts of *Denotations* and *Connotations* to distinguish between what is, essentially, the difference between the rationalistic, deterministic stance and one built upon recognizing the non-neutrality of technology.

Denotations refer to the functionalities found in a certain piece of technology. It is, as we have already outlined earlier, about describing the technical aspects of an artifact—e.g. focusing on a car as a piece of bent aluminum with four wheels, a steering wheel, 17" rims and a top speed of 250 km/h made by BMW.

Connotations, on the other hand, refer to the *"perception of the user in the social reality."* (Feenberg, 1999:85) Focusing on this aspect of the car owner and her relationship to the car, you might find that *because* it has the features it has, the owner finds it attractive and use it to display wealth, power and a sense of belonging to a certain group of people that feels natural for her to want to belong to. The focus has shifted from describing functions to understanding the meaning behind the choices she made.

In the same way, saying the core problem the car owner tries to solve is getting from point A to point B, you will miss all of the *connotative* aspects of owning an (expensive) car. It is an important point to remember when doing the *Problem Setting* as the solution to a problem might require wildly different connotative understandings to be established.

The Hammer

Having discussed the implications for introducing technology to a network of relations, we will now return to the Heideggerian theory of a Phenomenology molded to a pragmatic emphasis. As we described previously, when putting a tool to use, it can become *embodied,* acting as if it was an extension of the person using the tool to attain a result.

The embodiment of the tool is extensively discussed in Heidegger's famous example of using a hammer. When a person engages in the activity of hitting the nails on the head, she can become so occupied and focused on the task that the tool with which she reaches the goal will “disappear”. The arm, elbow, wrist, hand and hammer become one unity that work together unconsciously on the user. This is what Heidegger refers to as *ready-to-hand*.

The opposite of this is what Ihde refers to as *readiness-to-hand*—others, including Winograd & Flores (1986) have called it *present-at-hand,* which is the wording we will adopt here as well. For the hammer to disappear and become maximally *ready-to-hand* as authentically as possible, its *presence-at-hand* must withdraw in the embodiment-relation. (Ihde, 1990:32).

Ihde uses this example of technology being constantly *ready-to-hand* as one of his main arguments against technology being neutral, as well as whether human beings in general are able to live in a non-technological world—the uninhibited *“Garden”*: *“If direct bodily and perceptual contract with an environment is constant it retains the sense of the non-technological Garden existence. Technology becomes invisible through constant use.”* (1990:18)

We will constantly act unreflectively through *practical involvement* with the artifacts that are *ready-to-hand*, and it will form what Heidegger, as well as Hans-Georg Gadamer, German philosopher and author of the highly influential work *"Truth and Method"*, refers to as *prejudice*. Prejudicial behavior is a condition for *being*, as we would otherwise constantly approach every situation as if we experienced it for the first time, when we should just solve our task using the technology available and go on to the next task. We can do *detached contemplation* (what Winograd & Flores (1986:33) call *Praxis*). It is *"a concentrated acting in the world"*, so in a way, the hammer will only be there when we think of it.

Returning to Ihde, he argues that while the example of a person using a hammer to drive a nail through a piece of wood seems simple enough, it still concerns *"a rather complex field of involvements, and the referentiality of the use-context may be shown during Breakdown, malfunction or an absent tool." (*1990:32) In this way, we will become aware of the complex references that are made in the relationships between you and the problem you are to solve with the tool that is now absent, broken or in another way made *present-at-hand* to you.

The concept of *Breakdown* is of immense interest to us, as it is a universal example of how we will act when our technologies let us down in one way or another in the process of trying to accomplish a goal.

