

Ambiguous Atoms

How products learn to understand us and change our lives

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"We shape our tools and afterwards our tools shape us."

- Marshall McLuhan/John M. Culkin

Introduction

Crashing computers and internet connections not working properly have major impact on our daily lives. More and more products are being connected by the medium of the internet with all its pros and cons. The last two decennia we became more than ever dependent on this technology. The internet is the medium of; freedom and cyber-attacks; sharing and privacy violation; self-actualization and pigeonholing people with the use of algorithms. The users of the internet are becoming aware of this ambiguity and are warned for companies, hackers, and governments whom collect their personal online data. Interconnective products make their way to the consumer market and take a place in our daily lives and environment. The current ambiguity of the “normal” internet would probably also appear in the products of our daily lives that we see as solid and reliable .

In the networked world where we live in, there are already multiple devices and services that communicate over the internet. We can call them inter-connective and rely on sharing data within a global network to make full use of their capacities. The quick development of networks, calculation power, energy use and algorithms, increase the opportunities of those interconnective products and services. In this paper the focus is not on products and services that we already associate with the internet and interconnectivity, like computers and smartphones. In this paper the focus is on products of our daily lives that we normally wouldn't associate with the internet and inter-connectivity.

Where “old” technologies mainly replace physical processes it are the inter-connective products and services that fulfil cognitive tasks. Those interconnective services and products analyse our behaviour and thoughts. This led to the following research question: “What are the consequences for the user when dealing with daily products if they are interconnectively connected?”.

Products & Technology

In our houses and homes we are surrounded with all kinds of technologies, the carriers of those technologies are products. The pen and paper can be seen as relatively old technologies, they already are a part of our world for quite some time. But also new interconnective technologies as smart-televisions, smart thermostats like TOON from Enesco are becoming more prominent and important in our lives (Eneco, 2015). Those technologies are connected over the Internet and share and collect data over this medium. Those products and the technologies that they carry within them can be seen as extensions of our human bodies. These products enable us to complete complex physical and cognitive tasks easier and faster, by this we have more spare time to spend on other affairs. But, is this true? What are the consequences for the user if he or she uses and allows a product laden with new interconnective technology into his or her live?

*“Technology is messy and complex. It is difficult to define and understand.
Today most people in the industrialised world
reduce technology’s complexity, ignore its contradictions,
and see it as little more than gadgets”. (Hughes, 2004)*

Pen and paper, smart-televisions and smart thermostats were innovative technologies at the time they were introduced. The consequences for our daily lives of those technologies at the time they were introduced are mostly unclear until they have gained a profound place into our societies. Marshal McLuhan describes in *“Understanding Media”* the phenomena that our world changes by the rise and introduction of new technologies (McLuhan, 1964). In *“Understanding Media”* McLuhan elaborates on the question: “What are the consequences of the introduction of new technologies into our societies?”. To quote Hughes again: *“Technology is messy and complex. It is difficult to define and understand”* (Hughes, 2004). We cannot standardise this term and we shouldn’t do this for every new technology or product. By this fact I don’t expect a unilateral answer to my question: “What are the consequences of the introduction of new technologies into our societies?”. This question can be a starting point to value an “old” or “new” technology.

Over time we became more and more dependant of all kinds of technologies. If you think about clothing and lighting for example, try to imagine how the world would look like without those technologies. For me a world without those two technologies seems unrealistic to live the life I live today. All technologies shaped our lives and identities with all the benefits and downsides. Clothing is an extension of our skin, an example of a technology that protects us from earth’s elements, and made it possible for humans to live wherever they wanted to live on this planet. This freedom that clothing provides also asks that we care for this technology, if our clothing is damaged, dirty or worn-out, we have to repair, wash or replace them. Lighting gives humans the freedom to do things in the dark, with the introduction of the light bulb we became less dependant on the light of the sun, day and night. With the vast introduction of the light bulb we quickly depended on big machines and electricity-networks that we have to feed and should maintain.