Breakdown

If we assume that the tools the user engage with usually work as expected, the occurrence of a *Breakdown* will be a deviation from the norm, and thus not the standard case. Therefore, the users will find themselves having to response to that Breakdown before they can get on with their work. Wright & McCarthy argue that while we can anticipate Breakdowns, we cannot predict the response the user will

give to that perturbation. The argument as laid out by Winograd & Flores, and quoted by Wright & McCarthy, is that because we *"cannot impose any structure on another person, [they] will adapt to perturbation in their own way." (*2004:30)

This is obviously a pain point for the rationalistic, deterministically oriented designer that wants people to follow the rules laid out by their system but now finds himself in a situation where the user is acting unpredictably. Winograd & Flores argue that because *"we are always already experiencing and understanding without reflection, [the Breakdowns have] obvious implications for the rationalistic notion of goal-oriented plan-controlled action."* (Wright & McCarthy, 2004:30) The rationalistic problem-solving behavior that focuses on solving a problem most efficiently will come to a halt, if the *goal-oriented plan-controlled action* is suddenly set aside in favor of a problem-setting behavior that involves trying to get the tool to work again. This might even include other tools (for instance hammer meets computer) and as such the relations now include other objects that, in the rationalistic sense, have nothing to do with solving a particular problem to attain a specific goal. It is simply out of scope for the programmer that focused on creating an application that could be used for one thing, without anticipating the problem-solving behavior of a user facing a Breakdown looking at workarounds to solve the new issue at hand.

Winograd & Flores (1986:78) still see the Breakdowns where our tools are made *present-at-hand* to us as a positive situation. It should not be regarded as a problem (though many will take it as such) but an opportunity to move beyond the *Problem Space* and start outlining the new limits for the *Problem Setting*.

Thrownness

So, what happens in the situation where the tool becomes all too present-at-hand because of a—for the user—unexpected Breakdown? Heidegger argues that

“whenever we treat a situation as present-at-hand, analyzing it in terms of objects and their properties we thereby create a Blindness.” (Winograd & Flores, 1986:97) If we do not look at the relations we form between each other or with technology, we, according to Heidegger, will miss the point of why we were using the technology. We will thus become *blind* to the meaning that is being established through these relations.

Furthermore, Heidegger argued that the source of human intelligence lies not in our ability to *reflect* on a particular situation (that is still just accounting for what the situation consists of—it is, in other words, a Baudrillardian, *denotative* account), but in our *Thrownness*. Thrownness is Heidegger's term for our ability to *“reject, restructure and transcend the particular Blindness created by the limitations imposed by a particular characterization of the world in terms of objects.”* (Winograd & Flores, 1986:99)

Thrownness is a description of our ability to maintain a set of relations even in the face of a tool's Breakdown. Winograd & Flores further argue, although focusing on language, that we are always thrown into action dealing instinctively and independent of our own will. This happens when we enter a dialogue with another person because when you speak you will construct the situation concurrently. It could be argued that mini-Breakdowns happen constantly in a dialogue, but because language to us (at least in our native language) will behave as ready-at-hand, we are constantly overcoming those by handling the situation with deliberate *Thrownness* that brings the group discourse forward through your, and the group members', interpretations. (Winograd & Flores, 1986:68)

Because of the Thrownness of actions needed to maintain the structure of the relations, one could argue that it would be relevant to look at whether a particular

interpretation works in different cultures as well, or whether it comes down to a cultural adaptation by the technology.

Multistability

This issue of technology being adopted by multiple cultures simultaneously can be approached from a couple of different angles.

In his paper, *"Upon Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology,"* the American professor in philosophy of technology, Langdon Winner, argues that Social Constructivists have pleaded for a view of technology that is different from one that only includes input and output. Rather, we should open up the *black box* of historical and contemporary technology and see what is there (Pinch & Bijker in Winner 1993:365). It has been a matter of convenience, in their opinion, that we have described them only as having *"certain valuable functions"*. There has been a tendency as well to look at technology as the *"lesser relative of science"* and those historians and sociologists who dared take a *"turn to technology"* were *"intellectually slumming it"*, meaning they were degrading themselves to look at such insignificant interpretations of technology. (Winner, 1993:365-366)

Social Constructivists employed a methodological posture, *"the empirical programme of relativism"*, as opposed to the *empirical positivism* employed by the followers of hard science, which allowed them to study the *"interpretative flexibility of artifacts and their uses"*.

Ihde (1990:218) weighs in on this subject with his definition of *pluri-culture*; that technologies take on different meanings in different social contexts. To understand what he meant, we return to the *hermeneutic gestalt shifts* discussed previously.

When Christopher Columbus sailed across the Atlantic Ocean, he used maps to help him guide the way. When he “read” the maps he did so by placing himself in a *disembodied* or *imaginative perspective* that he in fact did not occupy. He looked at the world from above while he physically read it from the very real decks of the Santa Maria ship (Ihde, 1990:67). While studying how the Paluwatian tribe in the Pacific Ocean managed to also cross vast distances on the ocean, Ihde found that they in fact occupied another perspective; they were placing themselves not as moving towards islands as seen from above, but as the center of attention with islands approaching them. By using the islands as well as stars and the movement of waves as guidances, they did not need compasses and maps to navigate over vast distances (Ihde, 1990:148).

Technologically enhancing the maps employed by Columbus could consist of more information about depths of the water, where the fastest route between Lisbon and the Americas is and letting him zoom in on his current location, much as we know it from GPS navigation and Google Maps today. Technologically enhancing the navigation principles for the Paluwatians would rely on *“embodiment relations to enhance, extend or magnify sensory, bodily perception.”* (Ihde, 1990:144) This way, they would be able to feel the waves more easily, look further than the horizon or see more stars; all enhancements of their currently employed reading forms.

As we discussed previously on reading the time through a clock, you do not really “read” the clock but the arms or the numbers will tell you what time it is and you will hermeneutically understand what is meant. The same can be done with a thermometer. You read that it is 5 degrees outside and while you are still inside where it is warm and nice, you will know what it feels like outside. *Perceptually*, however, you still only read the numbers on the thermometer or clock.

Ihde (1990:186) argues that *"this materialization of the conceptual through the instrument of the computer is a return to* perceivability.*"* You will have to "calculate" what time it is by looking at the numbers on your digital watch, or understand the implications for your business by looking at the curve that goes straight down. This *"materialization of the conceptual"* call for *"subconscious influences—calculations—to replace more instantaneous perceptions [and] such influences are mini-decisions."* (Ihde, 1990:178) What this means is that in the situation where I have to read the clock saying *15:46*, I will reference it to my *Lifeworld*. I will know that I have been at work for 7 hours and 40 minutes, my workday will be over in 1 hour and I have just enough time to get to the bank before it closes. This is not stated on the watch in anyway, but I make those decisions based on the *micro-* and *macroperceptual* view I have of the current time.

Dystopianistically, using the overwhelming amount of features found in a word processor, the American author, Michael Heim (also known as *"the philosopher of cyberspace"*) is quoted by Ihde (1990:182) as arguing *"the super-abundance of possibilities offered through the word processor is comparable to Nietzche's description of nihilism as a state of indetermination wherein everything is permitted."* Because we have a super-abundance of possibilities, we will not be able to actually finish anything. Everything can be changed constantly according to our wishes, in contrast with using a typewriter or pen, where the very real ink on the very real paper makes for a sort of closure while writing.

Realistically, however, one can see the possibilities offered by different kinds of technologies as an opening of the mind: *"Once the viewer is asked to grasp each of the gestalts of the variants the same viewer cannot simply return to the naive reviewing previously taken for literal."* (Ihde, 1990:150) This is underlined by the fact

that once the Paluwatian tribe members were shown the possibilities of using the compass to navigate, they have mostly forgotten how to “read” the waves and stars and navigate as they have always done. The key point here, however, is that they were *shown* the possibilities of the compass. Had they just been given one and told to figure it out themselves, they would perhaps eventually have figured out how to use it, but it is arguable that they would have stayed at the *perceptual* level of reading.

It is only in the situation where the technology becomes *hermeneutically* transparent to them it is actually the same technology that is transferred.