How products and technologies manifest in our societies to a point where we heavily rely on those products and technologies, is described in the *“Pyramid of Technology”* by Koert van Mensvoort (Mensvoort, 2014). This model is based on *“The hierarchy of human needs”* by Abraham Maslow (Maslow, 1943). Van Mensvoort divided technologies in seven levels; Level 1: Envisioned; level 2: Operational; Level 3: Applied; Level 4: Accepted; Level 5: Vital; Level 6: Invisible and Level 7: Naturalised. Every new technology starts at the bottom of the pyramid, with an idea or concept and is “Envisioned”. Some ideas and concepts almost immediately get to the “Operational” level by being prototyped and can grow within the pyramid to an “Applied” level and so on, other technologies keep stuck at a certain level (Mensvoort, 2014).



Pic1. The pyramid of Technology

If we look with this broad view at technologies we can conclude that humans are technological beings in their deepest sense. This amplifies the importance to look critical at technology and the pros and cons. We have to consider how we want to rely and depend on those technologies in our worlds. The designer plays a major role in the implementation of technologies into our societies. Besides the user the principals and designers have an important ethical responsibility for the future of our world.

Products that we consider to be reliable

Smart-televitions and smart-thermostats designed and engineered today reach the consumer market and gain a place in our daily lives. More and more services and products communicate and share data over the internet with various parties without our notice. The internet is the medium of freedom and cyber-attacks, sharing and privacy violation, self-actualization and pigeonholing people with the use of algorithms. The users of this medium are becoming aware of the ambiguity of this platform and are warned for companies, hackers and governments whom collect personal data. What if our daily products that we consider to be reliable get connected over this ambiguous medium?

Most physical products in our daily lives we consider to be reliable. Reliable, in the sense that the products do what we expect them to do. How longer a product is part of our daily lives, society and culture the bigger the trust in the product. Take the historic perspective from a chair for instance; the chair is an object to sit on and to rest; from sitting on the ground, sitting on a tree trunk to mass-produced chairs from Ikea. Primarily they al serve the same goal. By the introduction of multiple technologies throughout the years this became how it is today. A well designed and made product fulfils the function it is intended to do and doesn't disappoint us when we do this. The reliability finds its origin in techniques that can mostly be explained by physics. By these facts we see well-designed and made products as reliable.

Atoms don't Lie!

Interconnective products

In the networked world that we inhabit, there are already plenty of interconnected products. Interconnectivity means that a product is depending on the exchange of data within a global network to utilize its full capacity.

In the automotive industry there are already computers built-in cars that are constantly sharing information with their manufacturers (Navet, 2005). This allows the manufactures to gather data from their products. They use this data to analyse errors in their products and make improvements. Within the automotive industry, this seems as an innocent purpose to proceed. There are also interconnective products where we can question the innocence of the use of data. An article on Samsung smart-televisions shows that those televisions record conversations in the room where it stands (Zax, 2012). This is an example of a product that raises questions. Questions like; What is Samsung doing with this data? How do they improve their products with this data? Is the user being informed of the collection of this data? The development of interconnectivity played out mainly via and on the Internet. But how will this interconnectivity in products manifest themselves in the future?

A study by Professor Elgar Fleisch in which he explores the possible developments of interconnecting products, various technical aspects are discussed (Fleisch, 2010). Aspects such as energy consumption, the transmitting of data and the infrastructure of the Internet. For many applications, sending and receiving data requires relatively much power and therefore also electricity. According to Fleisch, it is therefore unlikely that this interconnectivity in our near future will manifest in small mobile everyday product. The emergence of new ways of generating, storing and using of energy can change this in the future.