Linguistics

If the Paluwatians did not want to adopt the technology of compasses for navigation, entering a discourse trying to establish a shared meaning was a bad idea. (Krippendorff, 2005:11) In linguistics, you can talk of a *“domain of recurrence”*—that we regularly talk about the same things and thus establish a shared understanding. (Winograd & Flores, 1986:64) You have to have *Generativity*, however, meaning that there needs to be an openness in the discourse to new vocabularies and metaphors, or hermeneutic understandings.

Krippendorff (2005:2) brings forth a dual meaning in his definition of *product semantics* in relation to the establishment of a shared understanding. They are as follows: 1) *“A vocabulary and methodology for designing artifacts in view of the meanings they could acquire for their users and the communities of their stakeholders”* and 2) *“a systematic inquiry into how people attribute meanings to artifacts and interact with them accordingly.”* Leading up to the part of this thesis concerning our Tactical Interventions, we outlined the process of *Contextual Design*. An important part of this method is to pose questions that are laden with context on

how the user actually uses the product, which is to ensure a deep understanding of the meanings they would employ to it. To Krippendorff, this *meaning of artifacts* concerns *"use, language, lifecycle and ecology"* and thus product semantics become an *"inquiry into the symbolic qualities of things and a design tool to improve these cultural qualities."* (Krippendorff, 2005:1)

So, for Krippendorff the product semantics are incredibly important by ensuring that the artifact brought forth by the designer fits culturally through inquiries into the symbolic qualities the user sees as meaning-establishing properties. In relation to this, Winograd & Flores established two problems concerning establishing meaning: 1) *"Semantic correspondence"* (Ontological problems) and 2) *"Relations among the meanings of different words"*.

Because, as we have discussed extensively, *interpretation* does not equal *textual interpretation*, it becomes necessary to take interpretations as relevant to *Ontology*. If interpretation also concerns the relativistic engagements we enter, it becomes relevant to our *"understanding of what it means for something or someone to exist." (*Winograd & Flores, 1986:30)

Heidegger argued that we all enter discourses with prejudices towards the world, because we are what we have experienced and thus we have biases towards our openness to the world. The prejudices are conditions with which we experience something, and decide what the experience says to us. Gadamer said that *"there is an underlying background of purposes of understanding"*, what he called our *Horizon*. (Winograd & Flores, 1986.105, 157)

This *Horizon* must not fuel the *Blindness* we need to overcome in the case of a *Breakdown*, if we are to fully employ the *Thrownness* that lets us enter new *Problem Settings* through which we can solve the problem at hand.

Cognition

The experiences that emerge simultaneously with our interaction create the grounds on which we act, think, sense and give meaning to things. These experiences are particularly interesting as we aim at understanding the accounts of human experience in a design-related context. The change in the possibilities of technology today has influenced our practices and therefore we argue that it is crucial that we dig deeper into the cognitive system of the user in order to understand the emerging new roles that we believe the user take upon herself.

Through our point of departure in human action and interaction in a technological context we will begin with the work of the Chilean biologist and philosopher Humberto Maturana and his studies on "Anatomy and physiology of vision in the frog" (1960, in Winograd & Flores, 1986). His point of departure takes its starting point in biology, and his initial hypothesis addresses whether a particular physical activity experienced by the nervous system of a frog is a perception, or if it acts as a filter on the mapping of reality. (Winograd & Flores 1986:42)

His studies question what he argues is our commonsense understanding of perception that "*[...]there is some objectively recognizable property of a thing in the environment and our perception of it is a capturing of that property in our mind.*" (Winograd & Flores, 1986:41) As he further explains, this rather naive understanding gives primacy to the fact that an objective reality exists external to and independent of us, which we can then perceive (*"cognize"*).

This view can be seen as rather extreme, as the argument seems to be that if something is not perceived, it does not even exist. And when something is perceived, it is brought into the personal domain and only exists through the particular perception made by the viewer. This conceptual perception is upheld through a process of *Autopoeisis*: *"An autopoeitic system holds constant its organization and defines its boundaries through the continuous production of its components."* (Winograd & Flores, 1986:45) Literally translated from Greek, *Autopoeisis* means *"self-creation"*, so for Maturana, an autopoeitic system has to be constantly upheld if the structure is not to *Disintegrate*: *"If Autopoeisis is interrupted, the systems organization, its identity as a particular kind of unity, is lost and the system disintegrates."* This is not to say that the viewer and the thing that is perceived will simply vanish, only that because the argument goes that the particular understanding between the two is established because of the perception, that unity is lost.

Maturana furthermore argues that *"the structure of the organism [or autopoeitic system] at any moment determines a domain of perturbations—a space of possible effects the medium (environment) could have on the sequence of structural states that it could follow*." (Winograd & Flores, 1986:43) Thus, if a disintegration happens, it will not be a complete disruption as the opportunities for re-establishing an *autopoeitic* system that closely resembles that which was disintegrated are upheld by the *space of possible effects*.

Let us take an example: If a person, reading a book, suddenly drops it, the established autopoeitic system between the person and the book will be disintegrated. However, the person will only have to pick up the book again to be able to establish a new *structural state*. It will never, in Maturana's view, be the exact same situation—just as the Greek philosopher Heraclitus argued you can

never enter the same river twice as the flowing water will constantly change the situation—but the structure of the state will closely resemble that which was disintegrated.

This constant, structural upholding resembles what Winograd & Flores (1986:47) define as cognition: *"A cognitive system is a system whose organization defines the domain of interactions in which it can act with relevance to the maintenance of itself, and the process of cognition is the actual (inductive) acting or behaving in this domain."* Heidegger was brought forth by Winograd & Flores in relation to this because his view of Dasein as being socially constructed aligns with the definition of cognition outlined here.

Moreover, Maturana described the situations in which people engage in linguistic behavior as a *Structural Coupling*. Because the participants will try to uphold an internal autopoeitic system, they will form a *Consensual Domain* that is *"generated in the interplay between the physical domain and the domain of interactions"* because they both have demands for upholding the internal autopoeitic system.

In the interaction between a person and an artifact, the person will try to find an understanding of what the interactions mean to her. *Structural coupling* operates within the connotations embedded in the artifact and thereby influence the linguistic properties in the domain. Therefore the consensus between *Structural Coupling* through the demands of *Autopoeisis* constitutes a cooperative domain of interactions between the person and the artifact.

To sum up, the cognitive system described is a system whose organization defines the domain of interactions in which we can act accordingly. A domain that is highly phenomenal and influenced by the changing structure not determined by them but

deals with the relevance of the potential changes the structure inflicts on the domain to maintain autopoeisis. In perspective to our research question the changes in the relation between use and design generates a changed pattern of activity that is triggered by specific perturbations by the user. It is this focus that needs to be the focal point in any cognitive analysis with regards to the Post-Functional Paradigm.

Experience

Wright & McCarthy (2004:49) explains the legitimate ground of Experience *"[...] as people's felt experience in order to concentrate on the logic of practice, people's concerns, enthusiasm, and ambivalence about participation are abstracted away"*. Our approach to experience will be through the concepts laid out by John Dewey and the Russian philosopher and semiotician Mikhail Bakhtin who contributed greatly to the area on philosophy of language. The reason we believe experience is important is that we believe that there exists a gap where the rationalistic and scientific research ends and where we believe our notions on the post-functional begins.

As established, the Post-Functional Paradigm is a concept of action and an important part of our actions in the instrumentalism that thought, decision making, means and ends are a big part of (Dewey 1929). What both Dewey and Bakhtin draw *"[...] attention to is the gap that had developed between science and the ordinary everyday experience of being and acting in the world and responded in a practical revisionary way by inquiring into what science might be and how it might be used to make life more meaningful for people."* (in Wright & McCarthy 2004:53)