There is a limit for mobile interconnecting products, which consume relatively little energy to receive and send data. Via wireless links used in RFID and NFC chips that are used in multiple access and payment cards such as the OV-chip card and debit cards, there is only limited bandwidth (100 Kbit / s) which results in limited and slow communicating and sharing possibilities of data (Simões, 2011). In contrast, the internet speed of an average household has in recent years greatly increased. Today it is already possible to have a bandwidth at home of more than 5000 (500 Mbit / s) times faster than that of RFID and NFC (XS4ALL, 2015). This makes it possible to have products in your house that are constantly connected and can share large amounts of data. This allows stationary interconnective products through a connection with a high bandwidth, for example in a home environment, to analyse human cognitive processes and share the information with third parties, in contrary to mobile personal products.

If we project these aspects on existing interconnecting products like smart televisions and TOON, we can conclude that they fall within the stationary limits. These products are not mobile, this results in a virtually limited amount of data that can be shared. This can enable these stationary products to understand and takeover cognitive processes, like the ability to choose.

Interconnecting products and systems are being divided into three categories. (i) "Human-in-the-loop systems", these are systems where the user has direct control over the system. An example is warning systems in cars. (ii) "Human-out-the-loop systems" within these systems, the individual is observed and the system takes decisions themselves, which currently happens on the internet in "Google AdWords". (iii) A combination of (i), and (ii) also referred to as "human-on-the-loop" (Google, 2015). TOON falls under this system, as user you decide what desired temperature you want. On the other hand, TOON can, based on your life pattern by itself decide when to turn off or not. These are the algorithms behind these systems that motivate you (i), or (ii) make choices for you and (iii) have the ability to influence (Sirajum, 2013).

Elgar Fleisch writes about the relationship of interconnected products with the outside world, how it starts and what the possibilities are. However, the ambiguity of the internet and the consequences of interaction with the outside world for the user is being disregarded. All interconnective products are

able to collect and share data via the internet. How this data could be collected? And for what purpose is the data used? These are questions for the designers of these products and algorithms that determine what data is collected and shared. It is up to the parties receiving this personal data, how the data is fed back to the user.

It can be concluded that with the current technology, there will be more products designed, produced and sold that will fall within the previously described conditions. With the limitations of current technology the first devices will be stationary products that can exert influence on the user. But to what extent can we trust these products with algorithms to influence our privacy, choice, efficiency and ultimately our identity?

Ambiguous Atoms

Within our brief relationship with the virtual world of the Internet users are becoming ever more aware of the ambiguity embedded in this medium and they even take it, to a certain extent, for granted. Companies, governments and hackers are regularly in the publicity; Google which develops applications that collects and shares data of its users; the NSA collected personal data in opposition to the privacy laws and Snowden who hacked into the NSA appliances and brought this matter to the everyday attention. In today's internet, we have become aware of the collection of personal data and will become more accustomed with the use of big data (Gartner, 2015). It is for example, used to improve products for personalized marketing, to set up an individual's life more efficient and make our physical world safer. But how did they get this data?

Often this personal data is voluntarily shared with the parties that use it, such as Google, Facebook and other virtual platforms. This method of collecting I would categorize under a Human-in-the-loop method of collecting data because the user is actively participating in creating this data. Furthermore the user gives permission for the use of this data by consenting to the terms and conditions attached to the use of such services. In addition there are also human-out-the-loop and human-on-the-loop modes of data collection that use algorithms to autonomously collect and share data over the Internet with an external party. Algorithms do not always function as they are supposed to is discussed by Kevin Slavin (Slavin, 2011). In his presentation he gives several examples of algorithms that have come into conflict with each other. One example, where the price of a book multiplies fourteen times on the online store, Amazon.com, is according to Slavin the result of algorithms which are in conflict with one another. That conflicts between algorithms not only take place on Amazon.com is shown by the "flash crash or 2:45" on the US financial markets where within ten minutes they lost billions in shares (Wakefield, 2011). The consequences of algorithms in conflict with each other in our everyday products are unpredictable. This ambiguity is manifested from my research in three areas; (i) The purpose for which this data is used; (ii) the degree of access to an interconnecting product; and (iii) the algorithms themselves.

Live or to be lived?