This notion gives reason for understanding that technology is engaged *relational*. For Dewey the aspect of experience in context with people's changing relationships

with technology give meaning to an understanding of experience as something social and political (Wright & McCarthy 2004). With this, both writers make their argument against the same dualism that has driven science until now. The same basic structure that Winograd & Flores direct their analysis towards, the same structure or system is what Dewey and Bakhtin argue to be occasionally useful concepts but not ontologically necessary bases for making sense of social life. (Wright & McCarthy, 2004)

It is in the action of acting, sensing, thinking, feeling and making meaning of things that makes Dewey (1929) draw the distinction *"[...] that experience is constituted by the relationship between self and object"*. According to Dewey it is through our experience we formulate our meaning-making of things, in the aesthetic experience, and in the everyday events and doings we constitute ordinary experience. The same aesthetics were in focus in our intervention with the rubber band. Rene argued that there might be a potential for the band if he were to explore the playfulness and aesthetics of the band. For him there was an equally meaningful incentive in applying the band as a solely aesthetic artifact rather than solving a concrete problem.

As Wright & McCarthy (2004:58) explain: *"In aesthetic experience, the lively integration of means and ends, meaning and movement, involving all our sensory and intellectual faculties is emotionally satisfying and fulfilling. Each act relates meaningfully to the total action and is felt by the experiencer to have a unity or a wholeness that is fulfilling"*. If satisfaction and fulfillment are what hold experience together, as argued by Dewey in relation to Cartesian Dualism, they may well be what fuel the connection between the mind and the physical extension.

If the premise then is that in design, experience is constituted between the felt aesthetic experience and the users' satisfactory appropriation of the artifact, the role of both the user and the designer has necessarily changed.

Conclusion

The purpose of this thesis has been to give the reader, whether she identifies herself as a designer, human, user or consumer, a better understanding of computational technology and its increasingly pervasive presence in society.

The idea of the “computer” has changed from being conceptualized as taking up a whole house with only one user for one purpose, to a model of living with transistors that have gradually overtaken more and more of the appliances we interact with in everyday life. This change has not come overnight but has been the result of a fruitful pursuit fueled by mankind's interest in technological development and the economic interests of the information technology industry. There are many arguments for why machines with computational capabilities existed in ancient China, during the time of the Greek philosophers and during the European Middle Ages. We are not to disagree with this, neither with the notion of the influence Ada Lovelace, Alan Turing, Hewlett & Packard or any other person, organization or institution could be said to have had on the development of the computer as we have known it throughout the last five decades or more.

What we are to disagree with, is the idea that the computer is a rationalizing machine that turns every problem it encounters into a fully computational problem that can be solved easily and efficiently by the powers vested in the transistors it is made up of. If you are to believe every kind of technology, computers included, are simply neutral entities we apply in our personal and work life to attain some result, we would argue that you have missed the point of the influence it possesses.

The technological development we have seen over the past five decades, combined with the thought experiments on the powers of computers long before that as well,

is not to be neglected and reduced to a theory of the inevitability of technological development to ever more advanced states. We see a pendular effect of the technology as influencing us as well as vice versa. We have changed the way we set up our businesses, the way we gather information for theses such as the one you are currently reading, and the way we use technology to aid us in our everyday work. It has been the continuing pursuit of creative endeavors to overcome very real problems of making the technology faster and faster for the convenience of a user model that has changed from being the programmer herself, to billions of people from every possible way of life.

However, if you are to keep a conceptual understanding of the computer as being a rationalizing, technological deterministic machine, you will create a Blindness for yourself that we see as missing the whole point of using computers in the modern age. We defined this thinking as underlying the *Functional Paradigm*.

We turned to a range of Tactical Interventions in our quest to understand how the conceptual model for technology in the Functional Paradigm is hurting the possibilities for moving further beyond it. One could argue that handing out a couple of rubber bands to some interaction designers is a strange way of going about understanding the future for computers, but we did so to see how they were able to apply a solution to a problem they did not have in their everyday life. The same exact model we will argue as being the one undertaken by most of the ways we apply to computers today; they are solutions to problems we do not have, and this provided us with possibilities in the same Problem Space defined by the programmers who made them for themselves decades ago.