Where “old” technologies mainly replaced physical processes, it are the interconnective products that replace cognitive tasks from people. The interconnective services and products analyse our behaviour and our thoughts by the use of algorithms. To what extend can we trust those products and services with those algorithms to influence the efficiently, privacy, freedom of choice and in its most extreme form our identities?

What does this mean for the world where we are going to live in is unclear to a certain extend. Regarding to the topics ‘Interconnective Products’ and ‘Ambiguous Atoms’ from this paper I came up with two future scenarios. (a) A utopic scenario, where the product becomes a personal assistant and it learns to know you and your friends and family. It knows what you like and don’t like, you can see the product in this scenario as a sort of a creature, the product also likes to be seen and treated this way. What leads to an emotional relationship with the product. (b) A dystopic scenario, where the product autonomously shares personal information and collects information from third-parties all over the world where the product is connected with. This allows those third parties to manipulate the live of the user. This sharing and collecting with third-parties deprive the users own will.

Both scenarios will be described with a daily stationary product. The chosen metaphoric product is the electric water kettle. This product has, like interconnective technologies a beautiful side and a dark side. The water kettle carries the technology of cooking, maybe one of the oldest technologies we know of, use on a daily basis and were we still heavily rely on. Besides that it is a product that is able to boil water quite efficient in a short amount of time. The dark side of the kettle is the fact that is frequently involved in the occurrence of house fires all-over the world. Those beautiful and dark sides of daily products does not only apply for the electric kettle, I would like to invite and challenge every reader of this paper to project the following scenarios on a product of their lives that you think is valuable for your life and imagine that is it influenced by this phenomena.

(a) You wake up and get out of bed. When walking to the kitchen you hear a happy robotic noise. Entering the kitchen you are welcomed by this happy machine that notices your presence. It is your electric kettle that is eager to boil some water for you, this is what he likes to do best. He boils water for your cup of tea where you start the day with every morning. He is already doing this for years and he knows exactly how and when you like your teas best. Because it is interconnectively linked to your other products and services it knows when and how it can meet your needs. He was there when you came home with your current partner, and it has seen your kid’s grownup. It does for them what it does for you, your whole family has an intimate relationship with him. Additionally he takes the availability and price of precious resources as water and electricity into account. This is better for you and for the world.

(b) You wake up and get out of bed. You are extremely thirsty and want a cup of tea. Your eclectic kettle refuses. Your kettle is equipped with multiple sensors and shares the collected data with governments and providers of your water and electricity, to ensure you don’t use too much of those resources. The reason why it refuses is completely unclear to you. You checked your water and energy usage this month and this doesn’t differ from your normal usage. What can it be? Is it a hacker that took over the command of your kettle? Or is it your health insurance company who wants to influence your lifestyle? Or is the interconnective network down for repair or by a cyber attack? The reason why still is absolutely unclear and you become suspicious, you even start to doubt yourself, if you didn’t do something wrong.

On the current internet the introduction of ad-blockers, private-mode internet browsers didn't went by unnoticed. Those applications remove some of the algorithm based persuasive marketing that the users otherwise have to cope with. The user is able to gain full control over those interconnective systems by learning how to program the core. With this skill the user is able to program those systems to their demanding's. "Learn to program or be programed" (Rushkoff, 2010). How realistic is this scenario? Can we expect that we will program all our products to our demanding's? In the first scene of the film Interstellar the main character "Cooper", takes over control of a low flying surveillance drone by hacking into it. He wants to use the solar cells of the drone to provide his farm with electricity (Interstellar, 2014). Coming home at his farm with the new asset his farming robots standing there with an error. He resets and reprograms the farming robots and they go back to work.

How realistic is this scenario? Where we all have to be engineers to program and reprogram our interconnective products to our own wishes? What if people lack in basic educations and programming knowledge and dupable listen to their products and the digital great powers? Does a new panoptic model arise? Where the user unsuspectingly subjects his or her entire being to the parties whom have access to their products of their daily lives?