Our Tactical Interventions in which we gave one test subject a Big Red Button gave us a way to showcase what we think will be the future for computers. Simple, low

cost technologies that can be applied to a wide range of situations by a person engaged in Problem Setting, rather than problem solving in a pre-defined Problem Space. Claus was able to come up with a surprisingly long list of appliances in which the button was able to fit in, but it was the process with which he was able to conceptualize over the structure of the technology we were interested in finding. It is a way for him to *sketch* with hardware, so to speak—he can try something out, see if it works, and if it has to be changed, the simple nature of the technology does not get in his way. The button itself is relying on software that is still built by and mostly for *hackers*, but it is a step along the right path in our view.

Our last Tactical Interventions was conceptually the simplest one: we removed access to a popular online social network for two regular users of it. Using what are essentially calculation machines for communicative purposes such as following friends' activities online creates a huge discrepancy between the conceptual models for each, in our view. We wanted to find out what Louise AB and Stine did in the situation where we took away one communications channel of theirs, and they were able to both overcome the hurdle by using other communication tools, as well as critically reflect on their use of these. This intervention ties in closely with our notion of what is important in the Post-Functional Paradigm.

We think that in order for both designers and critical users alike to have a clear understanding of the way in which computational technologies are employed in the modern age, the novelty of computers itself has to be washed away. Our argument is that you cannot reduce complex social situations to fully rationalized problems, and we should support the pursuit of solving Wicked Problems instead. We only do this if we bring forth a hermeneutic understanding of computers as a means to an end, rather than the center of our problem-solving attention.

Users will bring computers—of every kind—into their lives in more ways than the designers that create them can ever imagine. We argue that a socially constructivistic understanding based on the acceptance of Multistability as a driver for design is necessary if we are to change the view of technology as a one-purpose, neutral entity in a world where every human employing a tool comes from different wakes of life. Modern technology has already changed the way we work, the way we are entertained and the level of granularity with which we are able to capture life's most important moments. As a result of this, we have to get a new understanding of what it means to live equally with technology, rather than making our lives fit around it. We need, both as designers and humans that apply technology to attain a wide range of goals important to each of us in our life, to understand what it means to live in a Post-Functional Paradigm.

Our research question was as follows:

If we assume we are in the midst of a Post-Functional Paradigm where the design-use relation is established by the user's appropriation of the design rather than a paradigm where the technology is constituted by the notion of form following function, how has the user’s role then changed?

We are now able to offer the following answer:

The user’s role has changed from being seen as the recipient of instructions on how to use the computer as a means of conducting rationalistic problem solving formed by the designer’s cognitive modeling for correct use, to being seen as a full human being which employs the technology to attain a desirable result on their own account and in a way that fits their specific needs. This poses the challenge for the

designer to leave room in the design for a user that cannot be told what to do and expect, but one that appropriates it based on their beliefs, wants and needs.

“What information theorists call redundancy, it’s worth remembering, is also the stuff of poetry.”

— Nicholas Carr.

“I like to think

(it has to be!)

of a cybernetic ecology

where we are free of our labors

and joined back to nature

returned to our mammal

brothers and sisters,

and all watched over

by machines of loving grace.”

— Richard Brautigan, “All Watched Over By Machines of Loving Grace”.

Epilogue

Given the size of the thesis at hand, we have described and analyzed the outline and implications of what it means for the modern user to apply technology that is built for a different paradigm than the one they are currently in. There has been, and definitely still is, vast potential for changing the way we organize ourselves, how we work and establish our own identity through the use of technology. If we are to keep using computers, not as means to an end, but as the center of our attention, we are blinding ourselves to the intelligent plateau we could use the technology to reach. This thesis hopefully leaves the reader with an understanding of the change we see happening, while there is still potential in examining this area further in a postgraduate research program. This is something we are both interested in pursuing as this thesis could be seen as having merely introduced the concept, leaving room for a deeper investigation of its implications.

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