Where the classic panoptic model described by Bentham, was limited by visual surveillance (Bentham, J. 1843). The interconnective systems have access to our mental processes, and can get grip on our intentions before the act takes place. This observation and analysing of the users mental processes enables third parties to take the free will of the user of those products. This system in its optima forma can lead to a complete predictable society. All of this is at odds with Nietzsche's philosophy of "the naturalisation of man - "to be open to what absolutely happened suddenly and traverses all" (Nietzsche, F. 1881). According to the Korean/German philosopher Han are suddenly occurring events essential turning points for a subversion of power (Han, B. 2015). A suddenly occurring event allows something that was not possible in the previous state or was complete absent. Those suddenly occurring events are not possible in an interconnective system in its absolute form, where coincidence does not exist. This immediately leads to an absolute dependence of this interconnective system, technologies, products and great powers.

Conclusion

My research shows a line how technology relates to products, how products are carriers of all different kinds of technologies and how they shaped our world where we live in today. Human beings are technological creatures by origin. Before we become dependent of a certain technology, product and eventually a whole system we have to look at all its pros and cons. We have to consider how it can and will change our world. The designer has an important role in this process; designers are the unifying factor between technology and the implementation of those technologies into our societies. It is of great importance that designers are aware of this ethical responsibility.

Most technologies we use on a daily basis are often a long time part of our societies, cultures and world. Those technologies proved their quality over the years, by this we see them and the product that carry those technologies as reliable. This reliability mainly relates to material properties and construction technics and can mostly be explained by physics. In the future this may drastically change by the emergence of interconnective technologies.

Sharing and collecting data requires relatively much computer power and electricity. The amounts of data that can be shared and collected, determines if the user can be observed, analysed and controlled by third-parties.

Today's interconnective technologies are not able to connect all our daily products to an external network. Mobile everyday products that in their origin are not interconnective are still limited in the amount of data they can collect and share. On the other hand the stationary products in a local network especially products connected to a power source, are the first that will be able to collect and share large amounts of data. It can be concluded that with the current technology, there will be

more products designed, produced and sold that will fall within the previously described conditions that will be able to influence their users.

Current interconnective products and services collect data on different ways. Human-in-the-loop where the user itself provides the data and Human-out-the-loop where algorithms autonomous collect and share data. This data is insightful for companies, governments and hackers. They use data to improve their products, for persuasive marketing, to improve a person's efficiency, and to make our world safer. It is up to the parties that have access to the data, where it gets used for and what the direct influence for the user would be. If and how this data gets fed back to the user is up to the third-parties and algorithms. If those algorithms conflict it can have unpredictable ambiguous consequences. The ambiguity is manifested on three levels, (i) the purpose where the algorithm is used for (ii) the extend of accessibility to an interconnective product (iii) the algorithms itself.

The interconnective systems has access to our mental processes, and can get a grip on our intentions before the act takes place. This observation, analysing of the users mental processes enables third parties to take the free will of the user of those products. This system in its optima forma can lead to a complete predictable society. Suddenly occurring events are not possible in an interconnective system in its absolute form, where coincidence does not exist. This immediately leads to an absolute dependence of this interconnective system, technologies, products and great powers.

To come back at my research question "What are the consequences for the user when dealing with daily products if they are interconnectively connected?" Because we as human beings are technological creatures by origin we can become dependent on a certain technology. We have to constantly ask ourselves which technologies we do accept into our societies and which we don't. The most technologies we use on daily basis are often a long time part of our societies and we think about them as reliable. With the introduction of interconnective products this will radically change our perception of this reliability and will lead to an ambiguous relation with our products. With the use of algorithms companies, governments and hackers are able to influence our efficiency, freedom of choice and eventually our identity.

Algorithms in conflict can have unpredictable ambiguous consequences, what those consequences will be is unclear. Future research will have to be done to give an insight if nothing could happen suddenly in an interconnective world in optima forma, what will lead to an absolute predictable society.

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